CRANE

VALVES
FITTINGS
PIPE
FABRICATED
PIPING

NUMBER
53

FOUNDED
BY R. T. CRANE
1855

CRANE CO.

836 S. MICHIGAN AVENUE, CHICAGO 5, ILLINOIS

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Terms and Conditions

(This Catalog Supersedes All Previous Issues)

PRICES: All prices shown herein are list prices, intended for the customer's convenience in determining his net cost. They are not intended to establish nor to suggest resale prices. All list prices are subject to change without notice.

TAXES: Prices shown herein do not include excise, sales, use, occupation, or other taxes levied on sales transactions. All such taxes will be billed to our customers.

NET TERMS: 30 days. Material is subject to shipment in whole or in part at our option, and each shipment is subject to immediate invoicing. All orders are subject to the approval of our Credit Department.

REMITTANCES: Remittances should be made to the Crane Branch from which our invoice is issued, in funds free of exchange or collection charges.

CLAIMS: No claims for shortage or involving inaccurate filling of orders will be allowed unless made within ten days after receipt of goods. Claims for goods damaged or lost while in possession of the Transportation Company should be filed by the consignee direct with the Transportation Company.

RETURNED GOODS: We cannot accept the return of any goods unless our consent has first been obtained.

DELAYS: We shall not be liable for delays or defaults occasioned by strikes, differences with workmen, fires, accidents, delays or defaults occasioned by the exercise of governmental authority, failure to obtain materials, fuel or transportation, or by any cause unavoidable or beyond our control.

WARRANTIES: If within one year following date of delivery any material supplied by us proves defective, or fails to meet the agreed specifications, buyer shall not return it unless requested to do so, but shall immediately notify us, stating full particulars in support of his claim. If faulty workmanship or material is involved, we will adjust the matter fairly and promptly. Under no circumstances shall we be obligated to allow claims for consequential damages or for any labor or other expense incurred by reason of the use or sale of any defective material; the sole measure of damages being the price received therefor by us.

SPECIAL GOODS: Orders covering special goods are not subject to cancellation, except upon agreement to make payment for the special work which has been performed.

ILLUSTRATIONS: The illustrations in this catalog are actual representations of a certain size of each line of products, but do not necessarily represent all sizes in all details. The designs shown are subject to change without notice.

NOTICE

During this period of national emergency, we reserve the right to make changes in materials without notice, wherever such changes do not, in our opinion, affect the normal serviceability of the product or our recommended pressure-temperature ratings.

CRANE CO.

GENERAL OFFICES:

836 S. Michigan Ave., Chicago 5, Illinois—*Cable Address:* Cranecoy—Chicago

MANUFACTURING PLANTS

Chicago, Ill.—Chattanooga, Tenn.—Trenton, N. J.—Colton, Calif.

CRANE BRANCHES

In addition to Crane branch houses listed below, Wholesalers in all major markets sell Crane products.

ALABAMA
Birmingham (3).....2 S. Twentieth St.
Mobile (3).....300 N. Royal St.
ARIZONA
Phoenix.....233 S. First Ave.
Tucson.....35 Toole Ave.
ARKANSAS
Ft. Smith.....221 S. Ninth St.
Little Rock.....120 Commerce St.
CALIFORNIA
Long Beach (1).....824 W. Anaheim St.
Los Angeles (54).....321 E. Third St.
Oakland (7).....346 Ninth St.
Sacramento (5).....1227 Front St.
Salinas.....239 East Alisal St.
San Bernardino.....777 Mill St.
San Diego (1).....1138 India St.
San Francisco (19).....301 Brannan St.
San Jose.....63 San Jose Avenue
Santa Ana.....919 Poinsettia St.
Stockton.....331 North Harrison St.
COLORADO
Denver* (17).....1631 Fifteenth St.
Grand Junction*.....601 Pitkin Ave.
Pueblo*.....180 Central Main
CONNECTICUT
Bridgeport (3).....302 John St.
Hartford (5).....710 Windsor St.
New Haven (11).....365 Orchard St.
DISTRICT OF COLUMBIA
Washington (5).....1225 Eye St. N.W.
FLORIDA
Jacksonville (3).....1007 W. Bay St.
Miami (30).....85 N.W. Tenth St.
Orlando.....1027 Sligh Blvd.
Tampa (1).....1105 E. Twiggs St.
West Palm Beach.....217 Fifth St.
GEORGIA
Atlanta (3).....Washington St. Viaduct
Augusta.....701 Reynolds St.
Macon.....500 Broadway
Savannah.....14 W. Broad St.
IDAHO
Boise.....214 S. Fifth St.
Pocatello.....756 S. First Ave.
ILLINOIS
Aurora.....544 S. Lake St.
Chicago (6).....156 N. Jefferson St.
Southside branch (20).....231 W. 79th St.
Rockford.....800 S. Main St.
Springfield.....921 E. Monroe St.
Waukegan.....1219 Glen Rock Ave.
INDIANA
East Chicago.....1004 E. Chicago Ave.
Evansville (6).....118 S.E. Eighth St.
Indianapolis (6).....333 W. Market St.
Muncie.....342 N. Pershing Dr.
South Bend (23).....1616 S. Franklin St.
Terre Haute.....209 N. Ninth St.
IOWA
Davenport (8).....217 E. Second St.
Sioux City (2).....223 Jackson St.
KANSAS
Topeka.....132 No. Kansas Ave.
Wichita (1).....624 E. First St.
KENTUCKY
Kevil.....Box 276
Lexington (1).....165 Midland Ave.
KENTUCKY (Continued)
Louisville (2).....756 S. First St.
LOUISIANA
New Orleans (11).....710 S. Broad St.
Shreveport (92).....1320 Winston St.
MAINE
Portland (4).....70 St. John St.
MARYLAND
Baltimore (1).....626 W. Pratt St.
Salisbury.....1221 N. Salisbury Blvd.
MASSACHUSETTS
Boston (30).....48 W. First St., South Boston
Springfield (1).....60 Cypress St.
MICHIGAN
Detroit (26).....150 Randolph St.
Flint (1).....155 Lewis St.
Grand Rapids (2).....56 Grandville Ave., S.W.
Jackson.....409 Hupp Ave.
MINNESOTA
Duluth** (2).....102 Lake Ave., S.
Mankato**.....510 Pike St.
Minneapolis** (1).....400 Third Ave., N.
St. Paul** (1).....Broadway at 5th St.
MISSISSIPPI
Jackson (5).....176 N. Gallatin St.
MISSOURI
Kansas City (8).....2819 Warwick Trafficway
St. Louis (3).....30 S. 16th St.
MONTANA
Billings**.....30th St. and First Ave. S.
Great Falls**.....2 Third Ave., South
NEBRASKA
Grand Island.....115 E. Front St.
Omaha (8).....323 S. Tenth St.
Scottsbluff*.....1617 Avenue "A"
NEVADA
Reno.....401 E. Fourth St.
NEW JERSEY
Camden (4).....2994 Mt. Ephraim Ave.
Newark (5).....90 South St.
Trenton (5).....50 Escher St.
NEW MEXICO
Albuquerque*.....612 First St., N.W.
Roswell*.....102 So. Virginia St.
NEW YORK
Albany (1).....North Broadway
Binghamton (36).....21 Washington St.
Buffalo (5).....201 Church St.
Hempstead.....209 Main St.
Long Island City (1).....47-30 29th St.
New York City (Display Room).....101 Park Ave.
Rochester (2).....200 South Ave.
Syracuse (1).....760 W. Genesee St.
Utica (2).....326 Broad St.
NORTH CAROLINA
Asheville.....531 McDowell St.
Charlotte (8).....1307 W. Morehead St.
Greensboro.....205 Lyndon St.
Rocky Mount.....300 N. Church St.
NORTH DAKOTA
Fargo**.....1441 4th Avenue North
Minot**.....Box 1189
OHIO
Akron (11).....425 S. High St.
Canton (2).....210 Piedmont Ave., S.E.
Cincinnati (1).....824 Broadway
Cleveland (3).....6215 Carnegie Ave.
Columbus (15).....67 N. Front St.
OHIO (Continued)
Dayton (2).....901 S. Perry St.
Lima.....207 S. Central Ave.
Toledo (1).....390 S. Erie St.
OKLAHOMA
Muskogee.....302 Commercial St.
Oklahoma City (2).....705 W. Main St.
Tulsa (1).....623 E. Third St.
OREGON
Medford.....125 West Fourth St.
Portland (8).....710 N.W. Fourteenth Ave.
Salem.....3030 Portland Rd.
PENNSYLVANIA
Erie (3).....222 E. Eighth St.
Philadelphia (22).....245 Master St.
West Philadelphia Branch..1600 S. 59th St.
Pittsburgh (30).....40 24th St.
Reading.....407 N. Front St.
RHODE ISLAND
Providence (3).....245 W. Exchange St.
SOUTH CAROLINA
Charleston.....2026 Meeting Street
Greenville.....223 W. McBee Ave.
SOUTH DAKOTA
Aberdeen**.....324 Railroad Ave.
Sioux Falls**.....326 E. 8th St.
TENNESSEE
Chattanooga (1).....1317 Chestnut St.
Knoxville (1).....523 Jackson Ave., S.W.
Memphis (1).....254 Court Ave.
Nashville (2).....532 Eighth Ave., South
TEXAS
Beaumont.....720 Fannin St.
Corpus Christi.....1212 N. Tancahua St.
Dallas (2).....814 Young St.
El Paso*.....1609 Texas St.
Harlingen.....201 West "C" St.
Houston (1).....2204 Pease Ave.
San Antonio (6).....1200 E. Houston St.
UTAH
Ogden.....2001 Wall Ave.
Provo.....237 W. 5th No. St.
Salt Lake City (10).....307 W. Second South
VIRGINIA
Newport News.....7706 Virginia Ave.
Norfolk (10).....2 E. Twenty-second St.
Richmond (20).....1209 Admiral St.
Roanoke (17).....404 Center Ave., N.W.
WASHINGTON
Seattle (14).....419 Second Ave., S.
Spokane (4).....126 S. Post St.
Tacoma (1).....1209 South "A" St.
WEST VIRGINIA
Charleston (25).....502 Broad St.
WISCONSIN
Madison (3).....641 Williamson St.
Milwaukee (3).....2123 W. Michigan St.
Oshkosh.....37 Market St.
WYOMING
Casper* (5).....802 East "C" St.

*(Crane-O'Fallon Division)
**(Crane Company of Minnesota)

EXPORT

NEW YORK BRANCH
SAN ANTONIO BRANCH
SAN FRANCISCO BRANCH

CRANE LIMITED (Canada)

GENERAL OFFICE: 1170 Beaver Hall Square, Montreal, Que.—*Cable Address:* Cranelit—Montreal
MANUFACTURING PLANTS: Montreal, Que. — St. John's, Que. — Quebec, Que. — Port Hope, Ont. — Vancouver, B. C.

BRANCH HOUSES

ALBERTA
Calgary.....602 Eleventh Ave., W.
Edmonton.....11925 Kingsway
BRITISH COLUMBIA
Vancouver.....540 Beatty St.
Victoria.....1010 Government St.
MANITOBA
Winnipeg.....93 Lombard St.
NEW BRUNSWICK
Moncton.....293 Church St.
NEWFOUNDLAND
St. John's.....Hill O'Chips
NOVA SCOTIA
Halifax.....7-15 Doyle St.
ONTARIO
Hamilton.....40 Wellington St., North
Kingston.....71 Brock St.
London.....304 York St.
Ottawa.....288 Catherine St.
Port Arthur.....950 Memorial Ave.
Toronto.....306 Front St., W.
QUEBEC
Montreal.....1121 St. James St., W.
Quebec City.....39 St. Roch St.
SASKATCHEWAN
Regina.....1408 Broad St.
Saskatoon.....359 First Ave., N.

CRANE, LIMITED (Great Britain)

ENGLAND
LONDON—45-51 Leman St., London E. 1—*Cable Address:* Cranelon—London
IPSWICH (Works)—Nacton Road, Ipswich, Suffolk

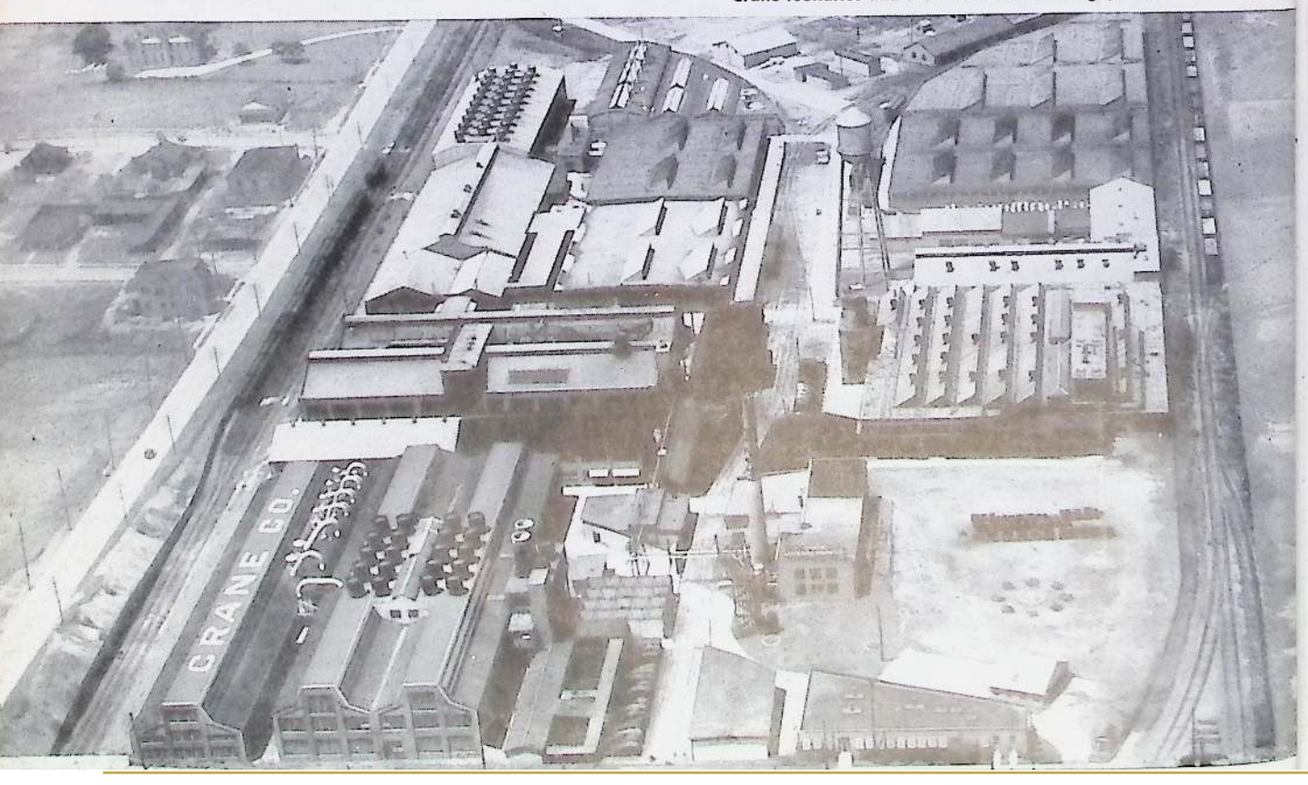
Birmingham.....1277 Coventry Road, South Yardley
Manchester.....Westinghouse Road, Trafford Park
Bristol.....1, 19 Colston St.
Brentford.....Great West Road

SCOTLAND
Glasgow—94-100 Clyde Ferry St., Anderston

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Crane Chicago Works, the world's largest plant for manufacturing valves and fittings. Occupies 160 land acres; has 72 buildings including 7 steel, iron, and brass foundries. Equipped with nearly 5,000 production machinery units.

Crane foundries and factories at Chattanooga, Tenn.



The Plants Behind the Products You Choose from this Catalog

Most products listed in this Catalog are made in the great Crane Chicago Works pictured above. Perhaps you know Crane Chicago Works is the world's largest factory of its kind. Here is a completely integrated operation for the production of valves, fittings, and piping specialties—from raw materials to ready-to-use equipment—in all kinds and types in general use today. More than 30,000 individual piping items are made at Crane Chicago Works. Part of the facilities of the Crane Chattanooga Plant are also used to make some of these products.

To you, a piping user, Crane Co.'s mighty production capacity is important. For whether you use much or little equipment, the factory is where your supply begins.

Where Quality Sets the Pace for Mass Production

More important to you is that Crane mass production is quality-maintained production. For example, an ordinary pipe fitting made by Crane is produced with the same scientific care as a Crane alloy steel valve.

Quality first for bigger value to the customer has been the policy of Crane Co. from its humble beginning in 1855. Intensified constantly through the years for almost a century, that policy alone could justify the ever-growing customer confidence in Crane Quality Products.

Quality—the Foundation of Crane Co.'s Leadership

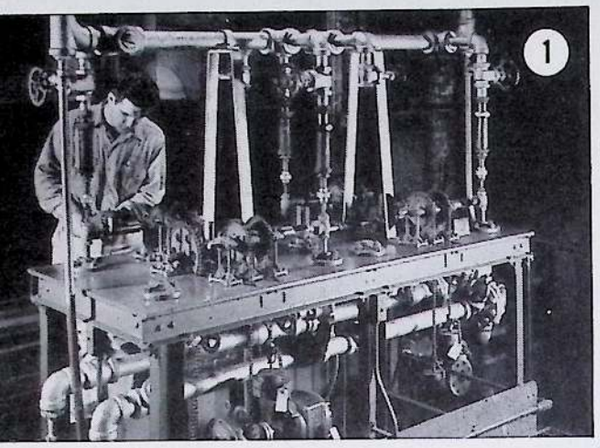
With each passing year, the foundation for Crane Quality grows firmer and broader. In control of raw materials, in product design, engineering, manufacturing, and testing techniques, Crane Co. is ever adding to its vast experience.

Not in years alone, but by outstanding achievements, can the leadership of Crane be measured best. Nowhere else in the industry are new piping products born in such an elaborate background as Crane Engineering Laboratories. Nowhere are there better and more complete facilities than those which Crane Co. has for efficient product engineering and manufacturing.

How you are assured of consistently high quality and value in Crane products—how these products are made available where you need them—and how Crane Co. meets the responsibilities of world leadership in supplying piping equipment needs, is evident in the following pages.

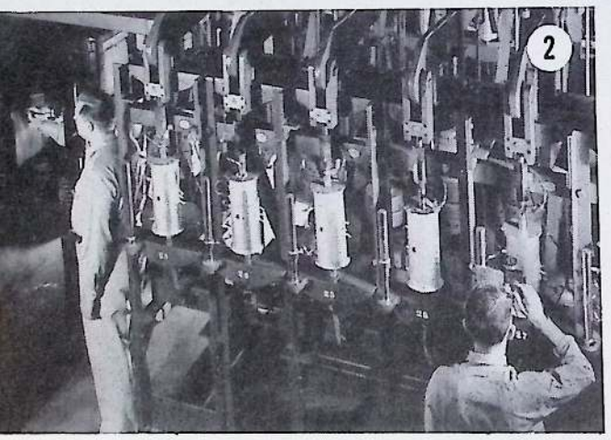
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Engineering and Development



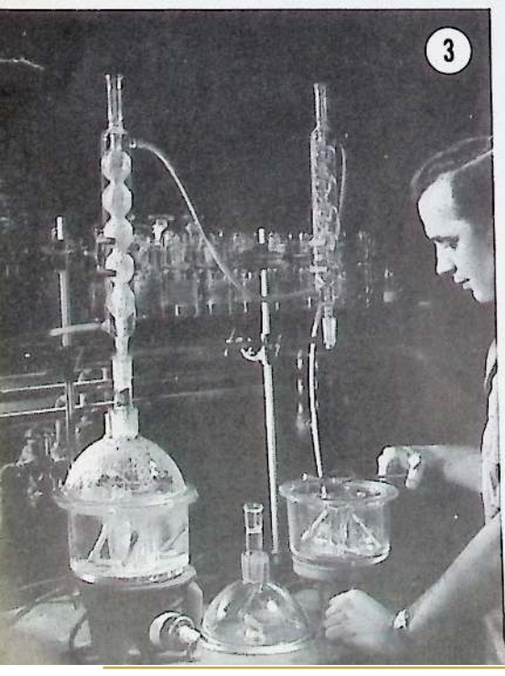
1 ***Brass Valve Studies***—How good is a brass valve? This multiple testing machine, simulating actual service conditions, gives Crane Engineers the facts. It helps evaluate not only the relative merits of valve constructions, but also to determine durability and service life of materials in stem and centerpiece combination. It is invaluable in study and development of thread profiles, clearances, alternative materials, etc. Such testing enables the constant improvement of performance and dependability.

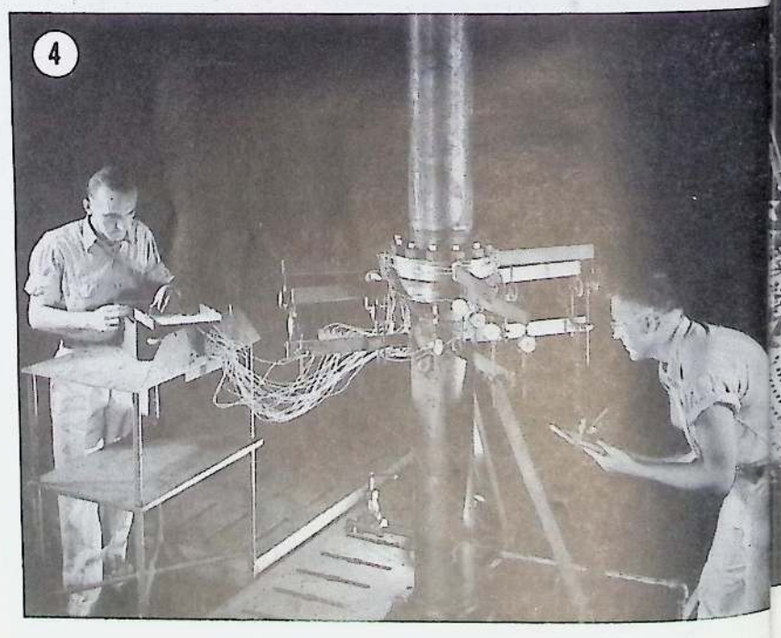
2 ***Creep Research***—The study of elevated tensile properties of metals was started by Crane in 1908, and since 1924, Crane has designed and built its own tensile creep testing equipment. Photo shows battery of individually controlled test furnaces operating in constant-temperature room. They permit direct telescopic creep measurement throughout test runs lasting thousands of hours, and up to the point of rupture. The vast data accumulated by Crane Engineers on elevated temperature properties of metals, has accurately guided Crane in supplying valves and fittings for the ever higher temperatures and pressures demanded by industry.



3 ***Double-Check for Facts on Corrosion***—Crane doesn't depend on either laboratory findings or field tests alone for facts on corrosion. One complements the other, with Crane tests guiding field research for most effective results, and often eliminating excessive cost and great hazard to the customer.

4 ***Stress Analysis***—Theoretical calculations, alone, of high load stresses on piping equipment may be good, but not good enough for Crane Engineering Laboratories. Photo shows typical simulated service test of 1500-Pound Crane Pressure-Seal line joint, giving accurate measurement of actual strains, deflections and movements on every part of the design.





Foundry, Forge, and Fabrication

1 ***Steel Melting Facilities***—Four large and many small electric furnaces with capacities ranging from 1000 to 20,000 pounds, having an average melting rate of 24,000 pounds of steel per hour, put Crane among the largest steel foundries in industry. For melting alloy steels, irons, and brass mixtures, Crane operates 101 furnace units of the most modern and efficient design.

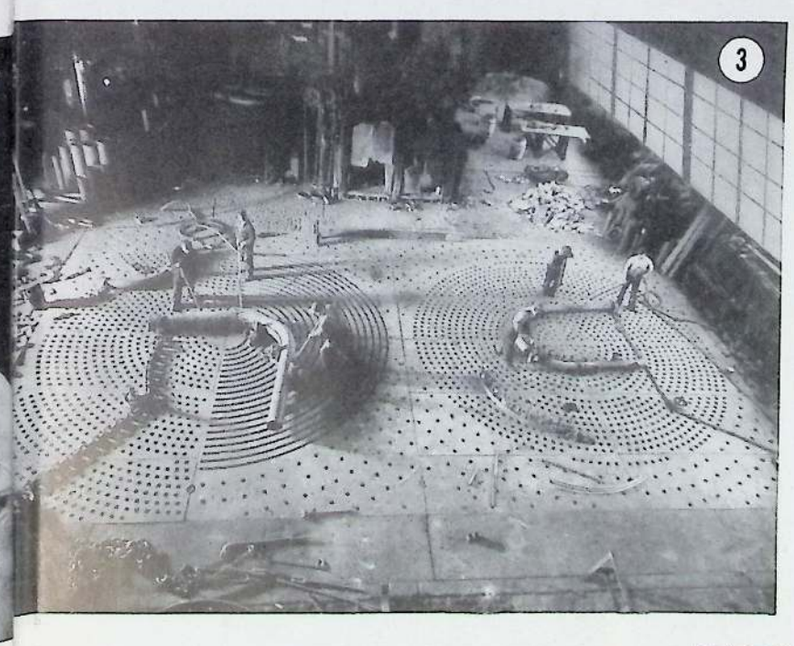
2 ***Acres of Casting Capacity***—Ready to convert each furnace melt into piping materials, Crane molding and casting equipment is of the finest type in any foundry. Molding, pouring and shakeout operations are mechanized to the highest degree, utilizing modern roller, belt, or overhead conveyor systems for continuous movement of castings and equipment on the large Crane foundry floors. High efficiency here is a strong factor in the high quality of Crane products.

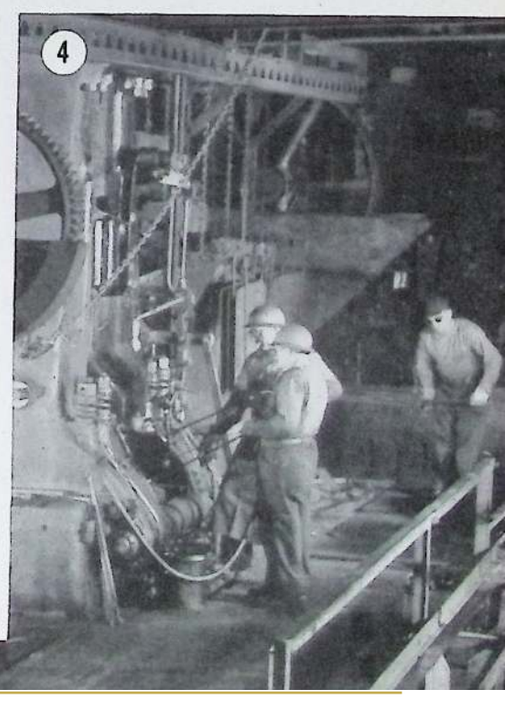
3 ***Pipe Bending and Fabrication***—This picture tells the story of Crane Co.'s ability to produce almost any shape or size of pipe bend. With special tools and techniques, and highly skilled men, four Crane pipe shops find no specification too difficult to meet. They also produce headers and other units, incorporating valves, handling all operations such as bending, lapping, flanging, welding, etc.,—and can produce pipe coils in all sizes and shapes.

4 ***Big and Modern Forge Shop***—Nearly 45,000 square feet of space is used for steel forging at Crane Chicago Works. This shop is lined with rows of forges ranging from 600 pounds to 22,000 pounds hammer weight, to efficiently produce valve parts, fittings, and flanges. Equipment includes shears to cut billets from cold steel up to 4-in. thick in one bite. Gas-fired furnaces, heat-treating ovens, and acetylene cut-off machines complete this shop.



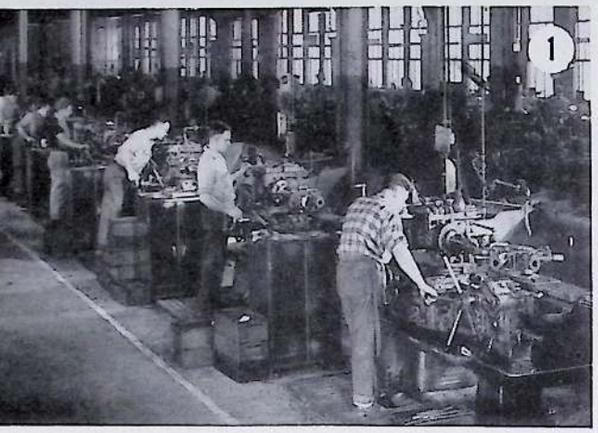






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Machining and Assembling

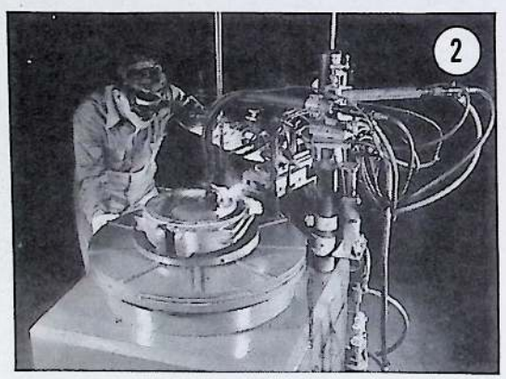


1 ***Machining Small Parts***—The Crane system of progressive manufacture reaches a high degree of efficiency with precise control of quality in the machining departments. Operations on various valve parts such as discs, stems, and glands, are accurately performed by the machine operators, each with unusual skill in his work.

2 ***Facing Discs by Continuous Welding***—One of the outstanding examples of efficient production engineering on Crane steel valves is this disc-facing operation. Here Stellite is being deposited on a disc for a Crane Pressure-Seal valve.

3 ***Fast and Accurate Machining***—Here, vertical turret lathes known for great speed and accuracy, are turning the flanges on Crane cast steel valve bodies. Hundreds of the finest machines, many designed by Crane engineers for special needs, occupy thousands of square feet in the great Chicago Works. They insure the high quality of Crane valves and fittings and produce them in ample quantity for every user.

4 ***Assembling Crane Valves a Smooth Operation***—The care given to Crane castings and forgings and the meticulous standards for machining all valve parts are reflected in the smoothness of assembly operations. In one department, 130 stations regularly handle steel valves 4 in. and larger. Brass valve assembly lines, using the progressive method, can handle as many as 20 different sizes and types at one time. Photo shows Crane diaphragm valves in process in a typical assembly department for small iron valves.







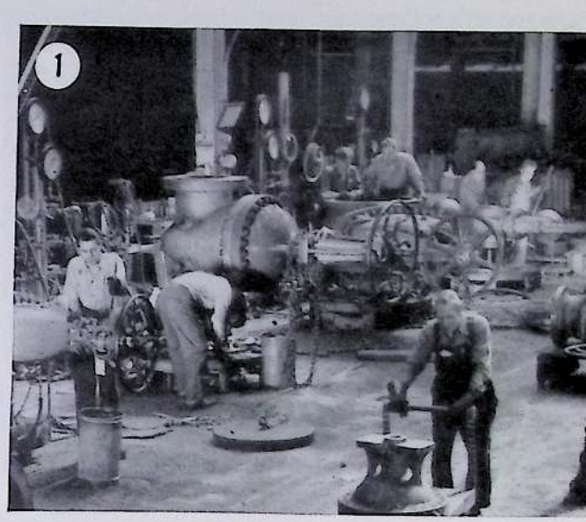
Inspection and Testing

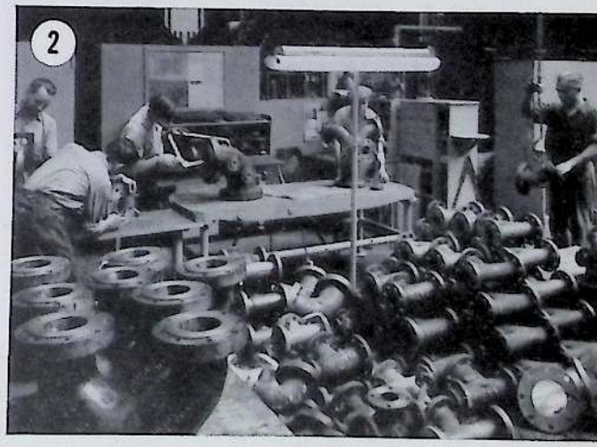
1 ***Large Steel Valves Get "O.K." for Service***—Here, Crane Steel gate valves get final check to insure customer satisfaction in the service for which they are intended. Hydrostatic pressure tests are made on shell and seat at prescribed pressures for each class of valve. In addition, valve seats are tested for tightness at 100 pounds, air-under-water. Crane takes great pride in its elaborate system for checking and testing the quality of all valves and fittings.

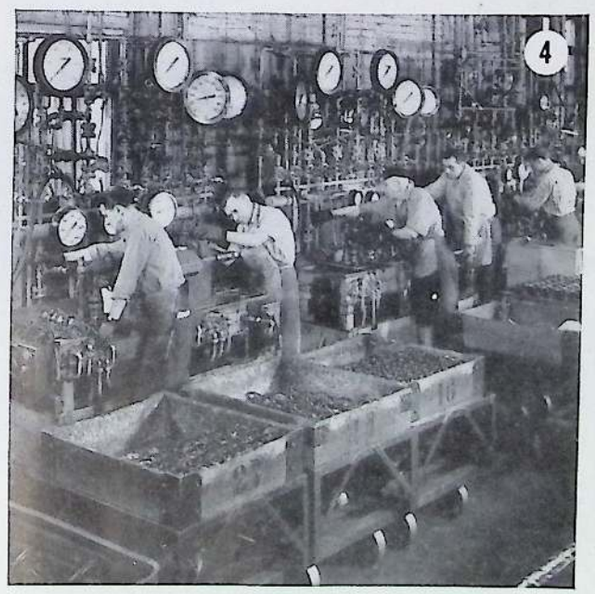
2 ***Fittings Must Measure Up***—Like valves, Crane fittings must measure up to close limits in every way. All types of fittings—steel, iron, and brass—are systematically inspected with precise instruments and gauges. Wall thickness, alignment, threading, drilling, etc., are examined at each stage in process and again before shipping to the customer or being placed in the stock room.

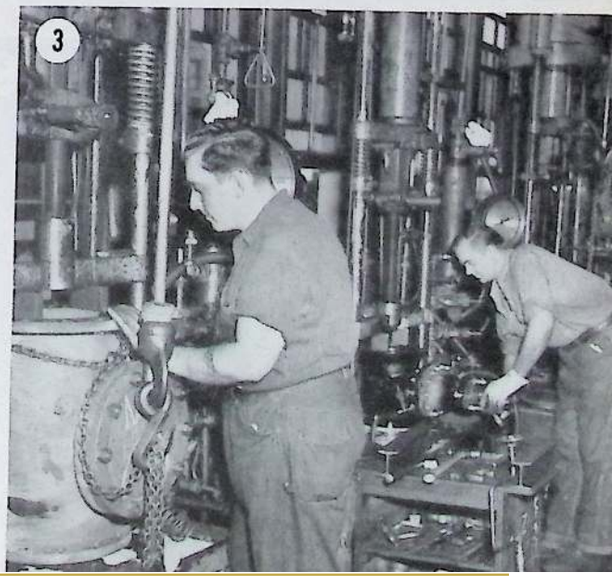
3 ***Check Valves Get Rigid Test***—Because check valves depend entirely on gravity or backflow pressure for tight seating, Crane engineers devised a highly critical test to assure seat tightness. Check valves are also given hydrostatic pressure tests on shell and seat, for which the 10-inch, 125-pound iron swing check in the photo is being prepared.

4 ***Pressure Testing Small Valves***—All steel and iron valves, which are produced in great quantity, are tested at a rapid rate by Crane-developed methods like this. Note the high visibility gauges. As many as 4800 valves in 80 different sizes and types can be tested daily in these departments.









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Warehousing and Distribution



1 ***In Storage at Chicago Works***—Here's just a "peek" view of the larger valve stocks normally maintained at the factory, ready for shipment to Crane Branches, Crane Wholesalers, or direct to customers. Shipments from the factory are accelerated by the skillfully planned flow of stock to packing and shipping departments, and highly efficient order-filling methods. 26 freight cars can be loaded from the main shipping platform at one time.

2 ***Branch Stock Matched to Local Needs***—More than 140 Crane Branches across the country carry a sufficient supply of staple items to permit filling many orders from stock. Branches in large industrial centers naturally carry larger stocks, as shown in this photo. Crane Wholesalers in these areas, as well as nearby Crane Branches, have access to such supplies for needs that can't await factory shipment.

3 ***No Delay of Deliveries at Crane Branches***—Shipping-platforms are usually the busiest places at Crane Branches. As fast as shipments from the factory are received and checked in, stocks move out to local customers. Crane Branches are located for convenient railroad service and rapid truck delivery.

4 ***Daily "Over the Counter" Service*** — All Crane Branches are equipped to give counter service on staple items throughout each business day. These departments, with close knowledge of such stock on hand, also handle your telephone "will call" orders with speed and efficiency.







Alphabetical Index

All items shown in this catalog are cross-indexed alphabetically. References under broad classifications are covered by page numbers showing the entire range of products. For example, under the very general heading of "Brass Valves", group page numbers are shown for each of the various types, but under the specific heading of "Angle Valves, Brass", etc., will be found a detailed listing of the many available types. Similarly, under "Fittings", will be found group page numbers, the detailed references being made under specific listings such as, "Elbows", "Tees", "Crosses", "Unions", etc.

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The thousands upon thousands of items manufactured by Crane—valves, fittings, and allied products for all pressures, temperatures, and services—necessitate the use of an unusually wide variety of metals and material. The most common of these are briefly described and discussed in this section. Additional information on these and other Crane metals and material will be furnished on request.

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Brasses, Bronzes, Nickel Alloys, Monel, and Nitri-Hard

Crane Steam Brass

Crane Steam Brass, widely used for valves, fittings, and other products recommended for temperatures up to 450° F. is an alloy of copper, tin, lead, and zinc. It conforms to A.S.T.M. Specification B 62 (Composition Brass or Ounce Metal Castings, 85-5-5-5) and is classified as "Leaded Red Brass" in A.S.T.M. B 119 (Standard Classification of Cast Copper-Base Alloys).

Physical properties at 70° F.		Average
Tensile strength	lbs. per sq. in.	36,000
Yield point	lbs. per sq. in.	16,000
Elongation in 2 inches	per cent	26

Crane Special Bronze

Crane Special Bronze, commercially termed "bronze", is a high grade alloy used in valves, fittings, and other products recommended for the higher pressures and for temperatures up to 550° F. It conforms to A.S.T.M. Specification B 61 (Steam or Valve Bronze Castings) and is classified as "Leaded Tin Bronze" in A.S.T.M. B 119 (Standard Classification of Cast Copper-Base Alloys).

Physical properties at 70° F.		Average
Tensile strength	lbs. per sq. in.	38,000
Yield point	lbs. per sq. in.	17,000
Elongation in 2 inches	per cent	30

Crane No. 44 Nickel Alloy

Crane No. 44 Nickel Alloy is a copper-base nickel-tin alloy, having a hardness superior to that of ordinary bronze.

Its particular application is as a seating material in valves which are to be subjected to services requiring the use of non-ferrous trim but where brass or bronze is inadequate.

Strong, tough, and hard, Crane No. 44 Nickel Alloy not only offers good resistance to wear, but resists as well, the corrosive action of dilute acids and alkalies which are common on refinery sludge service where various concentrations of sulphuric acid and alkalies are encountered.

Crane No. 49 Nickel Alloy

Crane No. 49 Nickel Alloy is a nickel-base copper-tin alloy, having excellent bearing qualities and corrosion resistance. With Brinell number up to 235, it withstands wear and erosion at steam temperatures up to 850° F. unusually well.

The combination of Crane No. 49 Nickel Alloy and Crane Exelloy used in steel valves (known as "XR" trim) has been found particularly satisfactory for steam, water, air, gas, and other non-lubricating and relatively non-corrosive gases or liquids such as gasoline, fuel oil, etc. Such valves are also well suited for oil having low viscosity such as is used in hydraulic systems, especially where seating loads are extremely high.

Crane Cast Manganese Bronze

Crane Cast Manganese Bronze was developed in order to procure a stem metal that would withstand the great torsional and tensile strains to which this valve part is subjected. Its unusually good bearing qualities offer excellent resistance to wear, and this, combined with strength and the good corrosion resistance typical of copper-base alloys, has extended its use to yoke sleeves, yoke bushings, and glands of iron and steel valves for a wide variety of services.

Crane Cast Manganese Bronze is made in two alloys, Alloy A and Alloy B, with minimum tensile strengths of 60,000 and 80,000 pounds per square inch, respectively. They conform to the requirements of A.S.T.M. Specification B 132, Leaded High-Strength Yellow Brass (Manganese Bronze) Sand Castings.

Cast Monel

Monel is a high strength nickel-copper alloy containing approximately two-thirds nickel and one-third copper. It has excellent resistance to corrosion by many acids, alkalies, salt solutions, food products, organic substances, and many other miscellaneous fluids. Among non-ferrous alloys, Monel is an outstanding material for handling solutions of the alkalies and it is widely used wherever the avoidance of copper contamination is not imperative.

Monel Valves are shown in Section 33 (Corrosion-Resistant Valves and Fittings). The average physical properties of this alloy are:

Physical properties at 70° F.		Average
Tensile strength	lbs. per sq. in.	67,000
Yield point	lbs. per sq. in.	35,000
Elongation in 2 inches	per cent	30

Crane Nitri-Hard

Crane Nitri-Hard is used for plug type discs and seats in brass, bronze, iron, and small size steel globe and angle valves. In the steel valves, this metal is designated as "W" trim.

The parts are either forged or machined from bar stock and after machining are heat treated to provide the desired hardness.

Seats and discs made of Crane Nitri-Hard withstand high temperatures and offer unusual resistance to wear, cutting, scoring, erosion, seizure, and galling.

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18-8 Mo, Hastelloy, Exelloy, Stellite, and Ihrigized Steel

Crane 18-8 Mo Alloy Cast Steel

Crane 18-8 Mo Alloy (18 to 22% chromium, 10 to 12% nickel, and 2.5 to 3% molybdenum) is an exceptionally high grade stainless steel that is highly resistant to corrosion and finds wide application in many industries.

The addition of molybdenum to regular chromium-nickel steel has been found to increase materially the corrosion resistance of this alloy, and, in recognition of this fact, Crane has adopted 18-8 Mo Alloy in preference to other types of 18-8 chromium-nickel steels.

Valves and fittings made of this material, shown in Section 33, may be recommended for use in services handling food products as well as for a large number of industrial chemicals.

Crane 18-8 Mo Alloy Steel is a casting material corresponding to A.I.S.I. (American Iron and Steel Institute) Type 316 wrought stainless steel. It conforms to, and substantially exceeds, the minimum requirements of A.S.T.M. Specification A 296, Grade CF-8M, as shown below, and is heat-treated to obtain maximum corrosion resistance.

Physical properties at 70° F.		A.S.T.M. Minimum	Crane Average
Tensile strength	lbs. per sq. in.	70,000	75,000
Yield point	lbs. per sq. in.	30,000	33,000
Elongation in 2 inches	per cent	30	50
Reduction of area	per cent	40	60

Hastelloy "C"

Hastelloy "C" trim, used in Crane Chlorine Valve discs, disc stem rings, and body seat rings, is a nickel-molybdenum-chromium-iron alloy. Its tensile strength and hardness are comparable to that of alloy steel. It withstands strong oxidizing conditions such as those encountered with free chlorine and aqueous solutions containing chlorine.

Hastelloy is the registered trade-mark of the Haynes Stellite Division of the Union Carbide and Carbon Corporation.

Crane Stellite Trim

Crane Stellite trim, used in high-pressure-temperature steel valves and known as "U" trim, is a cobalt-chromium-tungsten alloy. Facings of this material are deposited on steel discs or body seat rings by welding.

Stellite is recommended where service conditions are especially severe, particularly in modern steam power plants operating at elevated temperatures. Its extreme hardness when cold (Brinell number 375 minimum) is maintained almost unimpaired at red heat. Stellite withstands corrosion and erosion unusually well, and it displays excellent resistance to wear, seizure, galling, and abrasion.

Crane Exelloy for Stems

Crane Exelloy is a specially processed chromium iron having a chromium content of about 12 per cent and a carbon content of about 0.10 per cent.

For valve stems, it is carefully heat-treated to provide superior strength and excellent resistance to tension, compression, shear, and other strains attending stem service. Crane Exelloy withstands wear unusually well and offers liberal resistance to corrosion by atmosphere; by mildly alkaline water; and by steam, gas, air, oil, and hot oil vapors.

The remarkable properties of Crane Exelloy as a stem material have resulted in its adoption for regular use in nearly all Crane Steel Valves.

Physical properties at 70° F.		Minimum	Crane Average
Tensile strength	lbs. per sq. in.	100,000	115,000
Yield point	lbs. per sq. in.	80,000	90,000
Elongation in 2 inches	per cent	20	22
Reduction of area	per cent	60	65
Brinell hardness number (range)			225–250
Charpy impact strength (keyhole notch)	ft. lbs.		40

Crane Exelloy for Seating Surfaces

Crane Exelloy for seating surfaces is the same as Crane Exelloy for stems, but is heat-treated to secure greater hardness—minimum Brinell hardness number ranging up to 350, depending upon the valve part. With this high hardness—resisting scratching, scoring, or indentation by hard particles—is combined adequate strength and ductility; excellent resistance to wear, seizure, galling, and erosion; and high resistance to oxidation and to the corrosive action of hot sulfur-bearing oils.

Crane Exelloy seating surfaces, used in steel valves and known as "X" trim, are especially recommended for oil and oil vapor at temperatures over 500° F. and for most corrosive and unrefined oils regardless of temperature. Exelloy combined with Crane No. 49 Nickel Alloy makes an ideal combination for steam, water, gas, and similar services; see "Crane No. 49 Nickel Alloy", page 2.

Crane Exelloy has been more universally suitable for valve seats in oil service than any other single material. Because of its remarkable properties, thousands of tons are in valve service.

Crane Ihrigized Steel

Ihrigized Steel is resistant to wear and corrosion and has good bearing qualities. A typical application of this material is its use for packing glands in some iron and steel valves.

The surface of Ihrigized Steel is impregnated with silicon (approximately 15% Si) and is made by a patented process known as Ihrigizing.

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2

Cast, Malleable, Alloy, and Ni-Resist Irons

Crane Cast Irons

Crane Cast Iron is regularly produced in three grades — Cast Iron, Ferrosteel, and High Tensile Iron; they are recommended for temperatures up to 450° F.

All of these grades conform to and exceed the minimum requirements of the A.S.T.M. Specification A 126 for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

Each grade is particularly suited to provide uniform density, soundness, and close grain within a specific range of thicknesses of sections employed in the production of Crane cast iron valves and fittings.

Cast Iron, used for small valves and fittings having light metal sections, conforms to the requirements of A.S.T.M. Specification A 126 for Class A Castings.

Ferrosteel, used for sections of medium metal thicknesses, conforms to the requirements of A.S.T.M. Specification A 126 for Class B higher strength Gray Iron Castings.

High Tensile Iron, used for the heavier metal sections, conforms to the requirements of A.S.T.M. Specification A 126 for Class C High-Test Cast Iron.

	Crane Cast Iron Average	ASTM A 126 Class A Minimum	Crane Ferro-steel Average	ASTM A 126 Class B Minimum	Crane High Tensile Iron Average	ASTM A 126 Class C Minimum
Tensile Strength, pounds per square inch	26,000	21,000	35,000	31,000	50,000	41,000
Transverse Test, load at center, pounds	3,000	2,200	3,600	3,300	4,200	4,000
Transverse Test, deflection at center, inches	0.12	0.10	0.14	0.12	0.14	0.12

Crane Malleable Iron

Crane Malleable Iron is particularly suited for use in screwed pipe fittings, valves, and flanges. It is characterized by pressure tightness, stiffness, and toughness, the latter property being an especially valuable one for pipe line materials subjected to expansion and contraction stresses and shock.

This iron has a tensile strength of from 40,000 to 50,000 pounds per square inch. Through improved practices in casting and annealing, a superior line of malleable iron products is assured.

Crane Malleable Iron conforms to the requirements of the A.S.T.M. Specification A 197 for Cupola Malleable Iron.

The comparable ability of malleable iron to resist shock or impact as well as bending stresses due to piping weight, expansion, etc., is shown in the following table. Note that because of their exceptional ductility, the malleable iron and cast steel bars were reversed after each blow.

Tests for Shock or Impact (Bars 1″x1″x13″)

Material	Blows of a 25-pound Drop Hammer to Break	Shock Test Foot Pounds
Cast Iron	7	102
Ferrosteel	11	206
*Malleable Iron	22	1580
*Cast Steel	92	10,112

*Reversed after each blow because of bending.



Analysis of the crystal structure of materials by means of an X-Ray Diffraction machine.

Crane Alloy Cast Irons

Crane Alloy Cast Irons, a development of the Crane Engineering Laboratory, are offered to meet the need for iron having better physical properties and resistance to corrosion when subjected to services where ordinary gray iron is not adequate.

These materials, having a nickel low alloy composition, are suited for valves or fittings in specialized services of pulp or paper or petroleum industries.

Crane Ni-Resist Cast Iron

Ni-Resist Cast Iron is used as material where the physical properties of cast iron suffice but where greater resistance to corrosion is required.

Ni-Resist is an alloy cast iron containing 14% nickel, 6% copper, and 2% chromium; it has an average tensile strength of approximately 25,000 pounds per square inch.

2

Packing Materials

C.C. Rubber Sheet Packing

C.C. Rubber Sheet Packing is a superior grade of rubber composition packing, which is manufactured solely for Crane. This material is exceptionally tough, durable, and resilient. It is compounded according to a special formula, and it is subjected to frequent and careful tests to assure that the high quality is strictly maintained.

C.C. Rubber is available in rolled sheets or finished cut gasket shapes. It is recommended for all pressures in services such as saturated steam, hot and cold water, air, and gas.

C.C. Rubber Sheet Packing....page 473
C.C. Rubber Gaskets....pages 472 and 474

Cranite Sheet Packing

Cranite is a superior gasket material prepared from selected long fiber asbestos, cross-laminated to secure exceptional strength and durability. It has a high and uniform compressive strength, does not deteriorate with age, and is ideally suited for use with water, air, gas, gasoline, ammonia, steam, and other fluids at temperatures up to 750° F.

Cranite has been approved by the Underwriters' Laboratories, Inc. (National Board of Fire Underwriters), for use on hazardous liquids.

Cranite Sheet Packing....page 473
Cranite Gaskets....pages 472 and 474 to 476
Cranite Union Gaskets....pages 416 and 476

Corrugated Metallic Gaskets

Corrugated metallic gaskets are recommended for service where temperatures exceed 750° F.; they are available in copper, of No. 27 B&S Gauge, and in soft iron of No. 24 U.S. Gauge.

Crane Corrugated Metallic Gaskets are of good quality, having proper strength, ductility, and toughness.

To secure a smaller bearing surface with the resulting increase in unit compressive load, the inside diameter of these gaskets is made larger than the port diameter of the joint, providing assurance of tightness.

Prices and dimensions on application.

Composition Discs

Crane Composition Discs are furnished in a variety of materials, sizes, and styles to cover a wide range of service conditions. Through years of constant study, research, and testing, this line of Composition Discs was developed to fill the need for suitable renewable type discs in globe and angle valves.

These materials are made for use in steam, hot and cold water, oil, air, gas, and gasoline services. Users are urged to choose the type and material recommended on page 133, in order to obtain the best results.

Composition Discs....page 133

Rings for Ring Joints

Ring Joints can be utilized as connections for all pressure classes of Crane Steel Valves, Fittings, and Flanges. They require the use of a metal ring, which seats in an especially prepared groove in each flange face, to seal the joint.

Crane rings for ring joints are the result of extensive research and field and laboratory testing. They are of unusually high quality, being purchased under exceptionally rigid specifications; each shipment is carefully inspected and tested before being admitted to stock.

Crane rings are furnished in two types, as follows:

Type A . . . of soft steel, with a maximum Brinell hardness number of 90.

Type B . . . of 4 to 6% chrome and ½% molybdenum, with a maximum Brinell hardness number of 130.

Crane rings and ring joints are recommended for high pressure hydraulic installations and for high pressure-temperature steam and hot oil lines.

Rings for Ring Joints....page 472



Minute measurements give the inside story on creep.

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Crane Cast Steels

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To provide adequately for the widely varied services to which steel valves and fittings are subjected, Crane regularly produces several different types of cast steel. The individual characteristics and recommendations for each are described below and on the opposite page.

Crane Carbon Cast Steel

Crane Carbon Cast Steel is ideally suited for a multitude of services that are beyond the scope of bronze or iron. Its superior strength and toughness, and its resistance to piping strains, vibration, shock, freezing, and damage by fire, afford reliable protection when safety and utility are desired.

It is suitable for use on saturated or superheated steam, cold or hot water, cold or hot non-corrosive oil, gas, air, or other fluids. It has a carbon content not exceeding 0.35%, which assures good welding qualities. All castings are carefully heat treated.

Crane Carbon Cast Steel conforms to and substantially exceeds the minimum requirements of A.S.T.M. Specification A 216, Grade WCB, covering carbon steel castings for valves, flanges, and fittings for high-temperature service.

Chemical Composition	Minimum	Maximum	Crane average
Carbon, per cent		0.35	0.25
Manganese, per cent		0.70*	0.65
Silicon, per cent		0.60	0.40
Phosphorus, per cent		0.05	0.03
Sulfur, per cent		0.06	0.03

*Note: Maximum manganese content may be as high as 1.10 per cent provided it is accompanied by an appropriate decrease in the carbon content.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	70,000	76,000
Yield point, lbs. per sq. in.	36,000	45,000
Elongation in 2 inches, per cent	22	30
Reduction of area, per cent	35	50
Brinell hardness number	..	155
Bend test, degrees	90	180
Charpy impact strength (keyhole notch) ft. lbs.		15

Crane No. 4 Carbon-Molybdenum Alloy Cast Steel

Crane No. 4 Carbon-Molybdenum Cast Steel, containing approximately ½% of molybdenum, has many unusually desirable characteristics. At room temperature, its strength is slightly greater than that of Crane Carbon Steel, and this strength is retained to a marked degree at elevated temperatures. At temperatures to 1000° F., its resistance to creep is equal to that of more highly alloyed steels. Unlike most alloy steels, its weldability compares favorably with that of carbon steel.

It is admirably suited for use on steam, water, oil, gas, air, or other services when superior strength and toughness are essential. It is especially recommended for high-pressure, high-temperature service when valves and fittings are welded into the piping.

Crane No. 4 Carbon-Molybdenum Steel castings are carefully heat treated, by normalizing and drawing.

Crane No. 4 Carbon-Molybdenum Cast Steel conforms to and substantially exceeds the minimum requirements of A.S.T.M. Specification A 217-46T, Grade WC 1, covering alloy steel castings for valves, flanges, and fittings.

Chemical Composition	Minimum	Maximum	Crane average
Carbon, per cent	0.15	0.30	0.25
Molybdenum, per cent	0.40	0.60	0.50
Manganese, per cent	0.50	0.70*	0.65
Silicon, per cent	0.20	0.60	0.35
Phosphorus, per cent	....	0.05	0.03
Sulfur, per cent	....	0.06	0.03

*Note: Maximum manganese content may be as high as 1.10 per cent provided it is accompanied by an appropriate decrease in the carbon content.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	70,000	80,000
Yield point, lbs. per sq. in.	45,000	50,000
Elongation in 2 inches, per cent	22	26
Reduction of area, per cent	35	50
Brinell hardness number	..	165
Bend test, degrees	90	180
Charpy impact strength (keyhole notch) ft. lbs.		25

Crane No. 3 Nickel Alloy Cast Steel

Crane No. 3 Nickel Cast Steel provides excellent tensile and impact strength at sub-zero temperatures and is especially recommended for use at extremely low atmospheric temperatures, or for refrigerating processes down to −100° F., such as in the dewaxing of lubricating oil. All castings are carefully heat treated.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	67,500	75,000
Yield point, lbs. per sq. in.	45,000	55,000
Elongation in 2 inches, per cent	25	32
Reduction of area, per cent	45	55
Charpy impact strength (keyhole notch)		
At 70° F., ft. lbs.	25	35
At −100° F., ft. lbs.	15	20

Crane "Arctic" Nickel Alloy Cast Steel

(Trademark "Arctic" registered in U.S. Patent Office)

For sub-zero temperatures substantially lower than those for which Crane No. 3 Nickel Cast Steel is recommended, Crane Metallurgists developed Crane "Arctic" Nickel Cast Steel. All castings are heat treated to develop the required physical properties. Inquiries for Crane "Arctic" Nickel Cast Steel should include specifications of the contemplated service.

Physical Properties at 70° F.	Minimum
Tensile strength, lbs. per sq. in.	65,000
Yield point, lbs. per sq. in.	40,000
Elongation in 2 inches, per cent	25
Reduction of area, per cent	45
Charpy impact strength (keyhole notch)	
At 70° F., ft. lbs.	30
At −175° F., ft. lbs.	15

Crane No. 7 Chrome-Molybdenum Alloy Cast Steel

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Crane No. 7 Chrome-Molybdenum Alloy Cast Steel was introduced when it became apparent that steels need a substantial chromium content to stabilize them against graphitization under the operating conditions of welded power piping systems. For the purposes of welded piping systems operating up to 1050° F., Crane No. 7 Chrome-Molybdenum Alloy Cast Steel has been found highly satisfactory for its weldability and, when operating at high temperatures, for its stability and high strength.

The use of 1.00 to 1.50 per cent chromium and of 0.45 to 0.65 per cent molybdenum as the principal alloying elements establishes the stability of the steel against graphitization and, at the same time, assures excellent strength retention at elevated temperatures. Combined with these qualities is ready weldability, not usually associated with chromium-bearing steels, but made possible by the low carbon content comparable to that of the pipe.

Crane No. 7 Chrome-Molybdenum Alloy Cast Steel is regularly used in the Crane Pressure-Seal Bonnet Valves and Lip-Seal Bonnet Valves, recommended for steam service at temperatures up to 1050° F., and is available on special order for other Crane steel valves and fittings. All castings receive heat treatment proper to their design and chemical composition. The steel conforms to A.S.T.M. Specification A-217, Grade WC6, covering alloy steel castings suitable for fusion welding for high-temperature service.

Chemical Composition	Minimum	Maximum	Crane average
Carbon, per cent	....	0.20	0.13
Chromium, per cent	1.00	1.50	1.25
Molybdenum, per cent	0.45	0.65	0.55
Manganese, per cent	0.50	0.80	0.65
Phosphorus, per cent	....	0.05	0.03
Sulphur, per cent	....	0.06	0.03
Silicon, per cent	....	0.60	0.45

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	70,000	78,000
Yield point, lbs. per sq. in.	40,000	52,000
Elongation in 2 inches, per cent	20	28
Reduction of area, per cent	35	60
Brinell hardness number	...	165
Bend test, degrees	...	180
Charpy impact strength (keyhole notch), ft. lbs.	...	30

Note: A forging grade of this steel, having comparable characteristics, is available for forged valve parts.

Crane No. 9 Chrome-Molybdenum Alloy Cast Steel

Crane No. 9 Chrome-Molybdenum Alloy Cast Steel was developed for high-temperature service, particularly at 1050° F., and higher, where it possesses strength and steam corrosion resistance somewhat greater than Crane No. 7 Steel.

The characteristics of Crane No. 9 Steel are attributable to its higher chromium content (2.00 to 2.75 per cent) and higher molybdenum content (0.90 to 1.20 per cent).

Crane No. 9 is a weldable steel and is available for Crane Pressure-Seal Bonnet Valves, Lip-Seal Bonnet Valves, and for other Crane valve and fitting products.

Crane No. 9 Chrome-Molybdenum Alloy Cast Steel conforms to the requirements of A.S.T.M. Specification A217, Grade WC9.

Chemical Composition	Minimum	Maximum	Crane average
Carbon, per cent	....	0.18	0.14
Chromium, per cent	2.00	2.75	2.50
Molybdenum, per cent	0.90	1.20	1.00
Manganese, per cent	0.40	0.70	0.60
Phosphorus, per cent	....	0.05	0.03
Sulphur, per cent	....	0.06	0.02
Silicon, per cent	....	0.60	0.50

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	70,000	85,000
Yield point, lbs. per sq. in.	40,000	60,000
Elongation in 2 inches, per cent	20	25
Reduction of area, per cent	35	55
Brinell hardness number	...	180
Bend test, degrees	...	180
Charpy impact strength (keyhole notch), ft. lbs.	...	30

Crane No. 5 Chrome-Molybdenum Alloy Cast Steel

Crane No. 5 Chrome-Molybdenum Cast Steel is unusually strong at normal temperatures and possesses exceptional strength and creep resistance at high temperatures. It offers excellent resistance to erosion and to scaling at temperatures up to 1100° F. It is relatively economical in cost when compared with more highly alloyed steels.

Crane No. 5 Steel is ideal for severe service on steam, water, oil, or gas lines, particularly when corrosion resistance is essential as in oil refinery service. Since heat treatment after welding is necessary, it is best adapted to products having flanged or threaded ends. All castings are carefully heat treated by normalizing and drawing. Crane No. 5 Cast Steel conforms to and substantially exceeds the minimum requirements of A.S.T.M. Specification A217, Grade C5, covering alloy steel castings for pressure containing parts suitable for high-temperature service.

Chemical Composition	Minimum	Maximum	Crane average
Carbon, per cent	....	0.20	0.16
Chromium, per cent	4.00	6.50	4.87
Molybdenum, per cent	0.45	0.65	0.52
Manganese, per cent	0.40	0.70	0.65
Phosphorus, per cent	....	0.05	0.02
Sulphur, per cent	....	0.06	0.02
Silicon, per cent	....	0.75	0.55

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	90,000	105,000
Yield point, lbs. per sq. in.	60,000	78,000
Elongation in 2 inches, per cent	18	22
Reduction of area, per cent	35	55
Brinell hardness number	...	200
Bend test, degrees	90	180
Charpy impact strength (keyhole notch), ft. lbs.	...	25

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Crane Forged Steels

Paralleling the variety of Cast Steels produced by Crane to provide for widely varied services, is a corresponding group of Crane Forged Steels. While the chemical composition and physical properties of the forged steels are not exactly the same as those of the cast steels, in general characteristics and ultimate utility the forged material is the full equivalent of the cast.

The recommendations for Crane Cast Steels and the comparisons thereof, are, therefore, equally applicable to Crane Forged Steels; see pages 6 and 7. From the standpoint of life and service there is no difference; both are component parts of a complete line. Forgings have a highly refined grain, with physical properties well in excess of recognized minimum requirements.

Crane Carbon Forged Steel

For a greater diversity of service, Crane Carbon Forged Steel is furnished in two classes, Grade I and Grade II. Grade I, with a maximum carbon content of 0.30 per cent, has unusually good welding properties and is used for Welding Neck Flanges. Grade II, with slightly higher carbon content (0.35 per cent maximum) is used for all other types of steel flanges, and for flange unions, yokes on steel valves, socket-welding fittings, etc.

Crane Carbon Steel forgings possess such a highly mechanically refined grain structure and such generally excellent physical properties that heat treatment is confined to flanges in the 400-Pound and higher steel pressure classes.

Crane Carbon Forged Steels conform to A.S.T.M. Specifications A 105 covering Forged and Rolled Steel Pipe Flanges, Forged Fittings and Valves and Parts for High Temperature Service; A 181 covering Forged and Rolled Steel Pipe Flanges for General Service; and A 234 covering Factory Made Wrought Carbon Steel Welding Fittings.

The Crane average physical properties, substantially exceeding A.S.T.M. minimums, are shown below.

Physical Properties at 70° F.	Crane Average Grade I Heat treated	Grade I As forged	Grade II Heat treated	Grade II As forged
Tensile strength, psi	75,000	77,000	80,000	80,000
Yield point, psi	45,000	46,000	47,000	48,000
Elongation in 2 inches, %	32	25	30	25
Reduction of area, %	60	50	55	45
Brinell hardness number	155	160	160	160
Charpy impact strength, (keyhole notch) ft. lbs.	25	20	25	20

Crane No. 4 Carbon-Molybdenum Alloy Forged Steel

Crane No. 4 Carbon-Molybdenum Forged Steel has the same good welding properties, high strength retention at elevated temperatures, and excellent resistance to creep as Crane No. 4 Carbon-Molybdenum Cast Steel. Its mechanically refined grain structure is further refined by a careful heat treatment, consisting of normalizing and drawing.

This steel exceeds the minimum requirements of A.S.T.M. Specification A 182, Grade F 1.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	70,000	78,000
Yield point, lbs. per sq. in.	40,000	50,000
Elongation in 2 inches, per cent	25	30
Reduction of area, per cent	35	60
Brinell hardness number	...	155
Charpy impact strength (keyhole notch), ft. lbs	...	30

Crane No. 5 Chrome-Molybdenum Alloy Forged Steel

Crane No. 5 Chrome-Molybdenum Forged Steel, like the cast material, offers unusually high retention of strength on elevated temperature service, superior corrosion resistance, and excellent resistance to erosion and scaling.

All forgings are carefully heat treated, by normalizing and drawing.

This steel exceeds the minimum requirements of A.S.T.M. Specification A 182, Grade F 5.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	90,000	100,000
Yield point, lbs. per sq. in.	65,000	75,000
Elongation in 2 inches, per cent	22	25
Reduction of area, per cent	50	60
Brinell hardness number	...	200
Charpy impact strength (keyhole notch) ft. lbs.	...	35

Crane No. 3 Nickel Alloy Forged Steel

Crane No. 3 Nickel Forged Steel is characterized by its outstanding suitability for service on sub-zero temperatures. All forgings of this steel are carefully heat treated, by normalizing and drawing.

Physical Properties at 70° F.	Minimum	Crane average
Tensile strength, lbs. per sq. in.	62,500	68,000
Yield point, lbs. per sq. in.	36,000	42,000
Elongation in 2 inches, per cent	25	35
Reduction of area, per cent	40	60
Charpy impact strength (keyhole notch), at 70° F. ft. lbs.	25	35
at −100° F. ft. lbs.	15	20

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Bolting Materials

In the manufacture of Crane Valves and in bolting flanged valves, fittings, and flanges together to form a complete piping system, four classes of bolting materials are regularly used. These materials, open hearth steel, cold rolled steel, chrome-molybdenum steel, and chrome-molybdenum-vanadium steel, are described as follows:

Machine Bolts and Bolt-Studs

Bolts and studs for temperatures up to 500° F. are made from steel complying with A.S.T.M. Specification A 107, Open Hearth free-cutting grade, having the following physical properties:

Physical Properties at 70° F.	Minimum
Tensile strength, lbs. per sq. in.	60,000
Yield point, lbs. per sq. in.	35,000
Elongation in 2 inches, per cent	25
Reduction of area, per cent	50

Nuts regularly used with machine bolts or studs are made from free-cutting or resulfurized nut stock which conforms to A.S.T.M. Specification A107.

Studs and bolt-studs for temperatures up to 500° F., primarily for high pressure hydraulic service, are made from cold rolled steel complying with A.S.T.M. Specification A 108, Open Hearth free-cutting grade, having the following physical properties:

Physical Properties at 70° F.	Minimum
Tensile strength, lbs. per sq. in.	70,000
Yield point, lbs. per sq. in.	60,000
Elongation in 2 inches, per cent	18
Reduction of area, per cent	45

Nuts regularly used on cold rolled steel studs and bolt-studs are cold made of material in accordance with A.S.T.M. Specification A 107.

Alloy Steel Bolt-Studs

Crane pioneered in the development of alloy steel bolting. For many years, Crane Triplex Steel has been recognized as the highest quality bolting material for services at temperatures beyond the range of carbon steel.

Crane Triplex Steel

Crane Triplex Steel, a chrome-molybdenum steel having marked stability, retains its strength unusually well at elevated temperatures. It offers better resistance to creep than most high grade alloy steel bolting materials. Responding readily to heat treatment, it is carefully processed to secure liberal strength, hardness, and other desirable properties.

The uniformly satisfactory results secured with Triplex Steel Bolt-Studs in thousands of steel valve and fitting installations, many of which — particularly in oil refineries — have been operating under extreme pressures and temperatures, is a fitting testimonial of their excellence.

Crane Triplex Steel is regularly used for the bonnet bolting of Crane "XR", "X", "XW", and "W" trimmed bolted bonnet steel valves and Pressure-Seal Bonnet steel valves.

The steel is specially heat treated by quenching and drawing, producing a dense, uniform, and fine grain with superior physical properties.

Crane Triplex Steel substantially exceeds the minimum requirements of A.S.T.M. Specification A 193, Grade B 7.

Crane pioneered in the development of alloy steel bolting. For many years, Crane Triplex Steel has been recognized as the highest quality bolting material for services at temperatures beyond the range of carbon steel.

Crane Templex Steel resulted from much study and experience with high-temperature composition, and stands as the highest quality bolting material for services at temperatures beyond the range of other ferritic alloy steels.

Crane Templex Steel

Crane Templex Steel is a chrome-molybdenum-vanadium alloy developed by Crane. Its unusual strength and remarkable stability at elevated temperatures is the result of the molybdenum and vanadium combined with special heat treatment. Crane Templex Steel has greater resistance to creep than other bolting steels offered on the market today.

For exceptionally high temperature service, this steel is ideal. It is regularly used in the bonnet bolting of Crane "U" trimmed bolted bonnet steel valves.

The secret of the superiority of Crane Templex Steel lies in the exacting heat treatment developed by Crane laboratories. In addition to uniform grain and excellent physical properties, it produces a definite carbide size in the microstructure of the material, resulting in maximum creep resistance.

Crane Templex Steel substantially exceeds the minimum requirements of A.S.T.M. Specification A 193, Grade B 14.

Physical Properties at 70° F.	Minimum	Crane Triplex average	Crane Templex average
Tensile strength, lbs. per sq. in.	125,000	134,000	145,000
Yield point, lbs. per sq. in.	105,000	116,000	118,000
Elongation in 2 inches, per cent	16	20	20
Reduction of area, per cent	50	57	57
Brinell hardness number (range)	260–320	270–300	285–320

Nuts for Alloy Steel Bolt-Studs

Crane Triplex and Templex Steel Bolt-Studs are regularly fitted with hot forged, medium carbon, oil-quenched nuts, made to American Standard Semi-Finished Heavy Hexagon dimension, ASA B18.2. Having a Brinell hardness number of 250 minimum, they are capable of developing the full strength of the stud. They conform to A.S.T.M. Specification A 194, Class 2 H.

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Marking of Crane Products

The marking and identification of Crane products conform to the Manufacturers Standardization Society Standard Marking System for Valves, Fittings, Flanges, and Unions (MSS SP-25).

Distinguishing Marks

All products are marked for identification with either the name "CRANE", the letter "C", or the letters "CC", depending on the size and type of the article as well as the method of manufacture.

In addition, certain unions and union fittings have specific markings, such as "RAILROAD", etc. Unions, fittings, and valves made in accordance with the specifications adopted by the American Association of Railroads are marked with either the letters "ARA" or "AAR".

Supplementing the markings that are an integral part of castings or forgings, most regular Crane valves are now equipped with identification plates. These are made of a variety of materials and are mounted in different positions on valves, sometimes under the wheel nut, sometimes on the yoke, etc., depending upon the type and size of valve. The plates carry identifying material appropriate to the particular product, including in each case, at least the size and catalog number of the valve and a part number.

All identifying markings, including the information on these identification plates, should always be specified when corresponding about Crane valves in service or when ordering repair parts.

Designation of Material

Cast iron products have no marking indicating the material.

Malleable iron products are marked with either the letters "MI" or "MALL", except for unions, union fittings, and 150-pound screwed fittings which have no such marking.

150-Pound Malleable Iron Screwed Fittings have an open crotch between the bands, and are so distinguished from 125-Pound Cast Iron Screwed Fittings which have joining bands. Unions and union fittings are not made in cast iron.

Brass and bronze products can be readily distinguished from cast iron by their color, and therefore have no material marking; special bronze alloys, however, have special markings.

Steel products, if space permits, are marked with the word "STEEL", which definitely distinguishes them from cast iron. Likewise, alloy steels are marked with a symbol to identify the alloy. Steel castings of pressure containing parts have the heat number stamped on a raised pad.

Cast stainless steels and other corrosion-resistant alloys have special markings.

Designation of Service Pressure Ratings

Nearly all Crane products are now designated by their general or primary pressure class, such as "25-Pound", "100-Pound", "125-Pound", etc., the use of ambiguous terms such as "Low Pressure", "Standard", "Heavy", etc., having been discontinued as obsolete and misleading. The use of the new pressure designations, however, should not be construed to mean that the product is recommended for those pressures. Such names are only descriptive of the general class of product, and do not necessarily imply that all items within a given class or that all sizes of a given product are rated for the same primary pressure.

The recommended pressure ratings for Crane products are specified on the catalog page listing the product. Nearly all of the products, with the exception of Gas Stops and 125 or 150-Pound Screwed Fittings, are marked with the recommended basic working pressure.

Where the numerals are not followed by any suffix symbols, they represent the basic steam service pressure rating at the maximum temperature which is given for the line on the corresponding page of this catalog, or, where the maximum temperature is not specified, at the temperature of saturated steam.

Ammonia Valves and Fittings are an exception to the foregoing in that they are marked "300" without any suffix symbol to indicate ammonia service pressure. Valves with leather or rubber faced discs are another exception in that they use bodies regularly marked with a basic steam rating, yet should only be used on the service for which this type of disc face is recommended.

Where the numerals are followed by the letters "WOG", they represent the water, oil, or gas service pressure rating at or near atmospheric temperature. Where two sets of numerals are shown, the steam service pressure is followed by the letter "S", and the water, oil, or gas service pressure, by the letters "WOG". Test pressure marking, where used, is followed by the word "TEST".

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Air Testing

The fact that many Crane products are recommended for water, oil, and gas does not necessarily indicate that all such products are air tested. It has been found commercially that our regular stock valves have proven quite generally satisfactory for air or gas service without an air test; therefore, if an air test is required, it must be definitely specified.

Any valve intended for air, gas, or very volatile fluids, where absolute tightness is essential, should be ordered air tested unless the catalog definitely states the valve is regularly air tested.

Where iron and steel gate valves are to be used in pipe lines on natural dry gas service, orders should so specify and valves will be suitably packed. All valves which are air tested are provided with protectors placed over the openings.

Hydrostatic and Shock Working Pressures

All valves, fittings, and flanges in this catalog are suitable for the liquid working pressures specified only when used in hydraulic installations in which shock is absent or negligible.

The sudden closure of a valve in a hydraulic system causes the body of liquid, which may be moving at a rate generally in excess of 1 foot per second, to stop instantaneously. As a liquid is relatively incompressible, the effect of the sudden cessation of flow is to raise the pressure considerably above the static working pressure. This increase in pressure is called "SHOCK" and may, in some cases, be sufficient to cause valves or piping to fail.

The increase in pressure due to shock is not dependent upon the working pressure of the system but upon the velocity at which the liquid is flowing. For example: An installation having a working pressure of 100 pounds per square inch with a velocity of 3 feet per second will be subject to the same increase in pressure due to *instantaneous closure* of a valve as one having a working pressure of 1000 pounds per square inch and the same velocity.

Shock is generally prevalent in lines which are equipped with check valves, quick closing valves, or in lines supplied by reciprocating pumps. Shock, however, may also be produced in any line to a lesser degree by the rapid closure of regular globe or gate valves, and it is therefore recommended that care must always be used in closing valves in lines transporting liquids.

It is recommended that, where shock is likely to occur, the maximum shock pressure be added to the working pressure of the line to determine the working pressure of the valves, fittings, or flanges which should be used.

It is also recommended that all hydraulic installations be equipped with air chambers or other types of shock absorbers to eliminate, as much as possible, the increase in pressure due to shock.

Increase in Pressure Due to Expansion of Liquids

If a vessel is completely filled with a liquid so that there is no space available for volumetric expansion, any rise in temperature of the liquid will cause an increase in internal pressure. This increase in pressure is due to the tendency of the liquid to change in volume, and as liquids are relatively incompressible, the pressure builds up rapidly with only a slight change in temperature. The rise in temperature may be due to the sun's rays or to an increase in atmospheric temperature.

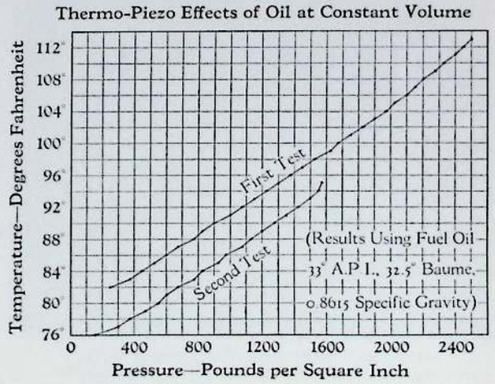
Crane has conducted tests which indicate that when vessels are completely filled with fuel oil of 33° A.P.I., a temperature rise of one degree Fahrenheit causes the internal pressure to increase approximately 75 pounds per square inch. Refer to chart at right.

In the first test, the temperature was increased a total of 31 degrees (from 82 to 113) and caused a total rise in pressure of 2250 pounds (from 250 to 2500), averaging approximately 73 pounds per degree. In the second test, the temperature was increased a total of 19 degrees (from 76 to 95) and caused a total rise in pressure of 1425 pounds (from 150 to 1575), averaging 75 pounds per degree.

While results may vary slightly under actual service conditions, depending upon the kind of oil, its cubical coefficient of expansion, the flexibility, if any, of the vessel, the presence of air in the oil, and other variables, the tests prove conclusively that dangerously high pressures can build up in an oil containing vessel with only a moderate temperature increase, such as might be caused by the sun's rays.

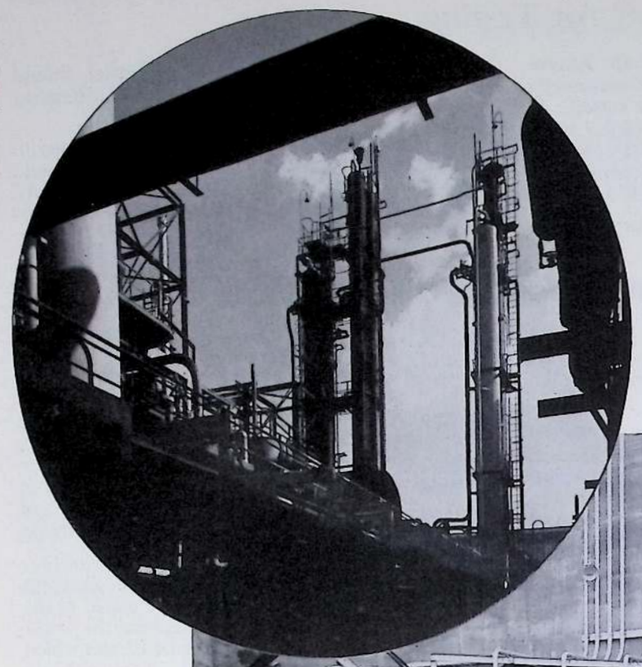
It is recommended, therefore, where valves are installed in lines carrying liquids (particularly oil), that some means be employed to prevent entrapping the liquid in the valve bonnet, to eliminate the possibility of pressure building up due to a rise in the temperature.

Thermo-Piezo Effects of Oil at Constant Volume



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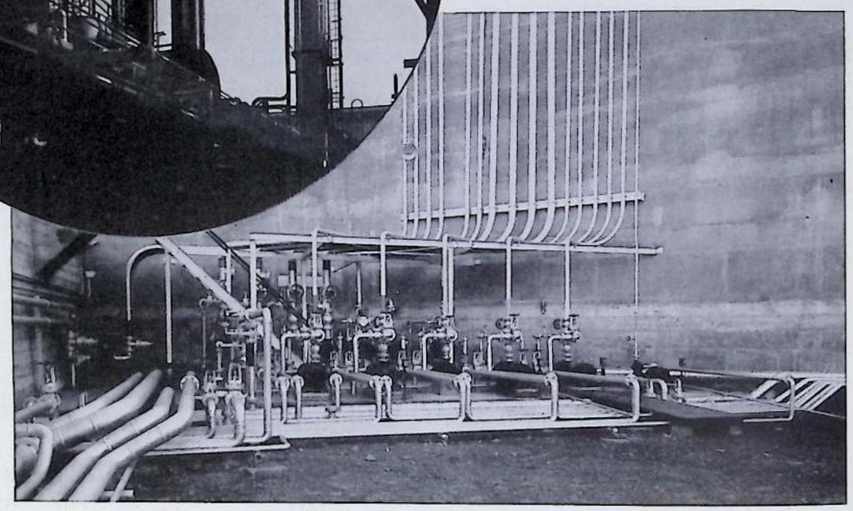
2



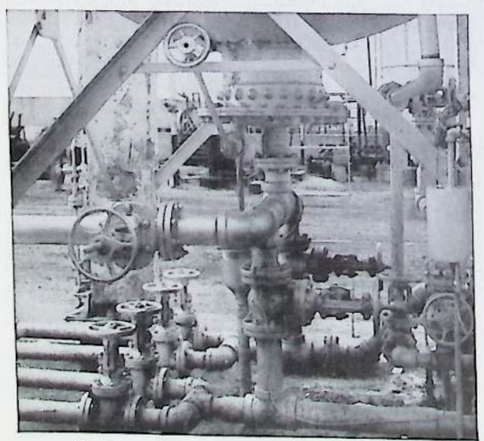
Everything from

CRANE

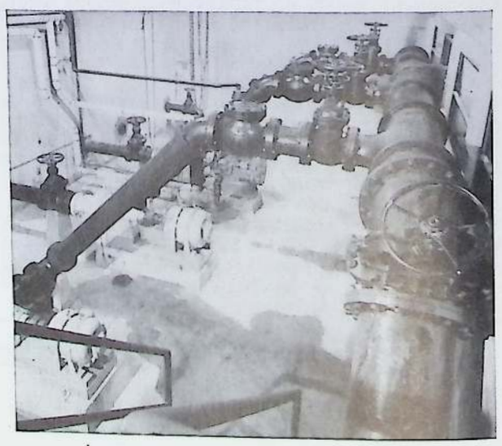
For Every Piping System



Oil piping manifold at terminal.



The base of a petroleum fractionating tower equipped with Crane valves and fittings.



A sewage treatment plant. Crane-equipped, for dependable performance—for long service.

3

Brass and Bronze Gate Valves

Names of Parts.....page 14

Gate Valves
100-Pound.....page 15
125-Pound.....pages 16 and 17
150-Pound.....page 17
200-Pound.....pages 18 and 19
300-Pound.....pages 20 and 21

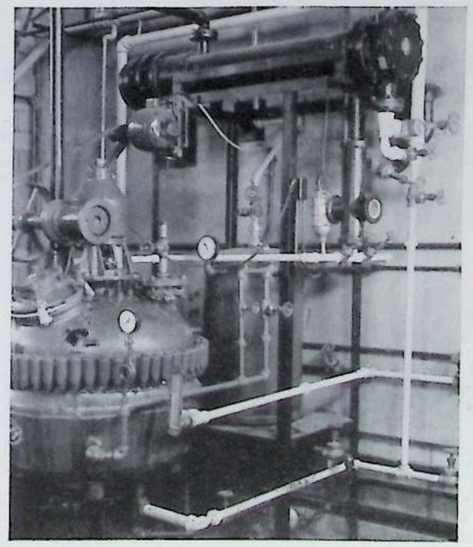
With Lock Shield.....pages 16 and 17
For Liquefied Petroleum Gases.....page 18

The Crane line includes a valve for every commercial requirement. The uniformly superior quality that distinguishes all Crane products has been maintained in this line. Excellence of design, high grade materials, and workmanship of the highest order assure dependability in service.

Other types of brass and bronze valves, supplementing the gate valves indexed above, are shown on the following pages:

Globe and Angle Valves.....pages 23 to 42
Check and Foot Valves.....pages 43 to 52
Hose Valves.....pages 60 and 61
Lever-Operated Quick-Opening Valves..pages 54 to 57
Radiator Valves.....page 58
Diaphragm Valves.....pages 388 to 391

The lists above do not include all Crane Brass and Bronze Valves. Those that perform a special duty or those made for special services such as Float Valves, Pop Safety Valves, Relief Valves, Pressure Regulators, Pressure Reducing Valves, Solder-Joint Valves, and Valves for Marine Service are described in other sections of this catalog. Refer to the index.



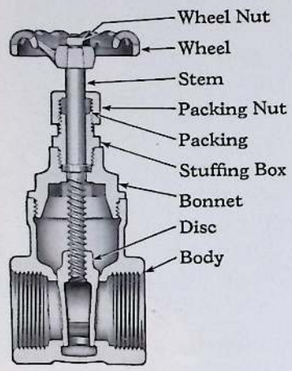
Crane Brass Gate Valves are widely used on experimental and laboratory installations.

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asbestosclaims.law/library/21276/26

Brass and Bronze Gate Valves

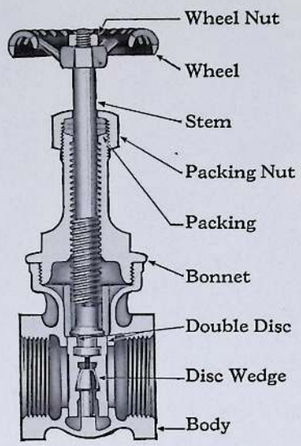
Names of Parts

3



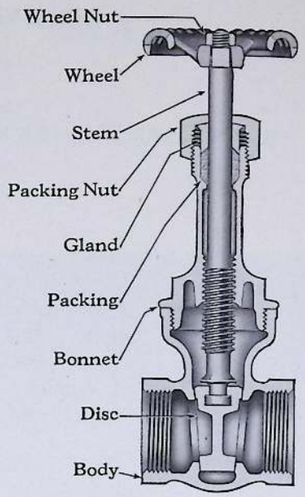
Brass Gate Valve
Non-Rising Stem
Wedge Disc

No. 410
(see page 15)



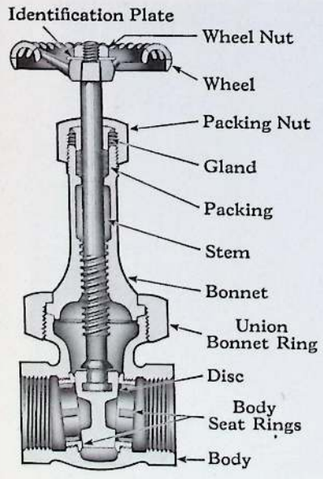
Brass Gate Valve
Rising Stem
Double Disc

No. 440
(see page 16)



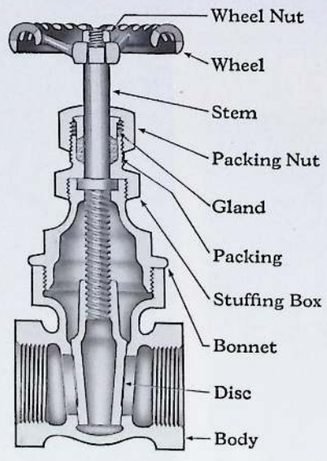
Brass Gate Valve
Rising Stem
Wedge Disc

No. 431
(see page 17)



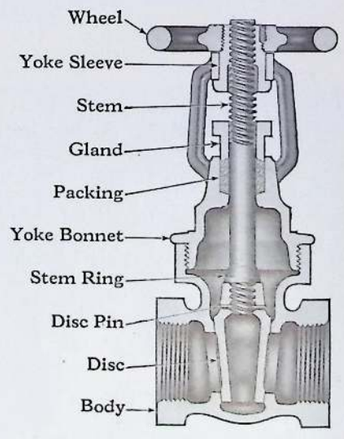
Bronze Gate Valve
Rising Stem, Union Bonnet
Wedge Disc, Renewable Seats

No. 423
(see page 18)



Bronze Gate Valve
Non-Rising Stem
Wedge Disc

No. 458
(see page 19)



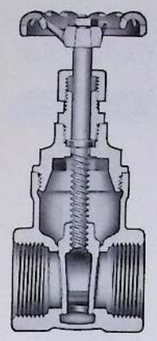
Bronze Gate Valve
Outside Screw and Yoke
Wedge Disc

No. 459
(see page 19)

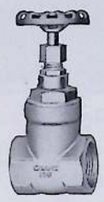
100-Pound Brass Gate Valves

Wedge Disc—Non-Rising Stem

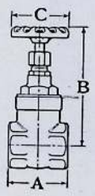
3



Cross Section
No. 410



No. 410
Screwed



With Screwed Bonnet

WORKING PRESSURES
100 pounds saturated steam
150 pounds water, 200° F.
150 pounds oil or gas, 150° F.

No. 410 Valves comprise a modernized line of 100-Pound Brass Wedge Disc Gate Valves.

The valves are excellently suited for low pressure service, such as city water lines, domestic hot and cold water lines, domestic gas and fuel oil lines, heating systems, exhaust steam, low pressure condensate or steam process piping, and similar services.

Materials: The body, bonnet, disc, stem, stuffing box, and packing nut are made of brass.

Design features: The valves feature wide-faced hexagons at the pipe ends, accurately cut threads, ample metal sections, and long disc guides for correct seating.

The upper portion of the body, cylindrical in shape, combines strength with light weight and reinforces the seats against the wedging action of the disc.

Repacking: The valves, when wide open, can be repacked while under pressure.

With Bolted Bonnet

WORKING PRESSURES
100 pounds saturated steam
125 pounds water, 200° F.
125 pounds oil or gas, 150° F.

Nos. 4436 and 4437 are liberally proportioned, bolted bonnet wedge gate valves of unusually high quality. Their body, bonnet, disc, stem, renewable body seat rings, stuffing box, and gland are made of brass.

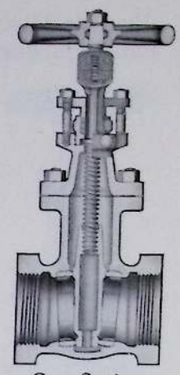
The stuffing box is deep, is filled with high grade packing, and on sizes 2½-inch and larger has a bolted gland; 2-inch valves have a screwed type stuffing box with a gland.

Repacking: The valves, when wide open, can be repacked under pressure.

Indicator: The valves are regularly furnished with an indicator to show whether the valve is open or closed. They will be furnished without an indicator when orders so specify.

Flanged valves: End flanges and drilling conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). The flanges are plain faced with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling to the MSS 150-Pound Standard; no deduction is made if valves are ordered faced only.

Full face gaskets should be used; see page 472.



Cross Section
No. 4436
With Indicator



No. 4436, Screwed
With Indicator



No. 4437, Flanged
With Indicator



No. 4436 or 4437 will be furnished without indicator if so specified.

List Prices and Dimensions

No. 410 Screwed				
Size	List Prices	Dimensions, in Inches		
		A	B	C
Inches	Each			
¼	3.00	1¾	3¼	1½
⅜	3.00	1 13/16	3¼	1½
½	3.50	1 15/16	3¾	1¾
¾	4.10	2 1/16	4⅜	2 1/16
1	4.90	2 7/16	5⅛	2 9/16
1¼	6.60	2⅞	5¾	2¾
1½	8.40	3	6⅜	3 1/16
2	12.00	3¼	7⅜	3 5/8

Marine Hose Valves.....page 403
Solder-Joint Valves.....page 420
Templates for drilling....page 458

Bolted Bonnet Valves (*Furnished with Indicator unless otherwise specified*)							
Valve No. and Type	Size	List Prices, Each		Dimensions, in Inches			
		With Indicator	Without Indicator *Specify*	End to end or face to face	Center to top of stem: With Indicator	Center to top of stem: Less Indicator	Diameter of wheel
	Inches						
No. 4436 Screwed	2	63.00	61.00	4 5/16	9¾	8⅝	4½
	2½	76.00	72.00	5½	11½	10¼	6
	3	111.00	107.00	6	13¾	12⅛	7
No. 4437 Flanged F. & D.	2	74.00	72.00	4⅝	9¾	8⅝	4½
	2½	94.00	90.00	5	11½	10¼	6
	3	128.00	124.00	5½	13¾	12⅛	7
	3½	170.00	165.00	6	14½	12⅞	7
	4	186.00	181.00	6½	16	14⅜	8
	5	266.00	260.00	7	18¼	16½	9
	6	342.00	336.00	7½	20	18⅛	9
	8	602.00	593.00	8½	25	23⅛	10
	10	833.00	821.00	9½	30	28⅛	12

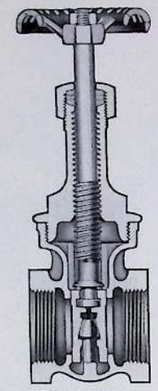
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125-Pound Brass Gate Valves

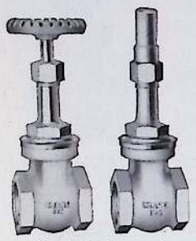
Rising Stem

3

Double Disc Parallel Seats



Cross Section
No. 440



No. 440, Screwed
With Wheel | With Lock Shield

No. 440 Valves are furnished with wheels unless orders specify "with lock shield".

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

Three Disc Types — A Choice To Suit Every Service Requirement

This unusually fine assortment of 125-Pound Rising Stem Valves, featuring three distinctive disc types, offers a style for every service or preference. The valves are recommended for general service on steam, water, oil, or gas lines. Ruggedly constructed and accurately designed throughout, they assure the user long, dependable service.

The rising stem clearly indicates whether the valve is open or closed.

No. 440 have a rising stem, a double disc guided in the body, and parallel seats. When closing, the last turn of the wheel forces the discs against the seats; when opening, the first turn releases the discs.

No. 428 have a rising stem and a solid wedge disc, reversible in the body. The disc slips onto a strong head on the stem end; accurate guiding prevents contact at the seating surfaces until the valve is almost closed.

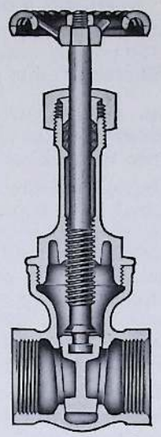
No. 430 have a rising stem and a double wedge disc, reversible in the body. The disc (see inset) is well guided and is carefully machined to assure positive, easy operation. When closing, the last turn of the wheel forces the discs against the seats; when opening, the first turn releases the discs from their seats. The disc-stem connection is of the slip-on type.



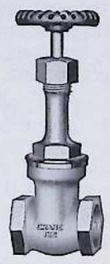
Materials: Except for the wheel and packing, all parts are made of high grade brass. The parts, carefully designed and liberally proportioned, assure a high safety factor.

Repacking: These valves, when wide open, can be repacked while under pressure. Nos. 428 and 430 have a gland in their stuffing box.

Solid Wedge Disc

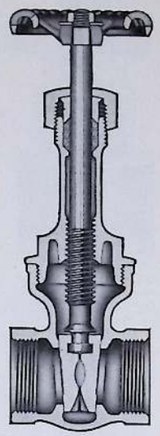


Cross Section
No. 428

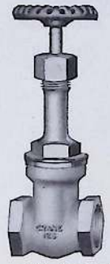


No. 428, Screwed

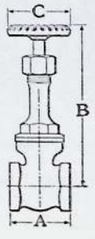
Double Wedge Disc



Cross Section
No. 430



No. 430, Screwed



List Prices and Dimensions

Size	List Prices, Each				Dimensions, in Inches						
	No. 440 Double Disc		No. 428	No. 430	No. 440				No. 428 or 430		
Inches	With Wheel	With Lock Shield	Solid Wedge Disc	Double Wedge Disc	A	B open	B with lock shield	C	A	B open	C
1/4	3.90		4.30	4.50	1 5/8	4 1/8		1 3/4	1 3/4	4 7/8	1 3/4
3/8	3.90		4.30	4.50	1 3/4	4 1/8		1 3/4	1 13/16	4 7/8	1 3/4
1/2	4.50	5.70	5.00	5.20	1 7/8	4 3/4	4 3/8	2 1/16	2	5 1/4	2 1/16
3/4	5.30	6.80	5.90	6.20	2 1/8	5 7/8	5 5/8	2 9/16	2 1/4	6 1/4	2 9/16
1	6.30	8.00	7.00	7.40	2 1/2	6 7/8	6	2 3/4	2 11/16	7 5/8	2 3/4
1 1/4	8.50	10.80	9.40	9.90	2 13/16	8 1/4	7 3/8	3 1/16	3	9	3 1/16
1 1/2	10.80	13.80	12.00	12.60	3 1/16	9 3/8	8 7/8	3 5/8	3 1/4	10 1/2	3 5/8
2	15.30	19.30	17.00	18.70	3 1/2	11 5/8	11 1/4	4 1/16	3 11/16	12 5/8	4 1/16
2 1/2	24.80		27.60	30.40	4 1/16	14		4 3/4	4 1/4	14 7/8	4 3/4
3	37.00		41.00	45.00	4 9/16	16 1/4		5 3/8	4 11/16	17 1/4	5 3/8

Keys for operating Lock Shield Valves . . . . page 137

Thread engagement . . . . page 494

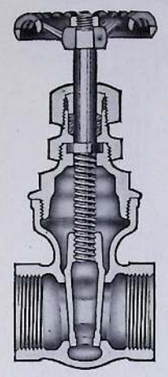
Brass Gate Valves

Wedge Disc

3

125-Pound

Non-Rising Stem



Cross Section
No. 438

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock



No. 438, Screwed
With Wheel | With Lock Shield

No. 438 Valves are a companion line to the 125-Pound Rising Stem Valves shown on page 16. Except for the wheel and packing, all parts are high grade brass. The valves, when wide open, can be repacked while under pressure. The stuffing box has a gland.

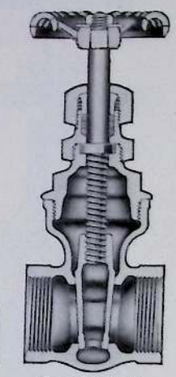
List Prices and Dimensions—125-Pound

Size	Prices, Each No. 438		Dimensions, in Inches			
			End to end	Center to top		Diameter of wheel
Inches	With Wheel	With Lock Shield		With wheel	With lock shield	
1/4	4.30		1 3/4	3 5/8		1 3/4
3/8	4.30		1 13/16	3 5/8		1 3/4
1/2	5.00	6.20	2	4	3 3/4	2 1/16
3/4	5.90	7.40	2 1/4	4 5/8	4 3/8	2 9/16
1	7.00	8.80	2 11/16	5 3/8	5 1/4	2 3/4
1 1/4	9.40	11.70	3	6 5/16	6 1/4	3 1/16
1 1/2	12.00	15.00	3 1/4	7 1/8	7 3/8	3 5/8
2	17.00	21.00	3 11/16	8 3/8	8 3/4	4 1/16
2 1/2	27.60		4 1/4	9 3/4		4 3/4
3	41.00		4 11/16	11 1/8		5 3/8

150-Pound

Non-Rising Stem

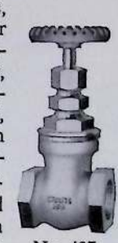
WORKING PRESSURES
150 pounds saturated steam
Cold water, oil, or gas, non-shock
Screwed valves—300 pounds
Flanged valves—225 pounds



Cross Section
No. 437

Crane 150-Pound Valves, available with non-rising or rising stem, are recommended for steam, water, oil, or gas service where conditions require a heavier, more massive construction than that found in "Standard" or 125-Pound Valves.

Except for the wheel and packing, all parts are high grade brass. The valves have a gland in the stuffing box. When wide open, they can be repacked while under pressure.



No. 437
Screwed

Rising Stem



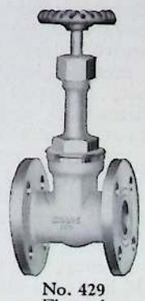
No. 431
Screwed

No. 437 are the non-rising type and have a wedge disc.

Nos. 431 and **429** are the rising stem type. Their solid wedge disc slips onto the stem, and is accurately guided in the body.

Flanged valves: End flanges of the No. 429 conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling to the MSS Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.

Cross Section
No. 431



No. 429
Flanged

List Prices and Dimensions—150-Pound

Size	Prices, Each			Dimensions, in Inches						
	No. 437 Screwed	No. 431 Screwed	No. 429 Flanged F. & D.	End to end	Face to face	Center to top		Diameter of wheel	Diameter of flange	Thickness of flange
						No. 437	No. 431 No. 429 (open)			
Inches										
1/4	4.70	4.70		1 7/8		3 5/8	4 7/8	1 3/4		
3/8	4.70	4.70		1 15/16		3 5/8	4 7/8	1 3/4		
1/2	5.50	5.50		2 1/8		4	5 1/4	2 1/16		
3/4	6.50	6.50		2 3/8		4 5/8	6 1/4	2 9/16		
1	7.70	7.70	26.00	2 7/8	3 3/8	5 3/8	7 5/8	2 3/4	4 1/4	3/8
1 1/4	10.30	10.30	30.00	3 3/16	3 7/8	6 3/8	9	3 1/16	4 5/8	13/32
1 1/2	13.20	13.20	37.00	3 7/16	4 3/8	7 1/8	10 1/2	3 5/8	5	7/16
2	18.70	18.70	62.00	3 7/8	5 1/2	8 3/8	12 5/8	4 1/16	6	1/2
2 1/2	33.00	33.00	85.00	4 1/2	6 1/2	9 3/4	14 7/8	4 3/4	7	9/16
3	49.00	49.00	103.00	4 15/16	7 1/2	11 1/8	17 1/4	5 3/8	7 1/2	5/8

Keys for operating Lock Shield Valves . . . . page 137

Templates for drilling . . . . page 458

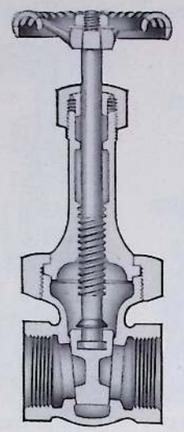
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asbestosclaims.law/library/21276/28

200-Pound Bronze Gate Valves

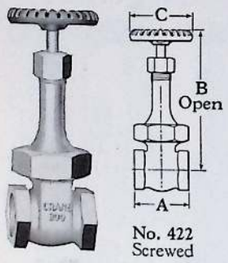
Wedge Disc—Rising Stem

3

Integral Seats



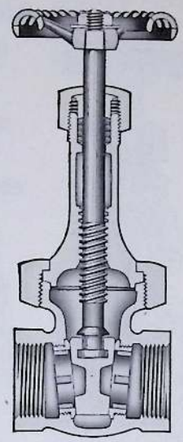
Cross Section
No. 422



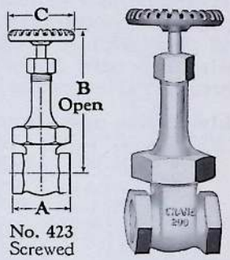
No. 422
Screwed

Solid Wedge Disc is
Crane Nickel Alloy
Integral Seats
Union or Bolted Bonnet
Slip-on Disc-Stem
Connection

Renewable Seats



Cross Section
No. 423



No. 423
Screwed

Solid Wedge Disc and
Renewable Seats are
Crane Nickel Alloy
Union or Bolted Bonnet
Slip-on Disc-Stem
Connection

WORKING PRESSURES*
200 pounds steam, 500° F.
400 pounds, non-shock
Cold water, oil, gas, volatile fluids, or air

TEST PRESSURE
600 pounds hydrostatic

Air Tested

Integral and Renewable Seat Gate Valves Suitable for Many Services

****No. 422 Valves, 2-inch and Smaller, Approved For Butane, Propane, and other LP-Gases***

No. 422 and No. 423 are unusually sturdy, dependable valves. They are excellent for use on steam, water, oil, gas, gasoline, air, light oils, volatile fluids, and similar services. No. 423 are particularly suitable where service conditions are severe.

*No. 422 Valves, 2-inch and smaller, have been approved by the Underwriters' Laboratories, Inc., for the safe handling of all liquefied petroleum gases such as butane, propane, propylene, etc., provided the valves are installed in a branch or by-pass line where a positive shut-off is not essential and where pressures do not exceed 250 pounds. An attached identification plate is marked "Butane-UL-Propane."

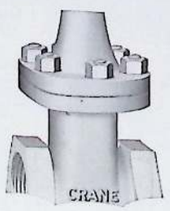
Construction: The valves are the inside screw, rising stem type. Their solid wedge disc slips onto a strong head on the stem end. The disc is accurately guided in the body to prevent contact between the seating surfaces until the valve is practically closed.

No. 422 Valves have the seats cast integral with the body and No. 423 Valves have Crane Nickel Alloy renewable seats; otherwise the valves are similar.

Materials: The body and bonnet are Crane Special Bronze, a high grade leaded tin bronze. Crane Nickel Alloy, used for the disc and renewable seats, is hard, tough, and highly resistant to wear. The stem is brass.

Interchangeability: Corresponding parts of these valves are interchangeable. The bodies, however, are not interchangeable in a line, the No. 423 having slightly longer end to end dimensions than the No. 422.

Bonnets: Sizes 2-inch and smaller have a union bonnet as shown above. Sizes 2½ and 3-inch have a compact, inside screw bolted bonnet, equipped with steel studs, brass nuts, and a Cranite gasket, as shown at the right. Both types provide a strong, tight joint, yet they can easily be dismantled and reassembled without danger of injuring the valve.



Stuffing box; repacking: The stuffing box is large and deep, and is filled with high grade packing; sizes ½-inch and larger have a gland. The valves, when wide open, can be repacked while under pressure.

List Prices and Dimensions

Size	List Prices, Each Screwed		Dimensions, in Inches			
	No. 422 Integral Seats	No. 423 Renewable Seats	A		B	C
Inches			No. 422	No. 423		
¼	6.10	8.00	1¾	1 15/16	3⅞	1¾
⅜	6.10	8.00	2	2 1/16	4¼	2 1/16
½	7.30	9.30	2¼	2⅜	5⅜	2 9/16
¾	8.70	11.30	2 9/16	2¾	6⅝	2¾
1	12.10	15.50	2⅞	3	7¾	3 1/16
1¼	15.50	20.00	3 3/16	3⅜	9⅛	3⅝
1½	19.40	25.00	3½	3¾	10¼	4 1/16
2	30.00	37.00	4	4 5/16	12½	4¾
2½	57.00	65.00	4 11/16	5	15⅛	5⅜
3	77.00	96.00	5¼	5 11/16	17½	6

Other Bronze Valves for LP-Gases:
Globe and Angle.....page 30
Check.....page 47

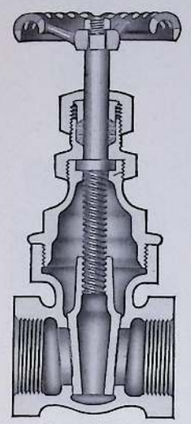
For Valves for Marine Service, see page 400.

200-Pound Bronze Gate Valves

Wedge Disc

3

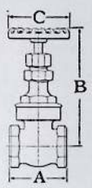
Non-Rising Stem



Cross Section
Non-Rising
Stem
No. 458



No. 458
Screwed

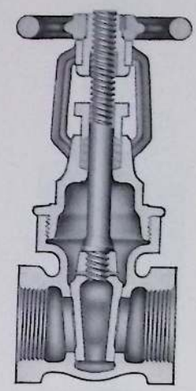


No. 458

Repacking: The No. 458 Gate Valves, when wide open, can be repacked while under pressure.

Outside Screw and Yoke

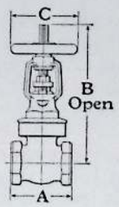
Underwriters' Pattern Sizes ¾ to 2-inch



Cross Section
Outside Screw
and Yoke
No. 459



No. 459
Screwed



No. 459

Repacking: The No. 459 Gate Valves, when wide open, can be repacked while under pressure.

WORKING PRESSURES
200 pounds steam, 500° F.
400 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
600 pounds hydrostatic

Service recommendations: No. 458 and No. 459 are sturdy, ruggedly constructed bronze gate valves recommended for service on steam, water, oil, or gas lines. They have been carefully designed to give long service under severe operating conditions. All parts are liberally proportioned to assure a high factor of safety against pressure, operating strains, and expansion and contraction of piping.

Non-rising stem valves: The No. 458 Valves have a non-rising stem and a wedge disc. The body and disc are made of Crane Special Bronze, a strong, hard, leaded tin bronze. The stuffing box is equipped with a gland and is filled with high grade packing.

Outside screw and yoke valves: The No. 459 Valves are of the outside screw and yoke type. Their body, bonnet, and wedge disc are made of Crane Special Bronze. The stuffing box is equipped with a bolted gland and is filled with high grade packing.

The valves are especially suitable on services where the action of the fluid might affect inside stem threads. In addition, the stem threads can be easily lubricated when necessary, thereby minimizing wear.

Underwriters' Specifications: No. 459 Valves, ¾ to 2-inch inclusive, have been approved by the Underwriters' Laboratories, Inc., and Factory Mutual Laboratories. They are marked "CU" and "FM".

List Prices and Dimensions

Valve No. and Type	Size	List Prices	Dimensions, in Inches		
			A	B	C
	Inches	Each			
No. 458 Screwed Non-Rising Stem	¼	6.10	2	4⅛	2 1/16
	⅜	6.10	2	4⅛	2 1/16
	½	7.30	2⅜	4⅞	2 9/16
	¾	8.70	2⅝	5½	2¾
	1	12.10	3	6¼	3 1/16
	1¼	15.50	3½	7¼	3⅝
	1½	19.40	4	8⅛	4 1/16
	2	30.00	4¾	9⅝	4¾
	2½	57.00	5⅜	11¼	6
	3	77.00	6	12¾	7
No. 459 Screwed Outside Screw and Yoke	½	16.80	2⅝	6⅜	3 5/16
	¾	18.20	2⅝	6⅜	3 5/16
	1	21.00	3	7⅜	3⅝
	1¼	26.00	3½	8¾	3⅞
	1½	32.00	4	9¾	4⅜
	2	48.00	4¾	11⅝	4 13/16
	2½	68.00	5⅜	13⅞	5¾
	3	107.00	6	16⅛	6 1/16

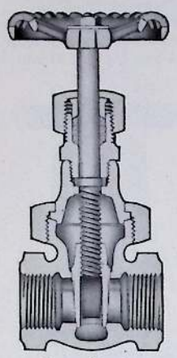
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asbestosclaims.law/library/21276/29

300-Pound Bronze Gate Valves

Wedge Disc—Non-Rising Stem

3

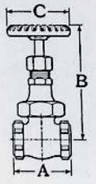
Integral Seats



Cross Section No. 624 E



No. 624 E Screwed



Valve Size	Working Pressures: Steam 550° F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
¼ to 2-inch	300 pounds	1000 pounds	1500 pounds
2½ and 3-inch	300 pounds	600 pounds	900 pounds

Air Tested

Features
Union or Bolted Bonnet
Interchangeable Parts
Crane Nickel Alloy Wedge Disc
Crane Nickel Alloy Renewable Seats in the No. 625 E Valve

Service recommendations: These ruggedly constructed non-rising stem bronze gate valves are ideal for high pressure service. No. 625 E Valves, having nickel alloy renewable seats, are particularly suitable where operating conditions are severe.

The valves are a companion line to the 300-Pound Rising Stem Gate Valves shown on page 21.

Construction: These valves are the inside screw, non-rising stem type. Except for their seats, they are similar. No. 624 E Valves have integral seats; No. 625 E Valves have Crane Nickel Alloy renewable seats.

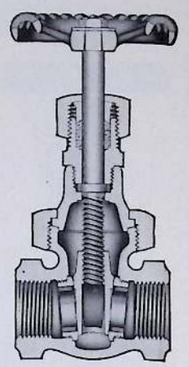
The valves have unusually heavy metal sections and are ruggedly constructed. Their body ends are made with lugs, permitting a secure wrench grip and presenting a neat, compact appearance.

Long, clean-cut threads engage the disc and stem, assuring accurate and easy operation. The disc is thoroughly guided throughout its travel; the seating surfaces do not come into contact until the valve is practically closed.

Materials: The body and bonnet are made of Crane Special Bronze, a high grade leaded tin bronze. Crane Nickel Alloy, used for the disc and the renewable seats, is especially resistant to wear, being hard and tough.

Interchangeability: All parts are interchangeable. The bodies, however, are not interchangeable in a line, the No. 625 E having slightly longer end-to-end dimensions than the No. 624 E.

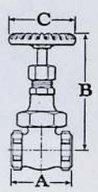
Renewable Seats



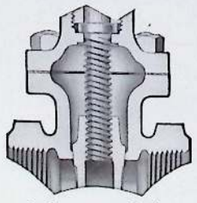
Cross Section No. 625 E



No. 625 E Screwed



Bonnets: Sizes 1-inch and smaller have a union bonnet as shown above; larger sizes have a compact inside screw bolted bonnet, equipped with steel studs, brass nuts, and a Cranite gasket, as shown at the right.



Both types provide a strong, tight joint, yet they can be easily dismantled and reassembled without danger of injuring the valve.

Stuffing box: The stuffing box is large and deep, and is filled with high grade packing. Sizes ⅜-inch and larger are equipped with a gland.

Repacking: These valves, when wide open, can be repacked while under pressure.

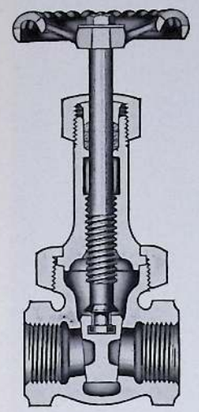
List Prices and Dimensions

Size Inches	List Prices, Each Screwed: No. 624 E Integral Seats	No. 625 E Renewable Seats	Dimensions, in Inches: A No. 624 E	A No. 625 E	B	C
¼	9.70	12.80	1 15/16	2⅛	3⅝	2 1/16
⅜	9.70	12.80	2 1/16	2 3/16	4 3/8	2 9/16
½	11.30	14.70	2⅜	2½	4 13/16	2¾
¾	13.60	17.70	2¾	2 15/16	5⅜	3 1/16
1	17.00	21.80	3¼	3 5/16	6⅜	3⅝
1¼	28.00	37.00	3½	3 11/16	7 3/16	4 1/16
1½	36.00	46.00	3¾	4	8	4¾
2	50.00	62.00	4 5/16	4 5/8	9 15/16	5⅜
2½	77.00	89.00	5 3/16	5½	10 3/8	5⅜
3	108.00	124.00	5⅝	6	11 7/8	6

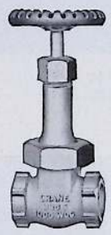
300-Pound Bronze Gate Valves

Wedge Disc—Rising Stem

Integral Seats



Cross Section No. 622 E



No. 622 E, Screwed

Valves		Working Pressures: Steam 550°F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	¼ to 2-inch	300 pounds	1000 pounds	1500 pounds
	2½ and 3-inch	300 pounds	600 pounds	900 pounds
Flanged	All sizes	300 pounds	500 pounds	900 pounds

Air Tested

Features
Union or Bolted Bonnet—Slip-on Disc-Stem Connection
Crane Nickel Alloy Wedge Disc—Interchangeable Parts
Crane Nickel Alloy Renewable Seats in Nos. 623 E and 623½ E Valves

Service recommendations: These valves, exceptionally durable and rugged, are recommended for high pressure service. Body ends are made with lugs to permit a better wrench grip.

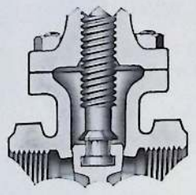
Construction: Except for the seats, the valves are similar. No. 622 E have seats integral with the body; Nos. 623 E and 623½ E have Crane Nickel Alloy renewable seats.

The valves have a Crane Nickel Alloy solid wedge disc that slips onto a strong head on the stem end. The disc is accurately guided in the body to prevent contact between the seating surfaces until the valve is practically closed. All parts are interchangeable. The bodies, however, are not interchangeable in a line.

Materials: The body and bonnet are made of Crane Special Bronze, a high grade, leaded tin bronze. Crane Nickel Alloy, used for the disc and renewable seats, is especially resistant to wear, being very hard and tough.

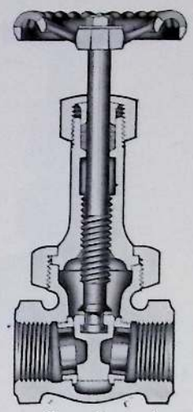
Stuffing box; repacking: The stuffing box is large and deep and is filled with high grade packing. In sizes ⅜-inch and larger, the stuffing box is equipped with a gland. All of these valves, when wide open, can be repacked while under pressure.

Bonnets: Sizes 1-inch and smaller have a union bonnet as shown along the margins; larger sizes have a compact, inside screw bolted bonnet, equipped with steel studs, brass nuts, and a Cranite gasket, as shown at the right. Both types provide a strong, tight joint which is easy to dismantle and reassemble without injury to the valve.

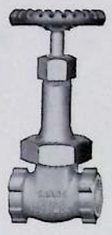


Flanged valves: End flanges conform to the MSS 300-Pound SP Bronze Flange Standard (No. SP-2-1946). Plain faced, they have two V-shaped concentric grooves between the port and bolt holes.

Renewable Seats



Cross Section No. 623 E

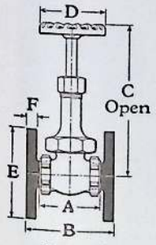


No. 623 E, Screwed



No. 623½ E, Flanged

Flanged Valve Prices
Prices of flanged valves include drilling to the MSS 300-Lb. Standard; no deduction is made for valves ordered faced only. Full face gaskets should be used; see page 472.



Screwed and Flanged Valves

List Prices and Dimensions

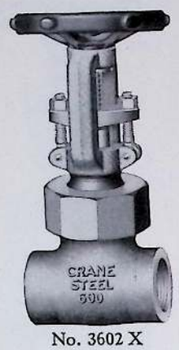
Size Inches	List Prices, Each: No. 622 E Screwed	No. 623 E Screwed	No. 623½ E Flanged F. & D.	Dimensions, in Inches: A No. 622 E	A No. 623 E	B	C	D	E	F
¼	9.70	12.80		1 15/16	2⅛		4⅛	2 1/16		
⅜	9.70	12.80		2 1/16	3 3/16		5¼	2 9/16		
½	11.30	14.70		2⅜	2½		6	2¾		
¾	13.60	17.70		2¾	2 15/16		7⅛	3 1/16		
1	17.00	21.80	39.00	3¼	3 5/16	4¾	8 3/8	3⅝	4⅞	19/32
1¼	28.00	37.00	52.00	3½	3 11/16	5¼	9¾	4 1/16	5¼	⅝
1½	36.00	46.00	73.00	3¾	4	6	11	4¾	6⅛	11/16
2	50.00	62.00	100.00	4 5/16	4 5/8	6½	13½	5⅜	6½	¾
2½	77.00	89.00	158.00	5 3/16	5½	7½	15½	5⅜	7½	13/16
3	108.00	124.00	230.00	5⅝	6	8	18⅛	6	8¼	29/32

Valves for Marine Service....page 400 *Templates for drilling....page 458*

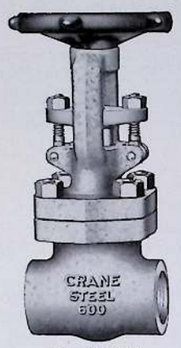
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3

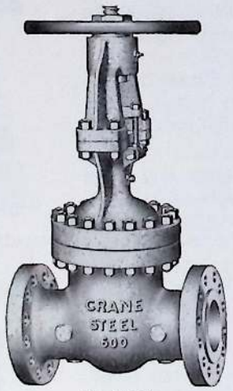
Crane Steel Gate Valves
For High Pressures And High Temperatures



No. 3602 X
Cast Steel
Wedge Gate Valve
Union Bonnet
Screwed
See page 223



No. 3607 X
Cast Steel
Wedge Gate Valve
Bolted Bonnet
Screwed
See page 225

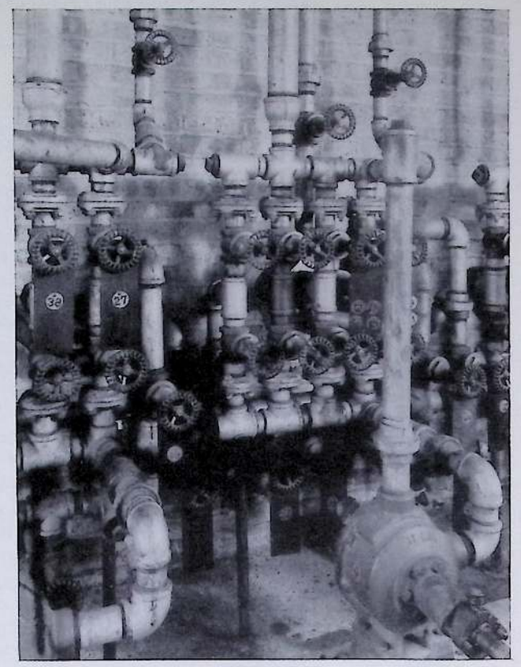


No. 76 X
Cast Steel
Wedge Gate Valve
Flanged
See page 229

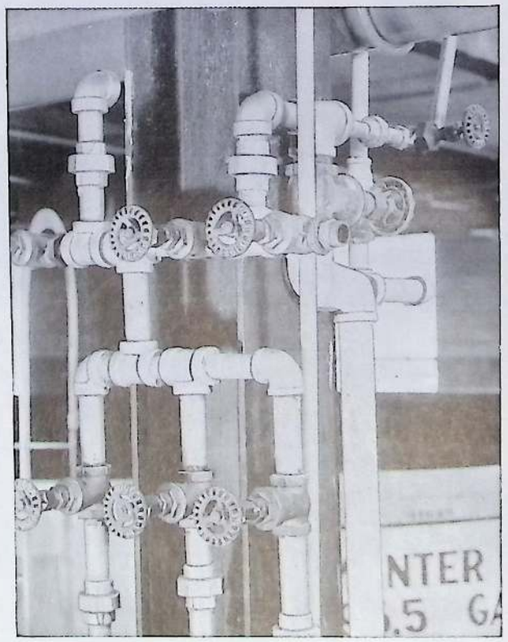
When gate valves are required for steam pressures above 300 pounds or temperatures exceeding 550° F., use Crane Steel Gate Valves.

They are made in a wide range of sizes and types for all service conditions and include the new design Crane Pressure-Seal Bonnet Gate Valves, which utilize the pressure in the valve to seal the bonnet joint and are streamlined to conserve space. Valves with pressure-seal bonnets are especially recommended for extremely high steam pressures and temperatures.

Crane Steel Gate Valves are described in detail on pages 205 to 211 and pages 221 to 234.



Crane Brass Gate Valves used to control flow in a turpentine plant.



Distilleries are important users of Crane Brass and Bronze Gate Valves.

4

Brass and Bronze Globe and Angle Valves
(Including AAR Valves)

Names of Parts ..... page 24

Globe and Angle Valves
- 100-Pound ..... page 25
- 125-Pound ..... page 26
- 150-Pound ..... pages 28 and 29
- 200-Pound ..... pages 32 to 34
- 300-Pound ..... pages 35 to 37
- 2000-Pound Hydraulic ..... page 41
- 2500-Pound Hydraulic (Globe only) ..... page 42
- Needle Point ..... pages 26 and 27
- For Liquefied Petroleum Gases ..... page 30
- For Light Oils and Gases ..... page 31

AAR Globe and Angle Valves
- Inside Screw Type ..... page 38
- Outside Screw and Yoke Type ..... page 39
- Listing of AAR Valve Parts ..... page 40

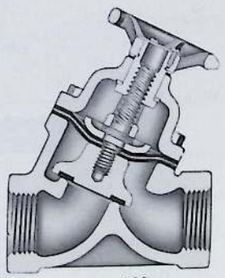
Cab Hose Valves ..... page 40

Vent or Sampling Valve
- For Transformer Oil Service ..... page 31

Other commonly used brass and bronze valves, supplementing those above, are described in Sections 3, 5, and 6. Brass and bronze valves that perform a special duty, or made for special services, such as Float Valves, Pop Safety Valves, Relief Valves, Pressure Regulators, Pressure Reducing Valves, Solder-Joint Valves, and Valves for Marine Service are shown in other sections of the catalog; refer to the main index.

Tight Seating, "Packless" Type Crane Brass Body Y-Pattern Diaphragm Valves

Unexcelled for a Wide Variety of General and Corrosive Services



Sectional View
Y-Pattern Diaphragm Valve

Crane Brass Body, Y-Pattern Diaphragm Valves, built for hard usage, are excellent for a wide variety of corrosive, as well as ordinary, piping systems. The flexible diaphragm mounted between the body and bonnet (eliminates the need for a stuffing box) and the tight-seating disc facing make the valves ideal for conveying liquids, compressed air, gases, volatile fluids, etc.

Brass Diaphragm Valves, suitable for pressures ranging up to 150 pounds and a maximum temperature of 180° F., are available with screwed ends in sizes ½ to 2-inch. They are regularly furnished with the diaphragm and disc insert made of neoprene, Buna N, or natural rubber.

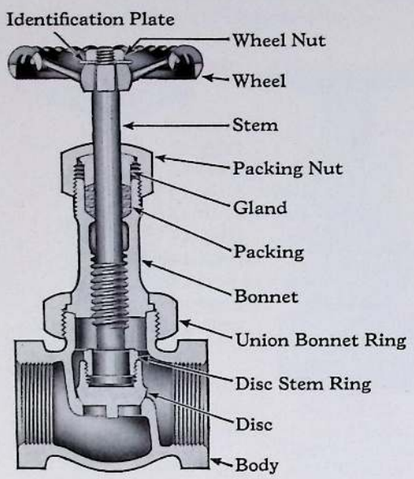
In addition to brass, the complete diaphragm line includes both screwed and flanged valves having the body and disc holder made of cast iron, aluminum, or 18-8 Mo. The cast iron flanged valves are also available with the body lined, and the disc coated, with neoprene or natural rubber.

For the complete Crane line of Diaphragm Valves, see pages 388 to 391.

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Brass and Bronze Globe and Angle Valves

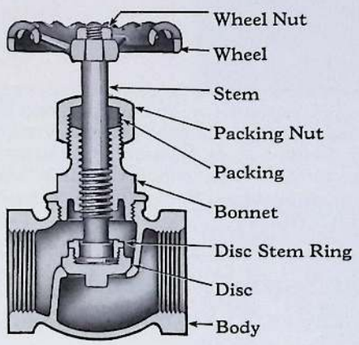
Names of Parts



Above

Bronze Globe Valve with Union Bonnet and Metal Disc

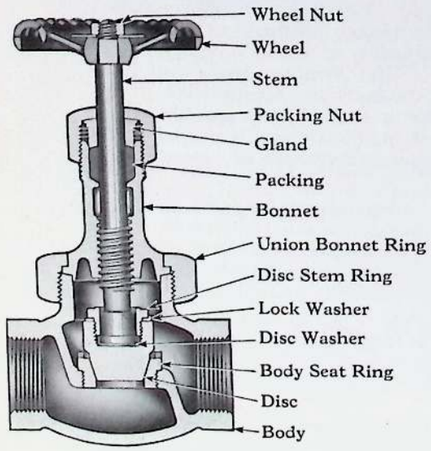
No. 362 E
(see page 35)



Below

Bronze Globe Valve with Union Bonnet, Metal Disc, and Renewable Seat

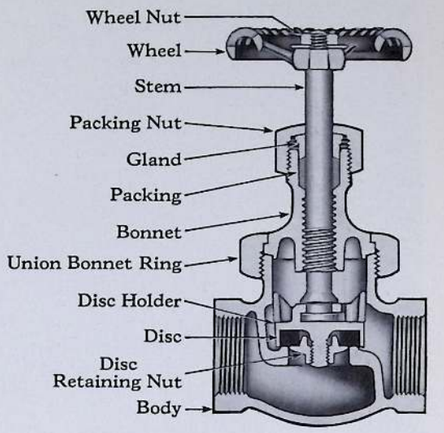
No. 382 P
(see page 36)



Below

Brass Globe Valve with Screwed Bonnet

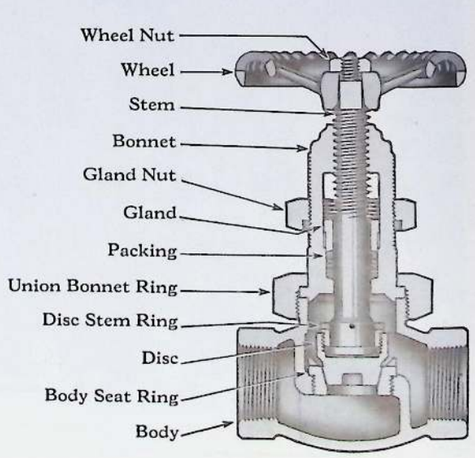
No. 1
(see page 26)



Above

Brass Globe Valve with Union Bonnet and Composition Disc

No. 7
(see page 28)



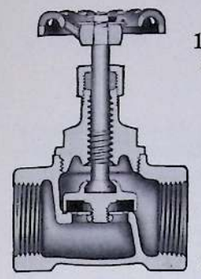
Below

Bronze Globe Valve with Union Bonnet, Metal Disc, and Renewable Seat
Outside Screw and Yoke
AAR Design

No. 396 P
(see page 39)

100-Pound Brass Globe and Angle Valves

With Composition Disc



Cross Section No. 1240



No. 1240 Globe Screwed

With Wheel



*With Lock Shield



No. 1241 Angle Screwed

With Wheel



*With Lock Shield

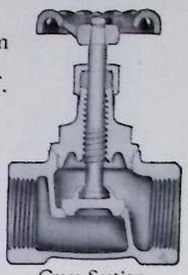
*Nos. 1240 and 1241 are regularly furnished wheel operated. Specify when sizes ¼ to 1¼-inch are wanted with lock shield.

With Brass Disc

WORKING PRESSURES

100 pounds saturated steam
150 pounds water, 200° F.
Domestic Gas Service

100 pounds saturated steam
150 pounds water, 200° F.
150 pounds oil or gas, 150° F.



Cross Section No. 1250



No. 1250 Globe, Screwed



No. 1251 Angle, Screwed

Service recommendations: This diversified line of 100-Pound Brass Globe and Angle Valves combines wide utility with moderate cost. Well proportioned and sturdily constructed, the valves offer ample strength and durability for any low pressure installation. They are especially recommended for domestic water or gas lines, steam heating systems, for piping on equipment operated at low pressures, and for similar services.

Construction: Nos. 1240 and 1241 Valves have a composition disc, whereas Nos. 1250 and 1251 Valves have a brass disc. Otherwise, the two types of valves are similar. Long hexagons on the body reinforce the openings and afford a good wrench grip. The seat is integral with the body. The bonnet is screwed into the body and has liberal thread engagement with the stem.

The disc holder or disc is spun onto the end of the stem, except on the ⅜ and ½-inch brass disc valves which have the stem and disc integral. The stuffing box is amply deep to prevent leakage at the stem.

Composition disc valves: Composition disc valves are regularly supplied with a No. 12 Disc suitable for 150 pounds hot or cold water (maximum temperature of 200° F.) and for domestic gas service. When so ordered, the valves will be furnished with a No. 10 Disc, making them suitable for 100 pounds saturated steam.

An identification plate under the wheel nut identifies the valve and the disc with which it is equipped. For extra composition discs, see page 133.

Brass disc valves: Brass disc valves have a ball-to-angle seat. They are suitable for 100 pounds saturated steam, for 150 pounds cold or hot water, 200° F., and for 150 pounds cold oil or gas service.

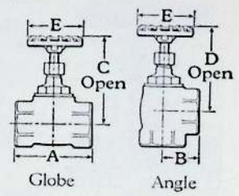
A complete line: Crane manufactures a complete assortment of 100-Pound Brass Valves. Gate valves are shown on page 15; check valves, on page 45. For solder-joint gate, globe, angle, and check valves, see pages 420 and 421.

List Prices and Dimensions

Valve No. and Type	Size	List Prices, Each		Dimensions, in Inches						
		With Wheel	With Lock Shield	A	B	C		D		E
						With Wheel	With Lock Shield	With Wheel	With Lock Shield	
	Inches		Specify							
No. 1240, Globe or No. 1241, Angle Composition Disc	⅛	2.10		1⅞	⅞	2¾		2½		1½
	¼	2.10	2.60	1⅞	⅞	2¾	2¾	2½	2¼	1½
	⅜	2.20	2.70	2	15/16	2⅞	2¾	2⅜	2½	1½
	½	2.90	3.60	2⅜	1⅛	3½	3¼	3⅛	2⅞	1¾
	¾	3.90	4.90	2¾	15/16	4	3⅝	3¾	3⅜	2 1/16
	1	5.50	6.90	3¼	1½	4½	4⅛	4¼	3⅞	2 9/16
	1¼	7.00	8.70	3⅞	1 13/16	4⅞	4½	4⅝	4¼	2¾
	1½	9.60		4¼	2	5½		5¼		3 1/16
	2	15.00		5	2¼	6		5⅞		3⅝
No. 1250, Globe or No. 1251, Angle Brass Disc	⅜	2.05		2	15/16	3		2⅝		1½
	½	2.60		2⅜	1⅛	3½		3¼		1¾
	¾	3.40		2¾	15/16	4⅛		3⅞		2 1/16
	1	4.70		3¼	1½	4¾		4⅜		2 9/16
	1¼	6.10		3⅞	1 13/16	5		4⅞		2¾
	1½	8.60		4¼	2	5⅝		5⅜		3 1/16
	2	12.70		5	2¼	6¼		6⅛		3⅝

Keys for Lock Shield Valves . . . . page 137

Composition Discs . . . . page 133

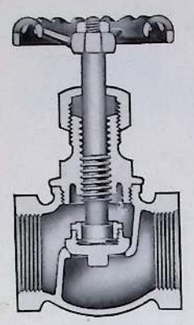


Composition Disc or Brass Disc Valves

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125-Pound Brass Globe and Angle Valves

Brass Disc



Cross Section, Globe



No. 1, Globe Screwed



No. 2, Angle Screwed

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

Service recommendations: Crane 125-Pound Brass Globe and Angle Valves are recommended for general service on steam, water, oil, or gas lines.

Construction: The valves are sturdy and unusually well constructed. They are heavier and more rugged than is usual with "Standard" or 125-Pound Valves.

All parts are liberally proportioned to assure a high factor of safety against pressure, operating strains, and expansion and contraction of the piping.

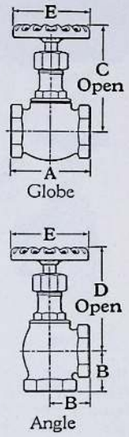
The disc in sizes ⅛ to ½-inch is integral with the stem. In the larger sizes, the disc swivels on the stem as shown in the cross section at the left.

Repacking: These valves, when wide open, can be repacked while under pressure. The stuffing box is amply deep to prevent leakage at the stem.

Flanged valves: When flanged valves are required, use the No. 71 Globe or Angle Valves described and illustrated on page 33.

List Prices and Dimensions

Size	List Prices		Dimensions, in Inches					
			Globe			Angle		
Inches	No. 1 Globe Each	No. 2 Angle Each	A	C	E	B	D	E
⅛	2.10	2.10	1 7/16	2¾	1½	¾	2⅝	1½
¼	2.10	2.10	1⅝	3	1¾	13/16	2⅞	1¾
⅜	2.40	2.40	1⅞	3¼	2 1/16	15/16	3⅛	2 1/16
½	3.40	3.40	2 3/16	3¾	2 9/16	1⅛	3⅝	2 9/16
¾	4.50	4.50	2 11/16	4¼	2¾	1⅜	4¼	2¾
1	6.20	6.20	3 3/16	4⅞	3 1/16	1⅝	4¾	3 1/16
1¼	8.00	8.00	3 11/16	5⅜	3⅝	1 13/16	5⅜	3⅝
1½	11.30	11.30	4 3/16	6¼	4 1/16	2 1/16	6⅛	4 1/16
2	17.50	17.50	5⅛	7⅜	4¾	2½	7⅜	4¾
2½	25.50	25.50	6 1/16	7½	5⅜	3 1/16	7⅞	5⅜
3	38.00	38.00	7 1/16	9¼	6	3 11/16	9¼	6

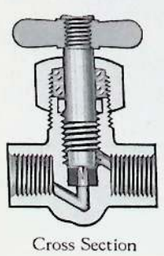


Brass Needle Air Valve

WORKING PRESSURE
300 pounds cold water, oil, or gas, non-shock

Service recommendations: The No. 57 Needle Air Valve is ideal for service on water lines to air drills, on air or water lines in garages, filling stations, and industrial plants, and for similar service.

Installation: The valve should always be installed with the pressure above the seat.



Cross Section

Construction: This valve is heavy and rugged. The body and packing nut are brass. The malleable iron tee handle is threaded onto the brass stem which has the end spun over to lock the handle in place.

The valve has an extra thick fibre seat that can be easily renewed should it become worn.



No. 57 Needle Air Valve

List Price and Dimensions

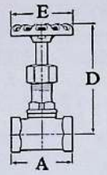
Size			Inches	⅜
No. 57 Needle Air Valve	List Price		Each	3.40
	Dimensions, in Inches	Diameter of seat opening		⅛
		End to end		2 5/16
		Center to top of stem, open		2½

Brass Globe and Angle Valves

Needle Point



No. 88 Globe, Screwed



WORKING PRESSURES
200 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock

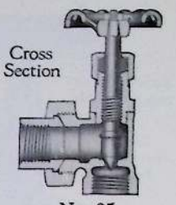
Service recommendations: Crane Globe and Angle Needle Point Valves are especially suitable where very close and delicate regulation of flow is desired.

They are recommended for steam, water, oil, gas, for light liquid lines, for fuel oil, and for similar services.

Construction: The valves, well proportioned throughout, are compact and unusually rugged in construction. They are furnished with a brass stem. Their stuffing box is large, and on the ¾-inch size, is equipped with a gland.

Repacking: The valves, when wide open, can be repacked while under pressure.

Seat opening: The diameter of the seat opening in these valves is included in the dimensions shown in the table below. The ⅛-inch size has a nominal seat opening; the larger sizes have a reduced seat opening.

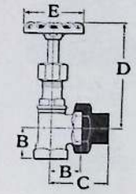


Cross Section

No. 85 Angle, Screwed With Female Union Outlet



No. 89 Angle, Screwed



List Prices and Dimensions

Size	List Prices, Each Screwed			Dimensions, in Inches					
Inches	No. 85 Angle with Union	No. 88 Globe	No. 89 Angle	A	B	C	D open	E	Diameter of seat opening
⅛	3.10	2.30	2.40	1 3/16	⅝	1 5/16	2⅜	1½	⅛
¼	3.50	2.50	2.60	1 9/16	13/16	1 9/16	2⅜	1½	3/16
⅜	4.20	2.70	3.00	1 13/16	⅞	1¾	2¾	1¾	¼
½	5.40	3.20	3.70	2 1/16	1 1/16	2	3⅛	2 1/16	5/16
¾	6.70	4.50	5.00	2 5/16	1¼	2 3/16	4	2 9/16	7/16

Hose Valves



No. 117 Angle Hose Valve with Cap and Chain

See pages 60 and 61

Crane offers a variety of brass hose valves in a wide range of sizes. Among these are Angle and Chicago Hose Valves, widely used on standpipes, hose racks, and similar services; Hose Gate including the Underwriters' type; and Garden Hose Valves. A variety of hose threads are available at no extra charge.

Solder-Joint Valves

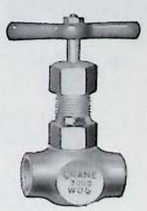


No. 1310 Globe Valve Solder-Joint

See pages 420 and 421

Sturdily built Crane Solder-Joint Valves, for use with copper tubing, include globe, angle, gate, and check types. The valves are particularly adaptable to plumbing and heating systems, low pressure steam and water lines in industrial plants, and for other similar services. Available in sizes ⅜ to 2-inch.

Steel Valves



No. 222 H Globe Valve Female Steel Bar Stock

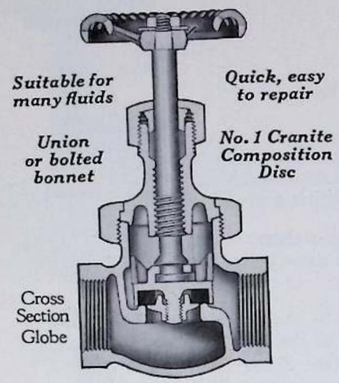
See page 236

The Crane line of bar stock valves includes small, rugged globe and angle valves made of steel, Exelloy, or Crane 18-8 Mo. They are ideal for use on orifice meters, regulator leads, by-passes, gauges, and many similar services. Available with female ends or with male and female ends in sizes ⅛ to 1-inch.

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150-Pound Brass Globe and Angle Valves

No. 1 Cranite Composition Disc





No. 7, Globe Screwed



No. 7, Angle Screwed



No. 9, Globe Flanged



No. 9, Angle Flanged

WORKING PRESSURES

Screwed valves—150 pounds saturated steam
300 pounds cold water, oil, or gas, non-shock

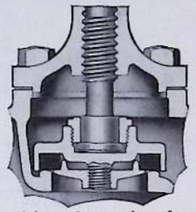
Flanged valves—150 pounds saturated steam
225 pounds cold water, oil, or gas, non-shock

Service recommendations: These valves are recommended for a wide range of service when equipped with the proper disc. They will give excellent results on steam, hot water, cold water, oil, air, or gas lines and are unexcelled where quick disc replacement is necessary.

Quick repairs: A leak is easily repaired by replacing the disc holder with an extra complete disc holder and disc, or by inserting a new disc into the original holder. Extra disc holders and discs should be kept on hand for this purpose.

Construction: All parts are unusually rugged to withstand severe operating strains.

Valves 2-inch and smaller have a slip-on disc holder and a union bonnet as illustrated in the cross section at the upper left. Larger sizes have the disc and stem fastened with a disc stem ring and are furnished with an inside screw, bolted bonnet; see the illustration at the right.



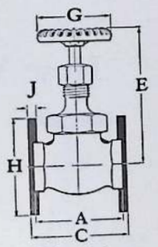
2½ and 3-inch valves have a disc stem ring and are made with a bolted bonnet.

Both types of bonnets provide a strong, tight joint, yet they can be easily dismantled and reassembled without danger of injuring the valve.

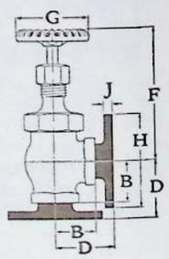
Discs: The valves are regularly equipped with a No. 1 Cranite Disc suitable for saturated steam or for hot water up to 300° F. Valves ordered for cold water, air, gas, oil, or gasoline are furnished with a No. 6 Disc. On hot water under 200° F., especially for frequent operation or easy seating, a No. 6 Disc is preferred to the No. 1. For list prices and description of discs, see page 133.

Stuffing box; repacking: The stuffing box is deep and has a gland. The valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.



Globe Valves



Angle Valves

List Prices, Each

Dimensions, in Inches

Size Inches	Globe or Angle: No. 7 Screwed	Globe or Angle: No. 9 Flanged F. & D.	A	B	C	D	E open	F open	G	H	J
⅛	3.30		2	15/16			3¾	3⅝	1¾		
¼	3.30		2	15/16			3¾	3⅝	1¾		
⅜	4.10		2 5/16	1 1/16			4 5/16	4 3/16	2 1/16		
½	5.20		2 11/16	1¼			4¾	4⅝	2 9/16		
¾	7.20		3 3/16	1 7/16			5⅜	5¼	2¾		
1	9.80	26.00	3¾	1 11/16	4⅜	2 9/16	6 1/16	5 15/16	3 1/16	4¼	⅜
1¼	13.40	33.00	4¼	2	4 13/16	2⅞	6¾	6⅝	3⅝	4⅝	13/32
1½	16.70	40.00	4¾	2 3/16	5½	3 3/16	7 9/16	7 5/16	4 1/16	5	7/16
2	27.00	60.00	5¾	2 11/16	6½	¾	8⅝	8⅜	4¾	6	½
2½	49.00	91.00	6¾	3¼	7½	4 5/16	10½	10⅜	7	7	9/16
3	69.00	126.00	8	3 13/16	8⅞	4⅝	11 13/16	11 9/16	8	7½	5⅝

When ordering, specify whether Globe or Angle type is wanted.

List prices of composition discs....page 133

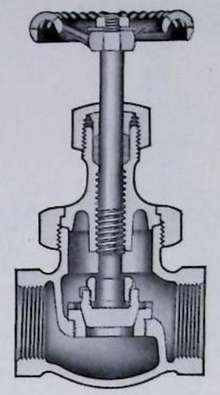
Templates for drilling....page 458

150-Pound Brass Globe and Angle Valves

Plug Type Disc

WORKING PRESSURES
150 pounds saturated steam
300 pounds cold water, oil, or gas, non-shock
Air Tested

Features
Crane Nitri-Hard Seating Surfaces
Plug Type Disc—Renewable Body Seat Ring
Union or Bolted Bonnet



Cross Section Globe

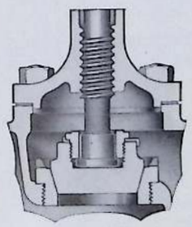
Service recommendations: These valves are recommended for throttling, for soot blower, blow-off, boiler feed, drip, and drain lines, and for other hard services. Having extremely hard stainless steel seating surfaces, the valves are unusually well suited for installations where operating conditions are severe.

Plug type disc valves for moderate pressures: High pressure valves are often used on much lower pressures in order to secure the better seat construction usually associated with higher pressures.

These valves are unique in that while only recommended for 150 pounds saturated steam and 300 pounds cold water, oil, or gas, they are made with a seat and disc that will stand up under extremely hard operating conditions. For severe and exacting services on moderate pressures, such as throttling, blow-off, boiler feed, frequent operation, etc., they are ideal, affording abundant seat life without the higher initial cost of a high pressure valve.

Disc and seat: The valves have a plug type disc and seat whose excellent design characteristics for rigorous service are well known. The wide seating surface is not easily ruined by foreign matter or by wiredrawing, and the tapered disc permits close regulation of flow when throttling.

Both the disc and seat are made of Crane Nitri-Hard, a stainless steel that withstands high temperatures and has an extremely hard surface. The design of the disc and seat and the unusual resistance of Crane Nitri-Hard to wear, cutting, scoring, erosion, seizure, and galling produce a superior seating combination. It will withstand severe operating conditions unusually well.



2½ and 3-inch valves have a bolted bonnet.

Sturdy construction: The valves are ruggedly constructed throughout. The brass body, bonnet, and stem are proportioned to provide liberal strength and safety under the recommended working pressures.

Bonnet construction: Sizes 2-inch and smaller have a union bonnet as shown on illustrations at the right; 2½ and 3-inch sizes have a low-type, compact bolted bonnet, inside screw, as illustrated at the left.

Both types of bonnet construction provide a strong, tight joint, yet they can be easily dismantled and reassembled without danger of injuring the valve.

Stuffing box: The valves have a stuffing box which is large and deep; it is equipped with a gland and is filled with high grade packing.

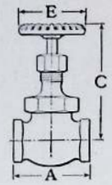
Repacking: These valves, when wide open, can be repacked while under pressure.

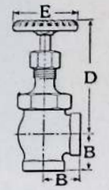


No. 14½ P Screwed Globe



No. 16½ P Screwed Angle





List Prices and Dimensions

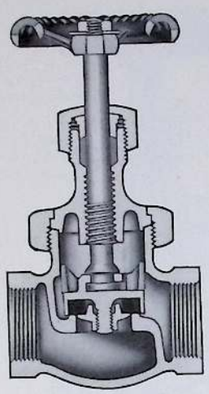
Size Inches	List Prices, Each: No. 14½P Globe	List Prices, Each: No. 16½P Angle	A	B	C open	D open	E
⅛	5.40	5.40	2	15/16	4	3⅞	1¾
¼	5.40	5.40	2	15/16	4	3⅞	1¾
⅜	6.70	6.70	2 5/16	1 1/16	4½	4⅜	2 1/16
½	7.60	7.60	2 11/16	1¼	5	4⅞	2 9/16
¾	9.50	9.50	3 3/16	1 7/16	5¾	5⅝	2¾
1	12.50	12.50	3¾	1 11/16	6⅝	6½	3 1/16
1¼	17.80	17.80	4¼	2	7	6¾	3⅝
1½	24.00	24.00	4¾	2 3/16	8	7¾	4 1/16
2	35.00	35.00	5¾	2 11/16	9⅛	8⅞	4¾
2½	63.00	63.00	6¾	3¼	10½	10⅜	7
3	94.00	94.00	8	3 13/16	11⅞	11⅝	8

Valves for Marine Service....page 400

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Bronze Globe and Angle Valves

For Liquefied Petroleum Gases



Cross Section Globe



No. 130 Globe Screwed



No. 131 Angle Screwed

WORKING PRESSURE
400 pounds, 150° F.
LP-gases, light oils, volatile fluids, or air

TEST PRESSURE
600 pounds hydrostatic
Air Tested

New, Easy-Seating, Safety-Tight Valves
****Underwriters' Approved for Efficient Handling Of Liquefied Petroleum Gases***

Service recommendations: These valves are especially designed and recommended for safe handling of all common commercial forms of liquefied petroleum gases, such as butane, iso-butane, propane, propylene, butylenes, etc. The gases can be handled separately or mixed, and in a liquid or gaseous state.

*The valves have been approved by the Underwriters' Laboratories, Inc. for use on all types of piping systems carrying liquefied petroleum gases, provided the system is subject to working pressures no greater than 250 pounds. Their identification plate is marked "Butane-UL-Propane."

In addition, they are excellently used for hot water (up to 200° F.), cold water, compressed air, gasoline, light oils, volatile fluids, and similar services operating at pressures up to 400 pounds.

Safety-tight: Precision design and the use of high quality materials have produced a valve that is completely tight throughout, assuring safer, more efficient handling of LP-gases, even under rigorous service conditions.

With reasonable attention and occasional replacement of the disc, the valves can be kept in a tight condition indefinitely.

Body and bonnet: The body is made of Crane Special Bronze, a high grade, leaded tin bronze. The union bonnet provides a strong, tight joint, yet it can be easily dismantled and reassembled without danger of injury to the valve.

Durable composition disc: The valves have a Crane No. 6 Disc. Made of a specially formulated composition, the disc is particularly suited for use with petroleum products. It is soft enough to make a tight seat, but sufficiently stiff and resilient to withstand hard wear.

The disc is secured to the underside of a slip-on disc holder by means of a disc retaining nut. The nut also serves to reinforce and protect the disc from strain and distortion ordinarily resulting from tight closure of the valve. As added precaution against leakage, the disc is sealed into the disc holder.

Quick disc repairs: A leak is easily and inexpensively repaired. Simply replace the disc holder with an extra complete disc holder and disc, or insert a new disc into the original holder.

A supply of extra disc holders and discs kept on hand for this purpose assures long, practically uninterrupted valve service.

Stuffing box: The deep stuffing box is equipped with a gland and is filled with one-piece molded asbestos packing to provide a long lasting, tight stem seal.

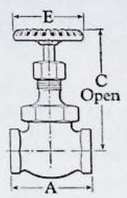
Repacking: The valves, when wide open, can be repacked while under pressure.

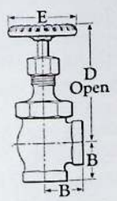
Installation: Wherever conditions permit, the valves should be installed with the pressure under the disc. An arrow cast on the body indicates the correct direction of flow.

List Prices and Dimensions

Size	List Prices, Each		Dimensions, in Inches				
Inches	No. 130 Globe	No. 131 Angle	A	B	C	D	E
1/4	3.75	3.75	2	15/16	3 3/4	3 5/8	1 3/4
3/8	4.60	4.60	2 5/16	1 1/16	4 5/16	4 3/16	2 1/16
1/2	6.00	6.00	2 11/16	1 1/4	4 3/4	4 5/8	2 9/16
3/4	8.00	8.00	3 3/16	1 7/16	5 3/8	5 1/4	2 3/4
1	11.00	11.00	3 3/4	1 11/16	6 1/16	5 15/16	3 1/16
1 1/4	15.00	15.00	4 1/4	2	6 3/4	6 5/8	3 5/8
1 1/2	18.00	18.00	4 3/4	2 3/16	7 9/16	7 5/16	4 1/16
2	30.00	30.00	5 3/4	2 11/16	8 5/8	8 3/8	4 3/4

For list prices of composition discs, see page 133.





Other Bronze Valves for LP-Gases:
Gate.....page 18
Check.....page 47

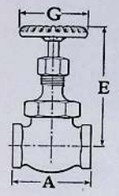
Bronze Globe and Angle Valves

For Light Oils and Gases

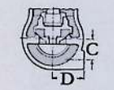
WORKING PRESSURE
400 pounds oil, air, gas, or gasoline, 250° F.
Air Tested

Tight, Easy-Seating Cranoil Disc Sturdy Union Bonnet Construction

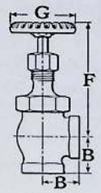
Recommendations: These are definitely superior to valves ordinarily used on light oils and gases. They seat perfectly tight, close easily, and withstand wear exceptionally well. They are especially recommended for refined oils such as transformer oil, for gases, and for solvents, which, in many cases, attack rubber composition discs but do not corrode brass, and which are difficult to hold with metal to metal seat valves.



Globe



Boss on body of globe valve, sizes 1 1/4-inch and larger only.



Angle

Construction: The valves are ruggedly constructed. Their body is made of Crane Special Bronze, a strong, hard, leaded tin bronze. The union bonnet provides a strong, tight joint which can be easily dismantled or reassembled without danger of injuring the valve.

Sizes 1/4 and 3/8-inch have a slip-on disc holder; larger sizes (see cross section) have the disc and stem fastened with a disc stem ring.

Disc and seat: The specially fabricated No. 5 Cranoil Disc will not swell, harden, nor break down. It is permanently cemented into the disc holder, eliminating seepage; see page 133 for description.

The seat and disc form a line to line contact. The narrow bearing and disc material, ideal for light oils and gases, provide absolute tightness and easy seating.

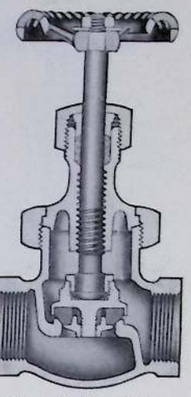
Stuffing box: The stuffing box is equipped with a gland and is filled with high grade packing.

Boss on globe body: Globe valve bodies 1 1/4-inch and larger have a boss cast on one side. When ordered tapped, or with a No. 211 Valve for transformer oil service (shown below), the boss is drilled and tapped with a 1/4-inch pipe thread at no extra charge.

List Prices and Dimensions

Size	List Prices, Each		Dimensions, in Inches							
	No. 207 Globe	No. 209 Angle	Globe Valve					Angle Valve		
Inches	Screwed	Screwed	A	C	D	E open	G	B	F open	G
1/4	5.80	5.80	2			3 3/4	1 3/4	15/16	3 5/8	1 3/4
3/8	6.20	6.20	2 5/16			4 3/8	2 1/16	1 1/16	4 1/4	2 1/16
1/2	6.70	6.70	2 11/16			5	2 9/16	1 1/4	4 7/8	2 9/16
3/4	8.70	8.70	3 3/16			5 3/4	2 3/4	1 7/16	5 5/8	2 3/4
1	12.80	12.80	3 3/4			6 5/8	3 1/16	1 11/16	6 1/2	3 1/16
1 1/4	16.00	16.00	4 1/4	15/16	1 7/16	7 1/2	3 5/8	2	7 3/8	3 5/8
1 1/2	22.00	22.00	4 3/4	1 1/8	1 1/2	8 3/8	4 1/16	2 3/16	8 1/8	4 1/16
2	32.00	32.00	5 3/4	1 1/2	1 3/4	9 3/8	4 3/4	2 11/16	9 1/8	4 3/4

Wherever conditions permit, these valves should be installed with the pressure under the disc. An arrow cast on the body indicates the direction of flow.



Cross Section, Globe



No. 207, Globe Screwed

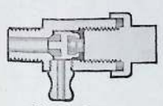


No. 209, Angle Screwed

Brass Vent or Sampling Valve

For Transformer Oil Service

For 400 pounds transformer oil, 250° F.
Air Tested



Cross Section

The No. 211 uses the same disc material and seat design as the No. 207 described above.

List Price

Size of male thread	Inches	1/4
No. 211	Each	4.20



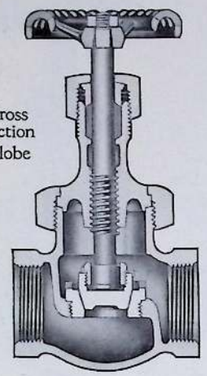
No. 211

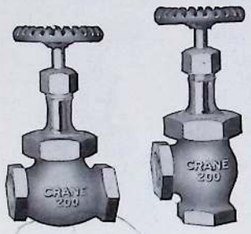
Uses: This valve is used on transformer oil, as a Vent Valve or as a Sampling Valve, in conjunction with the No. 207. When installed at the top of oil immersed electrical equipment, the valve is opened to vent air. When installed at a low point, the valve is opened to draw off samples of oil.

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200-Pound Bronze Globe and Angle Valves

Plug Type Disc





No. 212 P Globe, Screwed — No. 214 P Angle, Screwed

With Crane Nitri-Hard Plug Type Disc and Renewable Body Seat Ring

WORKING PRESSURES
200 pounds steam, *500° F.
400 pounds cold water, oil, or gas, non-shock
*Maximum temperature rating with No. 4 Cranite Disc is 450° F.

TEST PRESSURE
600 pounds hydrostatic

Plug Type Disc Valves are air tested.

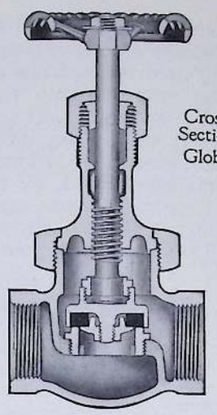
Rugged construction: These valves are ruggedly constructed, the body being made of Crane Special Bronze, a high grade leaded tin bronze. Except for the seat and disc, the valves are similar; a metal plate under the wheel nut identifies the type of disc.

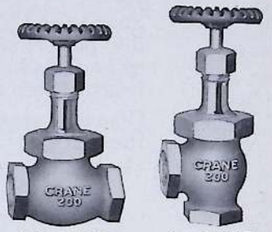
Plug type disc valves: Nos. 212 P and 214 P are recommended for severe services such as for throttling, and for blow-off, boiler feed, soot blower, drip, and drain lines.

Their plug type disc and seat are designed for exacting service. The wide seating surface is not easily affected by foreign matter or wiredrawing and the tapered disc permits close regulation of flow when throttling. Made of Crane Nitri-Hard, a stainless steel having an extremely hard surface, the disc and seat offer high resistance to seizure, erosion, galling, and scoring.

Composition disc valves: Nos. 212 C and 214 C can be utilized for a wide range of fluids when equipped with the proper disc. They are especially suitable where discs must be quickly and easily renewed. The body seat ring is Crane Nickel Alloy.

No. 4 Cranite Disc



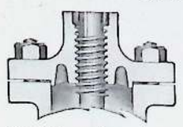


No. 212 C Globe, Screwed — No. 214 C Angle, Screwed

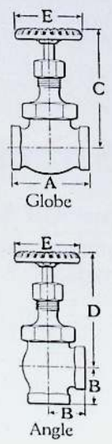
With No. 4 Cranite Disc and Crane Nickel Alloy Renewable Body Seat Ring

Composition disc valves are regularly equipped with a No. 4 Cranite Disc, suitable for high pressure steam up to 450° F., or for hot water up to 420° F. Valves ordered for cold water, air, gas, oil, or gasoline are furnished with a No. 6 Disc. On hot water under 200° F., especially for frequent operation or easy seating, a No. 6 Disc is preferred to the No. 4. See page 133 for discs.

Bonnet: All valves 2-inch and smaller have a union bonnet as shown above; 2½ and 3-inch plug type valves have a bolted bonnet, inside screw as shown below. Both types provide a strong tight joint, yet they can be easily dismantled and reassembled without danger of injury to the valve.



Stuffing box; repacking: The stuffing box is unusually deep, has a gland, and is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.



List Prices and Dimensions

Valve No. and Type	Size Inches	List Prices Each	Dimensions, in Inches A	B	C open	D open	E
No. 212 P Globe or 214 P Angle	¼	6.00	2	15/16	3 15/16	3 15/16	1¾
	⅜	7.40	2 5/16	1 1/16	4½	4⅜	2 1/16
	½	8.50	2 11/16	1¼	5 1/16	4 15/16	2 9/16
	¾	10.60	3 3/16	1 7/16	5¾	5⅝	2¾
	1	13.80	3¾	1 11/16	6 5/16	6 3/16	3 1/16
	1¼	19.70	4¼	2	7¼	7⅛	3⅝
	1½	27.00	4¾	2 3/16	8 5/16	8 3/16	4 1/16
	2	39.00	5¾	2 11/16	9½	9¼	5⅜
	2½	70.00	7¼	3⅝	10¾	9¾	7
	3	104.00	8¼	4⅛	12 5/16	11 5/16	8
No. 212 C Globe or 214 C Angle	¼	5.40	2	15/16	4	4	1¾
	⅜	6.70	2 5/16	1 1/16	4⅝	4½	2 1/16
	½	7.60	2 11/16	1¼	5⅛	5	2 9/16
	¾	9.50	3 3/16	1 7/16	5¾	5⅝	2¾
	1	12.50	3¾	1 11/16	6½	6⅜	3 1/16
	1¼	17.80	4¼	2	7⅜	7¼	3⅝
	1½	24.00	4¾	2 3/16	8⅜	8¼	4 1/16
	2	35.00	5¾	2 11/16	9½	9¼	5⅜

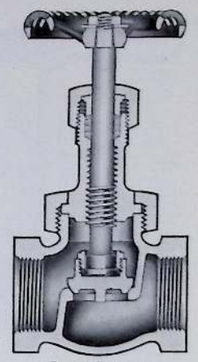
For list prices of composition discs, see page 133.

Valves for Marine Service . . . . page 400

200-Pound Bronze Globe and Angle Valves

Regrinding

Valve Ends	Working Pressures: Steam 500° F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	200 pounds	400 pounds	600 pounds
Flanged	150 pounds	225 pounds	450 pounds



Service recommendations: These sturdily constructed 200-Pound Bronze Globe and Angle Valves are recommended for service on steam, water, oil, or gas lines. All parts are of liberal proportions.

Body: The body is made of Crane Special Bronze, a strong, hard, leaded tin bronze.

Regrinding: The valves can be reground without removing the body from the line. Instructions for regrinding are furnished with each valve.

Union bonnet: The union bonnet ring reinforces the bonnet joint and facilitates dismantling and reassembling. When the valves are being reground, the ring centers and guides the valve trimmings.

Disc connection: The disc in sizes ⅛ to ½-inch is integral with the stem. In larger sizes, the disc swivels on the stem, as shown in the cross section at the right.

Stuffing box: The stuffing box is deep and is filled with high grade packing. Sizes ½-inch and larger are equipped with a gland; smaller sizes do not have a gland.



No. 70, Globe Screwed



No. 70, Angle Screwed

Repacking: These valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced with two V-shaped concentric grooves between the port and the bolt holes.

Prices include drilling to the MSS 150-Pound Standard; no deduction is made for valves ordered faced only. Full face gaskets should be used; see page 472.



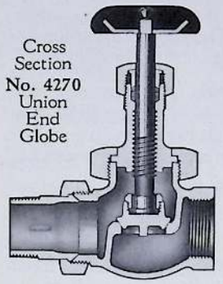
No. 71, Globe Flanged



No. 71, Angle Flanged

Valves with Union End

Users having need for a male union connection can conveniently install heavy duty No. 4270 Globe or Angle Radiator Valves. Their design and proportions are the same as the No. 70 Valves.

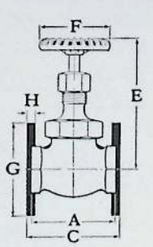


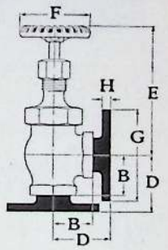
No. 4270 Valves are available in sizes ⅜ to 1-inch; see page 58 for list prices and description.

List Prices and Dimensions

Size Inches	List Prices, Each Globe or Angle: No. 70 Screwed	No. 71 Flanged F. & D.	Dimensions, in Inches A	B	C	D	E open	F	G	H
⅛	2.70		1 11/16	13/16			3½	1¾		
¼	2.70		1 11/16	13/16			3½	1¾		
⅜	3.40		1 15/16	1			3⅞	2 1/16		
½	4.40		2¼	1 3/16			4¼	2 9/16		
¾	5.70		2¾	1⅜			5	2¾		
1	8.30	19.00	3 5/16	1 11/16	4 3/16	2⅝	5¾	3 1/16	4¼	⅜
1¼	11.20	22.00	3⅞	1 15/16	4 9/16	2⅞	6⅝	3⅝	4⅝	13/32
1½	14.80	29.00	4½	2¼	5 5/16	3 3/16	7⅝	4 1/16	5	7/16
2	22.50	41.00	5¼	2⅝	6	3¾	8⅜	4¾	6	½
2½	37.00	61.00	6 5/16	3 3/16	6¾	4 5/16	9¼	6	7	9/16
3	55.00	94.00	7¼	3 13/16	7 15/16	4⅝	11	7	7½	⅝

When ordering, specify whether Globe or Angle Valves are wanted.



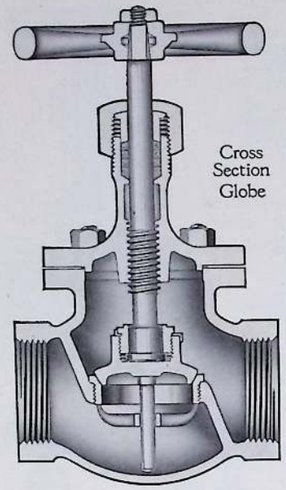


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200-Pound Bronze Globe and Angle Valves

Bolted Bonnet



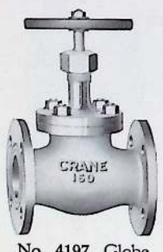
Cross Section Globe



No. 4196, Globe Screwed



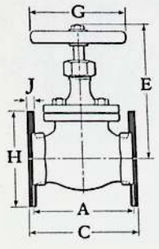
No. 4198, Angle Screwed

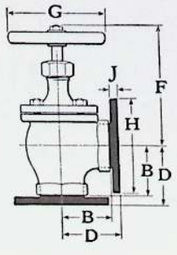


No. 4197, Globe Flanged



No. 4199, Angle Flanged





Valve Ends	Working Pressures: Steam 500° F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	200 pounds	400 pounds	600 pounds
Flanged	150 pounds	225 pounds	450 pounds

Sizes 3½-inch and larger have outside stem threads and a bolted gland (not illustrated).

Service recommendations: These are high quality valves, especially intended for use in large size pipe lines. They are recommended for general service on steam, water, oil, or gas.

Construction: The valves are strong, rugged, and durable. The bolted bonnet makes a tight joint and assures liberal strength. The disc is accurately guided by a guide stem which operates in a bridge cast integral with the body seat ring; the body seat ring is renewable.

Sizes 3-inch and smaller have inside stem threads, a screwed packing nut, and a gland, as illustrated.

Sizes 3½-inch and larger have outside stem threads with a crosshead type yoke and a one-piece bolted gland and flange (not illustrated).

Materials: The body, bonnet, disc, and body seat ring are made of Crane Special Bronze, a strong, hard, leaded tin bronze.

Stuffing box: The stuffing box is unusually deep and is filled with high grade packing.

Repacking: The valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 150-Lb. SP Bronze Flange Standard (No. SP-2-1946). They are plain faced with two V-shaped concentric grooves between the port and the bolt holes.

Prices include drilling to the MSS 150-Lb. Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.

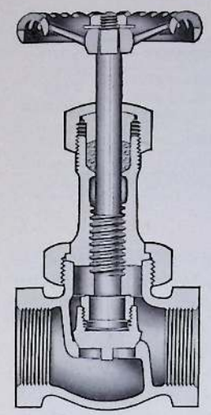
List Prices and Dimensions

Valve No.	Size	List Prices	Dimensions, in Inches								
	Inches	Each	A	B	C	D	E open	F open	G	H	J
No. 4196 or No. 4198 Screwed	1½	41.00	5 5/16	2 11/16			8	7½	4 1/16		
	2	55.00	6	3			9¼	8 15/16	5 3/8		
	2½	76.00	7¼	3 5/8			11	10½	7		
	3	105.00	8¼	4⅛			12 3/8	11¾	8		
No. 4197 or No. 4199 Flanged F. & D.	1½	54.00			5⅞	3⅛	8	7½	4 1/16	5	7/16
	2	68.00			6⅞	3¾	9¼	8 15/16	5 3/8	6	½
	2½	111.00			8	4¼	11	10½	7	7	9/16
	3	132.00			9⅛	4⅝	12 3/8	11¾	8	7½	⅝
	3½	221.00			10⅜	5¼	12¼	11¼	9	8½	11/16
	4	282.00			11	5½	13¾	12½	10	9	11/16
	5	402.00			12¼	6¼	16½	15	10	10	¾
	6	553.00			14	7	18⅛	16¼	12	11	13/16

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300-Pound Bronze Globe and Angle Valves

Regrinding



Cross Section No. 362 E, Globe

WORKING PRESSURES
300 pounds steam, 550° F.
600 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
900 pounds hydrostatic

Service recommendations: These valves are recommended for severe operating conditions at high pressures. They combine serviceability with moderate cost.

Body and disc: The body and disc are made of Crane Special Bronze, a strong, hard, leaded tin bronze.

Union bonnet: The bonnet is made of a special bronze. Its unusually good wear-resisting properties, combined with the long and accurately machined threads on the stem, materially lengthen the life of both the stem and the bonnet.

In addition to making a sturdy, tight joint, the union bonnet construction facilitates dismantling and reassembling the valve. The union ring reinforces the bonnet joint, and when the valve is being reground, it centers and guides the valve trimmings.

Regrinding: These valves can be reground without removing the body from the line. Complete instructions for regrinding are furnished with each valve.

Stuffing box; repacking: The stuffing box is unusually deep and is filled with high grade packing. It is equipped with a gland. The valves, when wide open, can be repacked while under pressure.



No. 362 E Globe Screwed



No. 364 E Angle Screwed

List Prices and Dimensions

Valve No. and Type	Size	List Prices	Dimensions, in Inches: Globe End to end	Globe Center to top, open	Angle Center to female end	Angle Center to male end	Angle Center to union end	Angle Center to top, open	Diameter of wheel
	Inches	Each							Globe or Angle
No. 362 E Globe or No. 364 E Angle	¼	4.80	2	4	15/16			3⅞	1¾
	⅜	5.60	2 5/16	4½	1 1/16			4⅜	2 1/16
	½	7.00	2 11/16	5	1¼			4⅞	2 9/16
	¾	8.80	2 15/16	6⅛	1½			6	3 1/16
	1	11.80	3½	6⅝	1¾			6⅝	3⅝
	1¼	14.80	4 1/16	7⅝	2 1/16			7⅝	4 1/16
	1½	20.00	4⅝	8½	2 5/16			8½	4¾
	2	31.00	5¾	10⅛	2⅞			10½	6
No. 1834 Globe or No. 1835 Angle	½ ×⅜	11.00	4¼	4½		2 1/16	2 3/16	4⅜	2 1/16
	¾ ×½	13.80	4 13/16	5		2⅜	2 7/16	4⅞	2 9/16
	1 ×¾	17.30	5½	6⅛		2¾	2¾	6	3 1/16
	1¼×1	22.00	6⅛	6⅝		3	3⅛	6⅝	3⅝
	1½×1¼	29.00	6⅞	7⅝		3 5/16	3 9/16	7⅝	4 1/16
	2 ×1½	43.00	7 13/16	8½		3 13/16	4	8½	4¾
	2½×2	55.00	9 1/16	10⅛		4⅜	4 11/16	10½	6
No. 1836 Globe or No. 1837 Angle	¼	9.60	2 15/16	4	1		1 15/16	3⅞	1¾
	⅜	10.20	3⅜	4½	1 3/16		2 3/16	4⅜	2 1/16
	½	12.00	3 13/16	5	1⅜		2 7/16	4⅞	2 9/16
	¾	15.30	4¼	6⅛	1½		2¾	6	3 1/16
	1	20.00	4⅞	6⅝	1¾		3⅛	6⅝	3⅝
	1¼	27.00	5⅝	7⅝	2 1/16		3 9/16	7⅝	4 1/16
	1½	40.00	6 5/16	8½	2 5/16		4	8½	4¾
	2	52.00	7 9/16	10⅛	2⅞		4 11/16	10½	6

Valves with Female Union Outlet

The union end valves shown below are part of the regular Crane line. Prices and dimensions are included in the table.



With Male Inlet and Female Union Outlet
No. 1834 Globe — No. 1835 Angle

Male end is one pipe size larger than female union end.



With Female Inlet and Female Union Outlet
No. 1836 Globe — No. 1837 Angle

Both ends are the same size.

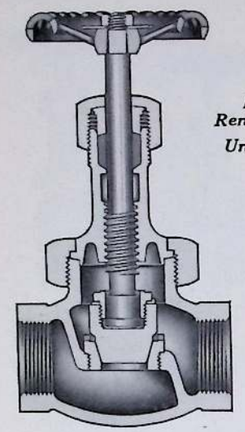
Interchangeability: All parts, except the bodies, of union end valves interchange with corresponding parts of Nos. 362 E and 364 E Valves.

Cab Hose Valves....page 40 *AAR Valves....pages 38 to 40* *Valves for Marine Service....page 400*

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300-Pound Bronze Globe and Angle Valves

Plug Type Disc



Cross Section Globe

Crane Nitri-Hard Plug Type Seat and Renewable Body Seat Ring

Union or Bolted Bonnet

Air Tested

Valve Ends	Sizes	Working Pressures: Steam 550° F	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	¼ to 2-inch	300 pounds	1000 pounds	1500 pounds
	2½ and 3-inch	300 pounds	600 pounds	900 pounds
Flanged	All sizes	300 pounds	500 pounds	900 pounds



No. 382 P, Globe Screwed



No. 384 P, Angle Screwed



No. 383 P, Globe Flanged



No. 385 P, Angle Flanged

Service recommendations: These valves are recommended for exceptionally severe service, such as for throttling, and soot blower, blow-off, boiler feed, drip and drain lines.

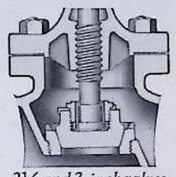
Body: The strong, durable body is made of Crane Special Bronze, a high grade leaded tin bronze.

Disc and seat: The valves have a plug type disc and seat especially designed for rigorous service. The wide seating surface is not easily damaged by foreign matter or by wiredrawing, and the tapered disc permits close regulation of flow when throttling.

Both the disc and seat are Crane Nitri-Hard, a stainless steel having an extremely hard surface. The design of the disc and seat combined with the excellent resistance offered by the high hardness to wear, cutting, scoring, erosion, seizure, and galling produce a superior seat. It will withstand severe operating conditions unusually well.

Stuffing box: The stuffing box is unusually deep; it is equipped with a gland and is filled with high grade packing.

Bonnet construction: Sizes 2-inch and smaller have a union bonnet as shown in the illustrations at the left; 2½ and 3-inch sizes have a compact bolted bonnet, inside screw, as illustrated at the right.



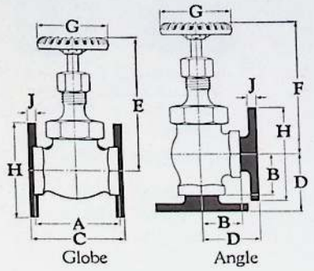
2½ and 3-inch valves have a bolted bonnet.

Both bonnet types provide a strong, tight joint, yet either can be easily dismantled and reassembled without danger of injuring the valve.

Repacking: These valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 300-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and the bolt holes.

Prices of flanged valves include drilling to the MSS 300-Pound Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.



Valves for Marine Service . page 400
Templates for drilling . . . . page 458

List Prices and Dimensions

Size Inches	List Prices, Each: No. 382 P or No. 384 P Screwed	List Prices, Each: No. 383 P or No. 385 P Flanged F. & D.	Dimensions, in Inches: A	B	C	D	E open	F open	G	H	J
¼	7.20		2¼	1⅛			4¼	4⅛	2 1/16		
⅜	7.80		2½	1¼			4⅞	4½	2 9/16		
½	9.60		2 15/16	1½			5¼	5	2¾		
¾	13.30		3½	1¾			6⅜	6⅛	3 1/16		
1	18.40	37.00	4⅛	2 1/16	5⅜	3¼	7	6¾	3⅝	4⅞	19/32
1¼	24.00	52.00	4¾	2⅜	6¼	3½	8	7¾	4 1/16	5¼	⅝
1½	31.40	69.00	5¼	2⅝	7¼	4	9⅛	8¾	4¾	6⅛	11/16
2	48.00	98.00	6⅜	3 3/16	8	4 5/16	10⅜	10	6	6½	¾
2½	81.50	145.00	7½	3¾	9	4¾	11½	10½	7	7½	13/16
3	126.00	220.00	8½	4¼	10 5/16	5 7/16	13⅜	12⅜	8	8¼	29/32

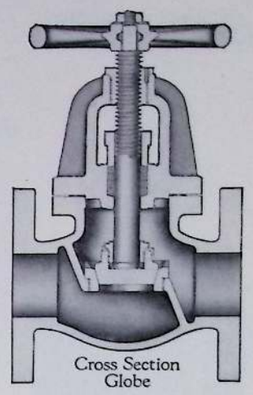
300-Pound Bronze Globe and Angle Valves

Outside Screw and Yoke—Bolted Bonnet

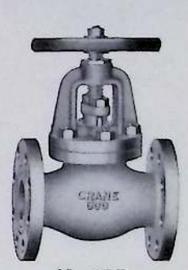
WORKING PRESSURES
300 pounds steam, 550° F.
500 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
900 pounds hydrostatic
Seat is Air Tested

Body and Bolted Bonnet made of Crane Special Bronze
Crane Nitri-Hard
Plug Type Disc and Renewable Body Seat Ring



Cross Section Globe



No. 87 P
Globe, Flanged



No. 87½ P
Angle, Flanged

Service recommendations: These valves are recommended for throttling, soot blower lines, and for exceptionally severe services.

Body and bonnet: The valves are unusually heavy and rugged. Their body and bonnet are made of Crane Special Bronze, a high grade leaded tin bronze. The bolted type bonnet provides liberal strength at the bonnet joint.

Disc and seat: The plug type disc and seat are designed for rigorous service. The wide seating surface is not easily ruined by foreign matter or wiredrawing. The tapered disc permits close regulation of flow when throttling.

Both the disc and seat are made of Crane Nitri-Hard, a stainless steel having an extremely hard surface with high resistance to seizure, erosion, galling, and scoring.

Outside stem threads: The outside stem threads are particularly well suited for services where action of the fluid might affect inside threads. The stem is liberal in diameter and strong.

Stuffing box: The stuffing box is deep and is filled with a high grade packing. It is equipped with a bolted gland.

Repacking: The valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 300-Pound SP Bronze Flange Standard (No. SP-2-1946). The flanges are plain faced, with two V-shaped concentric grooves between the port and the bolt holes.

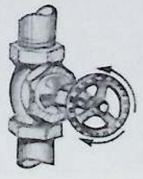
Prices include drilling to the MSS 300-Pound Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.

List Prices and Dimensions

Size Inches	List Prices, Each Flanged, F. & D.: No. 87 P Globe	No. 87½ P Angle	Dimensions, in Inches: Globe: Face to face	Globe: Center to top of stem, open	Angle: Center to face	Angle: Center to top of stem, open	Diameter of wheel	Diameter of flanges	Thickness of flanges
1½	87.00	87.00	7	9⅛	3⅞	8⅜	6	6⅛	11/16
2	115.00	115.00	8	10¼	4¼	9½	7	6½	¾
2½	155.00	155.00	9	11⅝	4¾	10⅝	8	7½	13/16
3	228.00	228.00	10 5/16	13	5 7/16	12	9	8¼	29/32

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Closing a Valve!



When a valve starts to leak, don't try to make it tight by brute force. And never put a wrench on the wheel for extra leverage; the chances are that won't stop the leak, and you may break the wheel or the stem.

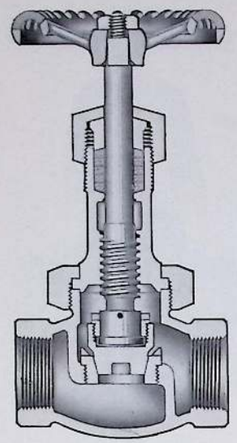
Instead, bring the disc to its seat gently, back it off a turn, and repeat this operation two or three times. A piece of dirt or scale has probably lodged on the seat, and this action may flush it away. If the leak persists, take the valve apart and clean and inspect it.

If the seat and disc are cut, they will have to be refinished or replaced. Valve reseating tools are available, and new parts can be secured through your Crane Branch.

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300-Pound—Inside Screw Type

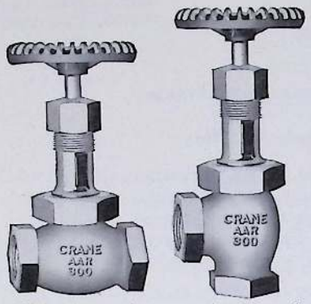
AAR Bronze Globe and Angle Valves



Cross Section
No. 376 P, Globe
Plug Type Disc

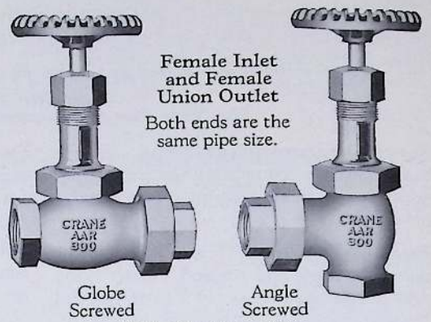
WORKING PRESSURE
300 pounds steam

TEST PRESSURE
800 pounds hydrostatic

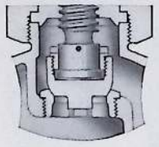


Globe, Screwed — Angle, Screwed
With Plug Type Disc
No. 376 P — No. 377 P
With Ball Type Disc
No. 376 E — No. 377 E

Female Inlet and Female Union Outlet
Both ends are the same pipe size.

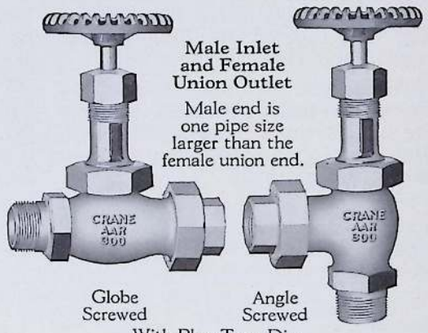


Globe Screwed — Angle Screwed
With Plug Type Disc
No. 1870 P — No. 1871 P
With Ball Type Disc
No. 1870 E — No. 1871 E



Partial Section
Showing Ball Type
Disc and Seat
(No. 376 E)

Male Inlet and Female Union Outlet
Male end is one pipe size larger than the female union end.



Globe Screwed — Angle Screwed
With Plug Type Disc
No. 1874 P — No. 1875 P
With Ball Type Disc
No. 1874 E — No. 1875 E

Association of American Railroads: These valves conform to the recommended practice of the Association of American Railroads (AAR) for 300-Pound Globe and Angle Valves for Steam Locomotives.

Interchangeability: Except for the body and the type of seat and disc, the valves are identical. In addition, all parts except the stem, packing nut, gland, and bonnet are interchangeable with corresponding parts of the Outside Screw and Yoke Valves shown on the opposite page.

Materials: The body, union ring, and tail-piece are made of Crane Special Bronze. The bonnet is a special wear-resisting bronze. The disc is Monel in sizes ½-inch and smaller and Crane Nickel Alloy in the larger sizes. The plug type seat ring is Exelloy in all sizes. The ball type seat ring is Exelloy in sizes ½-inch and smaller and Crane Nickel Alloy in sizes ¾-inch and larger.

List Prices and Dimensions

Size, Inches		List Prices, Each						Dimensions, in Inches						
Female End Valves	Male Inlet Valves	Plug Type			Ball Type			End to end	Center to end	Union End Valves			Center to top of wheel, open	Diameter of wheel
		Nos. 376 P 377 P	Nos. 1870 P 1871 P	Nos. 1874 P 1875 P	Nos. 376 E 377 E	Nos. 1870 E 1871 E	Nos. 1874 E 1875 E	Globe	Angle	Center to female end	Center to male end	Center to union end		
¼	⅜ ×¼	7.60	11.20	12.00	7.20	10.80	11.60	2 5/16	1 5/32	1 5/32	1 31/32	2⅛	4⅞	2¾
⅜	½ ×⅜	8.20	12.40	13.30	7.80	12.00	12.90	2½	1¼	1¼	2 1/16	2 5/16	4⅞	2¾
½	¾ ×½	10.10	15.20	17.20	9.60	14.70	16.70	2⅞	1 7/16	1 7/16	2 9/16	2½	5 9/16	3 1/16
¾	1 ×¾	14.00	19.70	22.60	13.30	19.00	21.90	3 9/16	1 25/32	1 25/32	3 1/32	3⅛	6 7/16	3⅝
1	1¼×1	19.40	26.00	31.20	18.40	25.00	30.20	4⅛	2 1/16	2 1/16	3 5/16	3 9/16	7 9/16	4 1/16
1¼	1½×1¼	25.30	33.20	39.10	24.00	31.90	37.80	4¾	2⅜	2⅜	3⅝	4⅛	8⅜	4¾
1½	2 ×1½	33.00	42.30	49.50	31.40	40.70	47.90	5¼	2⅝	2⅝	4⅛	4 11/16	9¼	5⅜
2	2½×2	50.60	67.50	84.50	48.00	64.90	81.90	6⅜	3 3/16	3 3/16	4 11/16	5 5/16	10⅝	6
2½	3 ×2½				73.00	107.00	140.50	7⅜	3 11/16	3 11/16	5 3/16	5 15/16	12 1/16	7
3					112.50			8⅜	4 3/16				14 3/16	8

List prices of parts . . . . page 40 *Cab Hose Valves . . . . page 40* *Locomotive Steam Heat End Valves . . . . page 309*

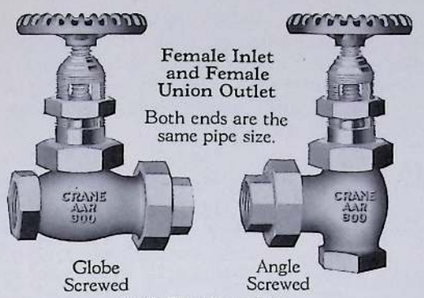
300-Pound—Outside Screw and Yoke

AAR Bronze Globe and Angle Valves

WORKING PRESSURE
300 pounds steam

TEST PRESSURE
800 pounds hydrostatic

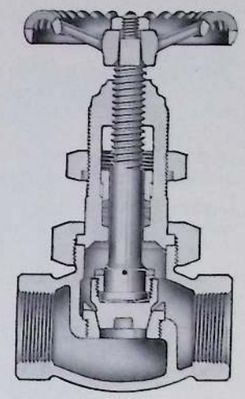
Female Inlet and Female Union Outlet
Both ends are the same pipe size.



Globe Screwed — Angle Screwed
With Plug Type Disc
No. 1890 P — No. 1891 P
With Ball Type Disc
No. 1890 E — No. 1891 E

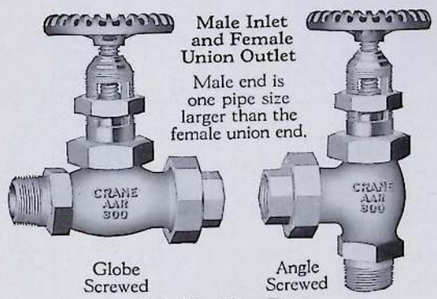


Globe, Screwed — Angle, Screwed
With Plug Type Disc
No. 396 P — No. 397 P
With Ball Type Disc
No. 396 E — No. 397 E



Cross Section
No. 396 P, Globe
Plug Type Disc

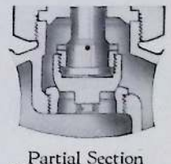
Male Inlet and Female Union Outlet
Male end is one pipe size larger than the female union end.



Globe Screwed — Angle Screwed
With Plug Type Disc
No. 1894 P — No. 1895 P
With Ball Type Disc
No. 1894 E — No. 1895 E

Association of American Railroads: These valves conform to the recommended practice of the Association of American Railroads (AAR) for 300-Pound Globe and Angle Valves for Steam Locomotives.

Interchangeability: Except for the body and the type of seat and disc, the valves are identical. In addition, all of the parts except the stem, gland nut, gland, and yoke bonnet are interchangeable with the corresponding parts of the Inside Screw Type Valves described and listed on the preceding page.



Partial Section
Showing Ball Type
Disc and Seat
(No. 396 E)

Stem End for Universal Joint

AAR Inside Screw Valves shown on the preceding page and the O. S. & Y. Valves shown above can be furnished at no extra charge with the stem end machined for a Universal Joint connection; dimensions follow AAR Recommended Practice.



Materials: The body, union ring, and tail-piece are made of Crane Special Bronze. The yoke bonnet is made of Crane Cast Manganese Bronze and the stem is Crane 18-8 Mo Chrome-Nickel Alloy. The seat and disc materials are the same, size for size, as those used for the Inside Screw Valves shown on page 38.

List Prices and Dimensions

Size, Inches		List Prices, Each						Dimensions, in Inches						
Female End Valves	Male Inlet Valves	Plug Type			Ball Type			End to end	Center to end	Union End Valves			Center to top of wheel, open	Diameter of wheel
		Nos. 396 P 397 P	Nos. 1890 P 1891 P	Nos. 1894 P 1895 P	Nos. 396 E 397 E	Nos. 1890 E 1891 E	Nos. 1894 E 1895 E	Globe	Angle	Center to female end	Center to male end	Center to union end		
½	¾ ×½	19.40	24.50	26.50	18.90	24.00	26.00	2⅞	1 7/16	1 7/16	2 9/16	2½	5 5/16	3 1/16
¾	1 ×¾	23.30	29.00	31.90	22.60	28.30	31.20	3 9/16	1 25/32	1 25/32	3 1/32	3⅛	5 11/16	3⅝
1	1¼×1	28.80	35.40	40.60	27.80	34.40	39.60	4⅛	2 1/16	2 1/16	3 5/16	3 9/16	6 9/16	4 1/16
1¼	1½×1¼	35.20	43.10	49.00	33.90	41.80	47.70	4¾	2⅜	2⅜	3⅝	4⅛	7½	4¾
1½	2 ×1½	44.00	53.30	60.50	42.40	51.70	58.90	5¼	2⅝	2⅝	4⅛	4 11/16	8 7/16	5⅜
2	2½×2	78.80	95.70	112.70	76.20	93.00	110.00	6⅜	3 3/16	3 3/16	4 11/16	5 5/16	10	6

List prices of parts . . . . page 40 *Cab Hose Valves . . . . page 40* *Locomotive Steam Heat End Valves . . . . page 309*

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List Prices of Valve Parts

For 300-Pound AAR Bronze Globe and Angle Valves

Inside Screw and O. S. & Y. Types

Through the application of uniform dimensions and tolerances, a wide degree of interchangeability of parts is maintained among the AAR Bronze Globe and Angle Valves illustrated on the two preceding pages. The table of list prices of parts shown below indicates this interchangeability.

Union bonnet ring: Sizes 1½-inch and smaller have a hexagon bonnet ring; larger sizes have a round spanner-type ring. ½ and ¾-inch O.S. & Y. Valves have an integrally cast union ring and yoke bonnet.

Disc construction: Valves ½-inch and smaller have the disc spun onto the stem. In larger sizes these two parts are held together with a disc stem ring. In ball-type valves 2, 2½, and 3-inch, the disc has a bottom pin guide which operates through a bridge in the body seat ring.

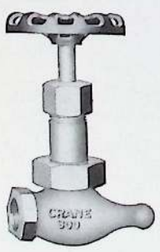
List Prices, Each

Size of Valve		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
			⅜x¼	½x⅜	¾x½	1x¾	1¼x1	1½x1¼	2x1½	2½x2	3x2½	
For Inside Screw Type Valves and Outside Screw and Yoke Valves	Wheel Nut		.05	.05	.05	.06	.06	.09	.09	.14	.14	.27
	Wheel		.24	.24	.30	.33	.48	.50	.79	1.82	2.12	2.22
	Union Bonnet Ring		.52	.52	*.79	*1.07	1.81	2.07	2.71	4.23	5.98	9.39
	Disc Stem Ring		None Used			.55	.64	.73	.92	1.12	2.07	2.44
	Disc — Plug Type		Spun on Stem			2.28	3.28	3.96	5.62	8.47		
	Disc — Ball Type					1.95	2.96	3.62	5.10	7.69	10.58	14.44
	Body Seat Ring — Plug Type		1.65	1.65	1.84	2.50	4.90	5.35	6.81	8.40		
	Body Seat Ring — Ball Type		1.45	1.45	1.60	2.00	4.01	4.13	5.41	6.06	7.60	11.49
	†Body, Globe or Angle — Female Inlet and Outlet		1.74	2.45	2.97	4.41	5.43	8.65	11.50	21.46	34.72	58.91
	†Body, Globe or Angle — Female Inlet, Union Outlet		4.76	5.66	6.96	8.67	10.35	13.95	17.38	33.09	59.63	
	†Body, Globe or Angle — Male Inlet, Union Outlet		5.72	6.74	9.36	12.15	16.59	21.03	26.02	53.49	99.83	
	Union Ring		.55	.73	.94	1.22	1.47	2.03	2.43	4.04	7.09	
	Female Tail-Piece		.75	1.11	1.20	1.37	1.54	2.15	2.85	4.61	8.80	
	Brazing Tail-Piece		.75	1.11	1.20	1.37	1.54	2.15	2.85	4.61	8.80	
	Packing		.20	.20	.21	.23	.32	.38	.44	.59	.70	1.32
For Inside Screw Type Valves Only	Stem — With Plug Type Disc		2.75	2.75	3.49							
	Stem — With Ball Type Disc		2.47	2.47	3.17							
	Stem Only					2.02	2.71	3.08	3.72	5.29	6.83	9.92
	Packing Nut		.26	.26	.40	.70	.76	1.64	1.74	1.92	2.42	3.96
	Gland		.10	.10	.18	.25	.28	.33	.39	.63	2.92	3.89
	Bonnet		1.61	1.61	1.88	2.39	2.61	3.58	4.87	6.65	11.52	16.75
For Outside Screw and Yoke Valves Only	Stem — With Plug Type Disc				8.58							
	Stem — With Ball Type Disc				8.22							
	Stem Only					7.39	9.45	10.85	12.50	22.09		
	Gland Nut				1.56	1.60	1.66	1.94	2.20	5.64		
	Gland				1.43	1.43	1.55	1.69	2.02	3.50		
	Yoke Bonnet				‡6.34	‡7.18	4.99	6.03	7.20	17.10		

*Not used on O.S. & Y. Valves in ½ and ¾-inch sizes.
†Prices are for bodies only and do not include body seat rings, union rings, nor tail-pieces.
‡Includes the union ring which is cast integral with the yoke bonnet in ½ and ¾-inch sizes.

Cab Hose Valves

Female Inlet—Hose End Outlet



No. 1878 P
Plug Type Disc

All parts of the No. 1878 P Cab Hose Valve except the body are AAR design and are interchangeable with the corresponding parts of AAR Plug Type Disc Inside Screw Valves shown on page 38.

List Prices and Dimensions

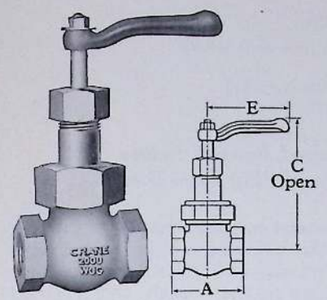
Size	Inches	⅜ female x ½ hose	½ female x ½ hose
No. 1878 P	Each	9.00	11.20
Center to female end	Inches	1¼	1 7/16
Center to hose end	Inches	2⅛	2⅛
Center to top, open	Inches	4⅞	5 9/16
Diameter of wheel	Inches	2¾	3 1/16

Wrenches for removing body seat rings ....page 137
AAR Malleable Iron Screwed Fittings.....page 148
AAR Unions and Union Fittings.....pages 178 to 180
600-Pound Steel Valves for Locomotive Service..page 240
300-Pound Locomotive Steam Heat End Valves....page 309

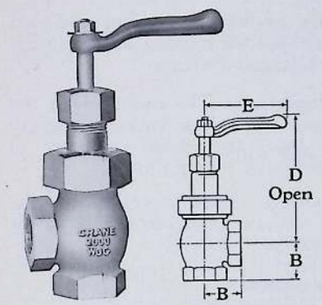
2000-Pound Hydraulic

Bronze Globe and Angle Valves

Union Bonnet



Globe, Screwed
No. 232 H—With 45° Seat
No. 233 H—With Plug Type Disc



Angle Screwed
No. 232 H—With 45° Seat
No. 233 H—With Plug Type Disc

Note—Globe and Angle Valves have the same catalog number. Orders must specify whether "Globe" or "Angle" is wanted.

WORKING PRESSURE
2000 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
3000 pounds hydrostatic

Available with Either 45° Seat or Plug Type Disc

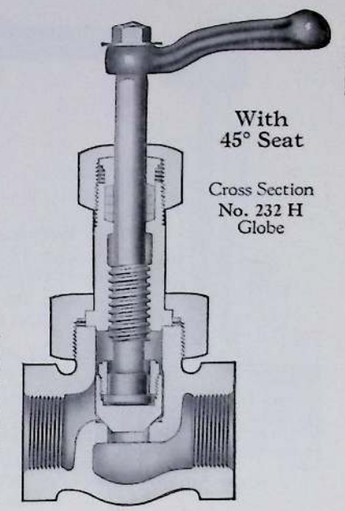
Features
Union Bonnet Construction
Crane Special Bronze Body and Disc

Valves with 45° seat: The No. 232 H Globe and Angle Valves are made with a 45° seat. They are suitable for general stop valve service on high pressure hydraulic lines that are not subject to shock and on high pressure gas lines.

All sizes have the disc stem ring construction illustrated in the cross section at the upper right.

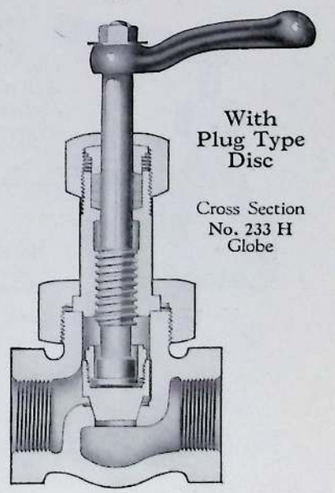
Valves with plug type disc: The No. 233 H Globe and Angle Valves have a plug type disc and seat. They are especially recommended for severe service, such as throttling. The wide seating surfaces have excellent resistance to wiredrawing and to foreign matter, and the tapered disc permits easy regulation of flow.

The valves in the 1¼-inch size have the disc stem ring construction shown in the cross section at the lower right; in smaller sizes, the disc is cast integral with the stem.



With 45° Seat

Cross Section
No. 232 H
Globe



With Plug Type Disc

Cross Section
No. 233 H
Globe

Body and disc: All valves have the body and disc cast of Crane Special Bronze, a leaded tin bronze having high strength and hardness and offering liberal resistance to wear.

Rugged construction: The valves are well proportioned throughout and are exceptionally heavy. Their union bonnet joint is strong and serviceable; it holds a tight joint readily. It facilitates dismantling and reassembling the valve and simplifies regrinding.

Seat opening: The diameter of the seat opening in the valves is slightly larger than the inside diameter of Double Extra Strong Pipe.

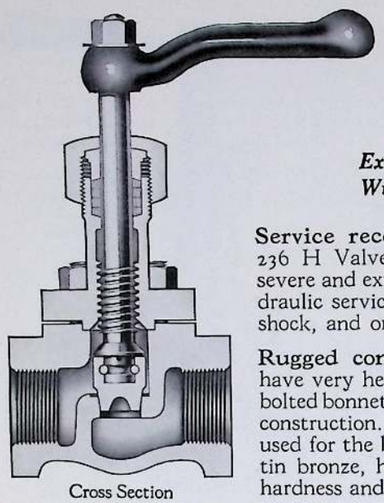
Repacking: These valves, when wide open, can be repacked while under pressure.

List Prices and Dimensions

Size	List Prices, Each		Dimensions, in Inches							
			Globe Valves				Angle Valves			
			A	C		E	B	D		E
Inches	No. 232 H Globe or Angle With 45° Seat	No. 233 H Globe or Angle With Plug Type Disc		No. 232 H	No. 233 H			No. 232 H	No. 233 H	
⅜	13.00	13.00	2 13/16	6⅛	6⅜	3⅞	1⅜	5¾	6⅛	3⅞
½	15.00	15.00	2 13/16	6⅛	6⅜	3⅞	1⅜	5¾	6⅛	3⅞
¾	19.00	19.00	3 7/16	6¾	7	4¼	1¾	6⅜	6½	4¼
1	24.00	24.00	4	8⅛	8⅜	4⅝	2 1/16	7½	7¾	4⅝
1¼	33.00	33.00	4 11/16	9⅞	9½	5	2⅜	9⅛	8¾	5

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2500-Pound Hydraulic
Bronze Globe Valves
Bolted Bonnet



Cross Section

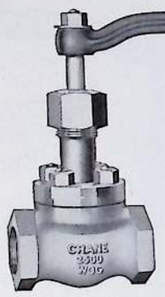
WORKING PRESSURE
2500 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
3750 pounds hydrostatic

Exceptionally Heavy, Rugged, Bolted Bonnet Valves With Crane Special Bronze Body and Plug Type Disc

Service recommendations: No. 236 H Valves are recommended for severe and extremely high pressure hydraulic service on lines not subject to shock, and on high pressure gas lines.

Rugged construction: The valves have very heavy metal sections; their bolted bonnet provides a sturdy, rugged construction. Crane Special Bronze, used for the body and disc, is a leaded tin bronze, having high strength and hardness and offering liberal resistance to wear.



No. 236 H
Globe, Screwed
Plug Type Disc

Plug type disc and seat: The plug type disc and seat are unusually resistant to wiredrawing and foreign matter. The wide tapered seating surface permits easy flow regulation when throttling.

Disc-stem connection: 1-inch valves have the disc and stem cast integral; 1¼ and 1½-inch sizes have the disc and stem cast separately and fastened together with two disc pins as shown in the cross section; on 2-inch valves, the two parts are cast separately and fastened together with a disc stem ring.

Handle or wheel: 1 and 1¼-inch valves have lever handles as illustrated; larger sizes have wheels.

Seat opening: The diameter of the seat opening in these valves is slightly larger than the inside diameter of Double Extra Strong Pipe.

Repacking: These valves, when wide open, can be repacked while under pressure.

List Prices and Dimensions

No. 236 H Globe Screwed	Size	List Prices	Dimensions, in Inches			
	Inches	Each	End to end	Center to top, open	Center to end of handle	Diameter of wheel
	1	40.00	4½	8⅛	5	
	1¼	54.00	4 15/16	9	5¾	
	1½	71.00	5½	10⅛		8
	2	94.00	6⅜	11½		9

For Higher Pressures—Use Crane Steel Valves

When globe and angle valves are required for hydraulic pressures higher than 2500 pounds, or for high pressure—high temperature lines, use dependable Crane Steel Valves. The complete line includes a wide range of sizes and types for all service conditions.

Especially desirable for extremely high steam pressures and temperatures are Crane Pressure-Seal Bonnet and newly introduced Lip-Seal Bonnet Globe and Angle Valves.

For detailed description and prices of Crane Steel Globe and Angle Valves, refer to pages 212, 218, and 235 to 248.



3000-Pound W.O.G.
No. 222 X
Globe



6000-Pound Hyd.
No. 225 H, Globe
Forged Steel



600-Pound
No. 3644 W, Globe
Forged Steel

Brass and Bronze Check Valves
Brass Foot Valves

Names of Parts.....page 44

Lift Check Valves
- 100-Pound.....page 45
- 125-Pound.....page 46
- 150-Pound.....page 47
- 200-Pound.....pages 48 to 50
- 300-Pound.....page 51
- 2000-Pound Hydraulic.....page 52
- 2500-Pound Hydraulic.....page 52
- For Liquefied Petroleum Gases.....page 47

Vertical Lift Check Valves
- 125-Pound.....page 46

Swing Check Valves
- 125-Pound.....page 46
- 200-Pound.....pages 48 and 50
- 300-Pound.....page 51

Foot Valves.....page 45

The check and foot valves shown in this section, like other Crane products, are characterized by quality. The line is complete and includes a valve for every commercial requirement. Designs are carefully developed based on an accurate knowledge of valve use, and are practical and serviceable.

Other types of brass and bronze valves, supplementing the check and foot valves indexed above, are shown on the following pages:

Gate Valves.....pages 13 to 21
Globe and Angle Valves.....pages 23 to 42
Hose Valves.....pages 60 and 61
Lever-Operated Quick-Opening Valves.....pages 54 to 57
Radiator Valves.....page 58

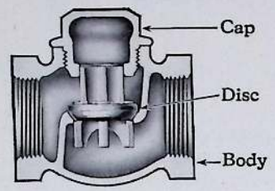
* * * * * * * * *

The lists shown above do not include all Crane Brass and Bronze Valves. Valves that perform a special duty or those made for special services such as Float Valves, Pop Safety Valves, Relief Valves, Pressure Regulators and Reducing Valves, Solder-Joint Valves, and Valves for Marine Service are described in other sections of this catalog. Refer to the index.

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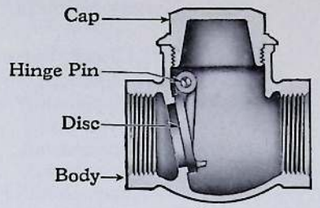
Brass and Bronze Check and Foot Valves

Names of Parts



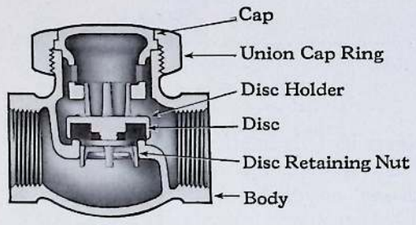
Brass
Horizontal Lift Check Valve
With Brass Disc

No. 20
(see page 46)



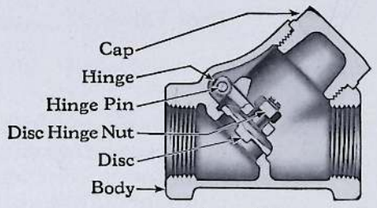
Brass
Swing Check Valve
With Brass Disc

No. 34
(see page 46)



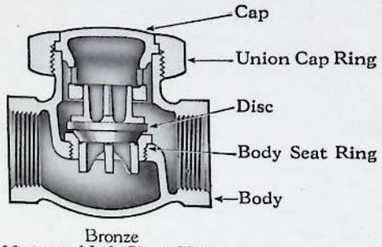
Brass
Horizontal Lift Check Valve
With Composition Disc

No. 27
(see page 47)



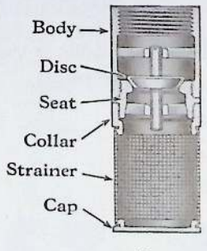
Bronze Y-Pattern
Swing Check Valve
Regrinding Type

No. 36
(see page 48)



Bronze
Horizontal Lift Check Valve
With Metal Disc and Renewable Seat

No. 218
(see page 49)

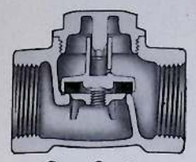


Brass
Foot Valve
With Strainer

No. 33½
(see page 45)

100-Pound Brass Lift Check Valves

With Composition Disc

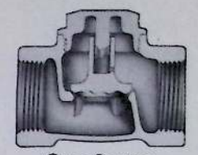


Cross Section



No. 1246
Horizontal
Screwed

With Brass Disc



Cross Section



No. 1256
Horizontal
Screwed

WORKING PRESSURES

100 pounds saturated steam
150 pounds water, 200° F.
Domestic Gas Service

100 pounds saturated steam
150 pounds water, 200° F.
150 pounds oil or gas, 150° F.

Service recommendations: These well proportioned, sturdily constructed 100-Pound Brass Lift Check Valves combine wide utility with moderate cost. The valves are particularly recommended for domestic water or gas lines and for other piping and equipment operated at low pressures.

Construction: No. 1246 Valves are furnished with a composition disc. No. 1256 Valves in sizes ⅛-inch and larger are furnished with a brass disc as illustrated in the cross section at the right; the ⅜-inch size has a metal ball disc. Otherwise, the two valves are alike. In both valves, the seat is integral with the body. Long hexagons on the body reinforce the openings and provide a good wrench grip.

Composition disc: No. 1246 Valves are regularly furnished with a No. 12 Composition Disc suitable for 150 pounds hot or cold water up to a maximum temperature of 200° F., and also, for domestic gas service.

When so ordered, the valves will be furnished with a No. 10 Disc suitable for 100 pounds saturated steam.

Other 100-Pound Brass Valves: Crane manufactures a complete assortment of 100-Pound Brass Valves suitable for a variety of purposes. For screwed end gate valves, see page 15; for globe and angle valves, see page 25; and for solder-joint gate, globe, angle, and check valves, see pages 420 and 421.

List Prices and Dimensions

Size	No. 1246 Horizontal Check With Composition Disc			No. 1256 Horizontal Check With Brass Disc		
	List Prices	End to end	Center to top	List Prices	End to end	Center to top
Inches	Each	Inches	Inches	Each	Inches	Inches
⅛	2.10	1⅞	1⅛			
¼	2.10	1⅞	1⅛			
⅜	2.20	2	1⅛	2.05	2	1⅛
½	2.80	2⅜	1⅜	2.60	2⅜	1⅜
¾	3.70	2¾	1½	3.40	2¾	1½
1	4.90	3¼	1¾	4.50	3¼	1¾
1¼	6.10	3⅞	1⅞	5.70	3⅞	1⅞
1½	8.40	4¼	2⅛	7.50	4¼	2⅛
2	12.50	5	2½	11.00	5	2½

For extra composition discs for No. 1246 Valves, see page 133.

Brass Foot Valves

With Strainer

WORKING PRESSURE
200 pounds cold water, non-shock

Service recommendations: No. 33½ Foot Valves are recommended for use on water suction lines.

Construction and materials: The valves are made entirely of brass and are designed to slip through Standard Wrought Pipe, two sizes larger than the nominal valve size.

The disc is accurately guided at the top and bottom to assure square seating. The strainer is perforated sheet brass with liberal area.



No. 33½
Screwed

List Prices and Dimensions

	Size	List Prices	End to end	Valve passes through
	Inches	Each	Inches	
No. 33½ Screwed	½	3.30	2⅜	1″ pipe
	¾	3.90	2 13/16	1¼″ pipe
	1	4.70	3⅛	1½″ pipe
	1¼	5.80	4¾	2″ pipe
	1½	7.70	5 7/16	2½″ pipe
	2	10.60	6¾	3″ pipe
	2½	23.60	8⅛	3½″ pipe
	3	30.00	9 5/16	4″ pipe

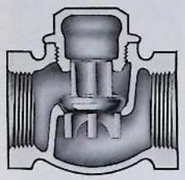
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asbestosclaims.law/library/21276/42

125-Pound Brass Check Valves

Lift Checks

Horizontal Type

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock



Cross Section
No. 20



No. 20
Horizontal
Screwed

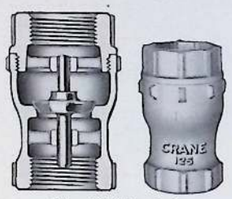
Lift check valves: As illustrated at the left, the Crane line of 125-Pound Brass Lift Check Valves includes both horizontal and vertical types. Both are recommended for general service on steam, water, oil, or gas lines.

The valves are heavier and more rugged than is usual with 125-Pound or "Standard" valves. All parts are liberally proportioned to withstand operating strains, and expansion and contraction of the pipe.

Disc construction: Lift check valves ½-inch and larger have a brass disc guided at the top and bottom. Smaller sizes have a ball disc (not illustrated).

Installing No. 24 Valves: The No. 24 Vertical Check Valves are designed to operate on upward flow only. They should always be installed with the inlet end down.

Vertical Type



No. 24, Vertical
Screwed

Swing Checks

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, non-shock

Swing check valves: No. 34 Valves have a brass disc and are recommended for service on steam or water lines.

No. 34½ Valves have a leather disc and are recommended for service on cold water lines only.

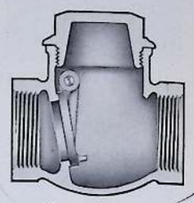
Like the lift check valves shown in the adjacent column, these 125-Pound Swing Check Valves are heavier and more rugged than is usual with 125-Pound or "Standard" valves. The valves are liberally proportioned throughout.

Disc construction: Except for their discs, the No. 34 and No. 34½ Valves are identical.

On sizes up to 2-inch, the disc is integral with the hinge as shown in the cross sections at the right. On 2½ and 3-inch brass disc valves, the disc swivels on the hinge.

Swing check valves in all sizes have a disc stop which prevents the disc from sticking in the open position.

With Brass Disc



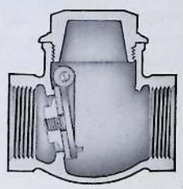
Cross Section
No. 34



No. 34
Screwed
With Brass Disc

With Leather Disc

Recommended for cold water only



Cross Section
No. 34½



No. 34½
Screwed
With Leather Disc

Swing check valves may be used either in a horizontal position, or in a vertical position for upward flow.

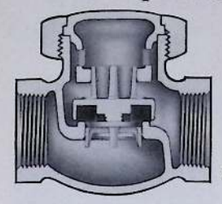
List Prices and Dimensions

Size	List Prices, Each				Dimensions, in Inches					
	Lift Checks		Swing Checks		No. 20		No. 24		No. 34 or 34½	
Inches	No. 20 Horizontal	No. 24 Vertical	No. 34 With Brass Disc	No. 34½ With Leather Disc	End to end	Center to top	End to end	Largest diameter	End to end	Center to top
⅛	2.10				1 7/16	1 5/16				
¼	2.10	2.60			1 5/8	1 1/16	1 13/16	1 1/8		
⅜	2.30	2.80	3.80	5.00	1 7/8	1 3/16	1 3/4	1 3/8	1 7/8	1 3/8
½	3.20	3.90	4.30	5.60	2 1/4	1 3/8	2 5/16	1 1/2	2 1/4	1 9/16
¾	4.30	4.70	4.90	6.50	2 11/16	1 5/8	2 3/4	1 3/4	2 11/16	1 13/16
1	5.60	6.20	6.50	8.50	3 3/16	1 7/8	3 7/16	2 1/8	3 3/16	2 3/16
1¼	7.20	7.50	8.00	10.40	3 11/16	2 3/16	3 13/16	2 9/16	3 11/16	2 9/16
1½	9.30	10.30	9.70	12.60	4 1/4	2 3/8	4 1/8	2 7/8	4 1/4	2 13/16
2	13.80	15.20	14.70	18.00	5 1/8	2 13/16	4 11/16	3 5/8	5 1/8	3 1/4
2½	23.00	24.00	24.00		6 1/16	3 5/16	5 3/4	4 7/16	6 1/16	3 7/8
3	34.00	36.00	36.00		7 1/16	3 3/4	6 5/16	5 1/4	7 3/8	4 1/8

For Solder-Joint Brass Swing Check Valves, see page 420.

150-Pound Brass Lift Check Valves

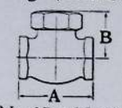
With No. 1 Cranite Composition Disc





No. 27, Horizontal
Screwed

WORKING PRESSURES
150 pounds saturated steam
300 pounds cold water, oil, or gas, non-shock

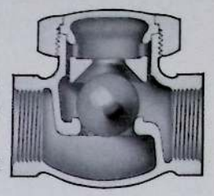


No. 27 or No. 31

With Metal Ball Disc



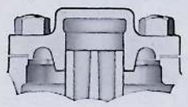
No. 31, Horizontal
Screwed



No. 27 are strong, rugged, composition disc valves. Equipped with the proper disc, they will give excellent results on steam, hot water, cold water, oil, air, or gas lines. They are especially suited for use where discs must be renewed quickly.

Quick repairs: A leak is easily repaired by replacing the disc holder with an extra complete disc holder and disc, or by inserting a new disc in the original holder. Extra disc holders and discs should be kept on hand for this purpose.

Cap joint: Sizes 2-inch and smaller have a union cap as shown above; sizes 2½ and 3-inch have a compact bolted cap as shown at the left. Both types provide a strong, tight joint, easily dismantled for cleaning or disc replacement.



Discs: Unless otherwise ordered, No. 27 Valves are furnished with a No. 1 Cranite Disc suitable for steam, or for hot water from 200 to 300° F. When ordered for hot water up to 200° F., or for cold water, air, gas, gasoline, or oil, the valves are furnished with a No. 6 Disc.

List Prices and Dimensions

Valve No.	Size	List Prices	Dimensions in Inches	
	Inches	Each	A	B
No. 27	¼	3.00	2	1 3/8
	⅜	3.40	2 5/16	1 1/2
	½	4.10	2 11/16	1 3/4
	¾	5.70	3 3/16	2
	1	8.00	3 3/4	2 1/4
	1¼	11.50	4 1/4	2 5/8
	1½	14.70	4 3/4	3
	2	22.00	5 3/4	3 1/2
	2½	42.00	6 3/4	3 1/2
	3	60.00	8	3 7/8
No. 31	½	4.50	2 11/16	1 11/16
	¾	6.20	3 3/16	1 15/16
	1	8.60	3 3/4	2 1/4
	1¼	13.00	4 1/4	2 9/16

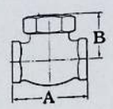
No. 31 are sturdy brass lift check valves recommended for use on steam, water, oil, or gas lines; they have a metal ball disc.

Smaller sizes: If sizes smaller than ½-inch are needed, use the No. 20 Horizontal Lift Check Valves illustrated and described on page 46; in sizes ⅛ to ⅜-inch, No. 20 Valves have a ball disc.

For list prices of composition discs for No. 27 Valves, see page 133.

Bronze Lift Check Valves
For Liquefied Petroleum Gases



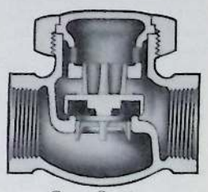


No. 132, Horizontal, Screwed

WORKING PRESSURE
400 pounds, 150° F.
LP-gases, light oils, volatile fluids, or air

TEST PRESSURE
600 pounds hydrostatic
Air Tested

****Underwriters' Approved for all LP-Gases***



Cross Section

No. 132 Valves, within the limit of the ratings specified above, are designed to safely handle liquefied petroleum gases, and are excellent for use on hot or cold water, compressed air, light oils, volatile fluids, etc.

*The valves have been approved by the Underwriters' Laboratories, Inc., (and are so marked), for the handling of all LP-gases, such as butane, propane, propylene, butylenes, etc., provided the piping system is subject to a pressure no greater than 250 pounds. The gases can be handled separately or mixed, and in the liquid or gaseous state.

Features: The body is made of Crane Special Bronze, a leaded tin bronze. The union cap provides a strong, tight joint, easily dismantled when necessary. The No. 6 Disc, a specially formulated composition ideal for petroleum usage, is secured to the disc holder by means of a disc retaining nut. As added precaution against leakage, it is sealed into the disc holder. Repairs are easy. Simply replace the disc holder with an extra complete holder and disc, or insert a new disc into the original holder.

List Prices and Dimensions

Valve No.	Size	List Prices	Dimensions in Inches	
	Inches	Each	A	B
No. 132	¼	3.30	2	1 3/8
	⅜	3.75	2 5/16	1 1/2
	½	4.50	2 11/16	1 3/4
	¾	6.25	3 3/16	2
	1	8.80	3 3/4	2 1/4
	1¼	12.60	4 1/4	2 5/8
	1½	16.00	4 3/4	3
	2	24.00	5 3/4	3 1/2

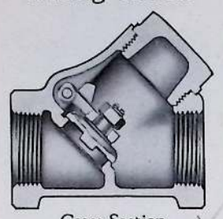
Extra composition discs...page 133

Other Bronze Valves for LP-Gases
Gate.....page 18
Globe and Angle.....page 30

200-Pound Bronze Check Valves

Regrinding

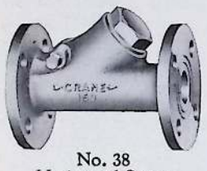
Y-Pattern Swing Check



Cross Section
No. 36



No. 36
Horizontal Swing
Screwed



No. 38
Horizontal Swing
Flanged

Swing Check Valves may also be used in a vertical position for upward flow.

Whether used horizontally or vertically, the valves should be installed with the pressure under the disc; an arrow cast on the body indicates the correct direction of flow.

Valve Ends	Working Pressures		Hydrostatic Test Pressures
	Steam 500° F.	Cold Water, Oil, or Gas, Non-Shock	
Screwed	200 pounds	400 pounds	600 pounds
Flanged	150 pounds	225 pounds	450 pounds

New, Improved 200-Pound Swing Checks Featuring Full Area, Y-Pattern Design

The No. 36 and No. 38 are ruggedly constructed valves recommended for severe service on steam, water, oil, or gas lines. Their Y-pattern design presents a marked improvement over conventional, regrinding type swing check valves.

The body, of Crane Special Bronze, a strong, hard, leaded tin bronze, features full area and smooth interior contours. Pressure drop and flow resistance are reduced to a minimum.

The cap and all internal parts are brass. The pressure-tight, easy seating disc has a threaded spud which passes through a hole in the lower end of the hinge; a disc nut, screwed onto the spud, retains the parts. The hinge and disc swing freely out of the path of flow. A hinge bumper prevents the disc from sticking in the open position.

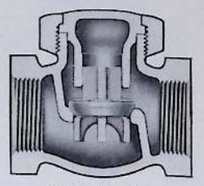
All parts are readily accessible and can be quickly replaced in the field.

The valves may be reground without removing the body from the line. A slot in the end of the disc-spud enables rotating the disc with a screw driver.

Flanged valves: End flanges conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling to the MSS 150-Pound Standard; no deduction is made if the valves are ordered faced only.

Use full face gaskets; see page 472.

Lift Check



Cross Section
No. 72



No. 72
Horizontal Lift
Screwed

Lift Check Valves: The No. 72 are sturdily constructed horizontal lift check valves, made of high grade materials and designed for long service. They are recommended for severe service on steam, water, oil, or gas lines.

The body is made of Crane Special Bronze, a leaded tin bronze that resists wear exceptionally well.

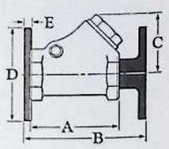
The cap, disc, and union cap ring are made of brass.

On sizes ½-inch and larger, the disc is guided at the top and bottom as illustrated at the upper right of the page; on the ¼ and ⅜-inch sizes, the disc is guided at the top only.

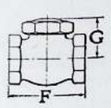
The valves can be reground without removing the body from the line.

List Prices and Dimensions

Size	List Prices, Each			Dimensions, in Inches							
	Swing		Lift	No. 36		No. 38				No. 72	
Inches	No. 36 Screwed	No. 38 Flanged F. & D.	No. 72 Screwed	A	C	B	C	D	E	F	G
¼	4.90		2.50	2⅛	1½					1 11/16	15/16
⅜	4.90		3.10	2⅛	1½					1 15/16	1⅛
½	5.20		4.00	2½	1¾					2¼	1 3/16
¾	6.30		5.40	3	2⅛					2¾	1 7/16
1	8.00	21.50	7.70	3¾	2½	5⅜	2½	4¼	⅜	3 5/16	1¾
1¼	10.00	27.00	10.00	4¼	3	6	3	4⅝	13/32	3⅞	2
1½	12.70	35.00	13.40	5	3½	6¾	3½	5	7/16	4½	2¼
2	18.40	54.00	20.50	6	4¼	8	4¼	6	½	5¼	3 5/16
2½	28.50	81.00	35.00	6⅞	5	9¼	5	7	9/16	6 5/16	3¾
3	46.00	107.00	51.00	8⅛	6	10⅜	6	7½	⅝	7¼	4 5/16



No. 36
or
No. 38



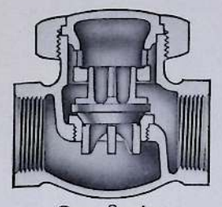
No. 72

Valves for Marine Service....page 400

Templates for drilling....page 458

200-Pound Bronze Lift Check Valves

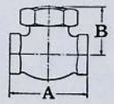
With Crane Nickel Alloy Disc



Cross Section
No. 218
Horizontal Lift



No. 218
Horizontal Lift
Screwed



Features of No. 218 Valves
Crane Nickel Alloy Seat
Crane Nickel Alloy Disc
Union Cap Construction

WORKING PRESSURES
200 pounds steam, *500° F.
400 pounds cold water, oil, or gas, non-shock
*Maximum temperature rating with No. 4 Cranite Disc is 450°F.

TEST PRESSURE
600 pounds hydrostatic

These are unusually strong and rugged valves. They are liberally proportioned and will withstand severe operating strains.

Except for the design of the disc and seat, both types of valves are alike. Corresponding dimensions are the same.

Body and cap: The valves have a body made of Crane Special Bronze, a strong, hard, leaded tin bronze. The union cap construction facilitates dismantling and reassembling for cleaning and repairing the valves.

Crane Nickel Alloy Disc Valves: The No. 218 Valves are recommended where operating conditions require a high quality metal disc and seat. They are suitable for severe service on steam, water, oil, or gas lines.

The disc and seat are made of Crane Nickel Alloy, a seating material that resists wear exceptionally well. The disc is guided from above and below the seat, assuring accurate seating at all times.

Composition Disc Valves: The No. 218 C Valves have a composition disc and are recommended for a wide range of fluids when equipped with the proper type of disc. They are especially suitable for installations where the discs must be renewed quickly and easily. As in the No. 218, the seat is Crane Nickel Alloy.

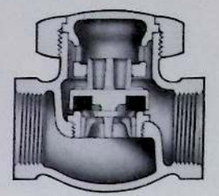
The valves are regularly equipped with a No. 4 Cranite Disc suitable for high pressure steam up to 450° F., or for hot water up to 420° F. When ordered for cold water, air, gas, oil, or gasoline, the valves are furnished with a No. 6 Disc.

On hot water under 200° F., especially where frequent operation is necessary, a No. 6 Disc is preferred to the No. 4. For list prices and description of composition discs, see page 133.

Composition disc valves have a brass disc holder guided from above and below the seat on sizes ½-inch and larger; in smaller sizes, the holder is guided in the cap only.

Quick repairs: A leak is quickly repaired on composition disc valves by replacing the disc holder with an extra complete disc holder and disc, or by inserting a new disc into the original holder. Extra disc holders and discs should be kept on hand for this purpose.

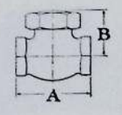
With No. 4 Cranite Composition Disc



Cross Section
No. 218 C
Horizontal Lift



No. 218 C
Horizontal Lift
Screwed



Features of No. 218 C Valves
Crane Nickel Alloy Seat
No. 4 Cranite Composition Disc
Union Cap Construction

List Prices and Dimensions

Size	List Prices, Each Screwed		Dimensions, in Inches	
	No. 218 Nickel Alloy Disc	No. 218 C Composition Disc	A	B
Inches				
¼	5.50	4.80	2	1 5/16
⅜	6.80	6.00	2 5/16	1½
½	7.80	6.80	2 11/16	1 11/16
¾	9.40	8.20	3 3/16	2
1	11.00	9.80	3¾	2¼
1¼	15.30	14.00	4¼	2⅝
1½	19.50	18.00	4¾	2⅞
2	29.00	26.00	5¾	3½

For list prices of Composition Discs, see page 133.

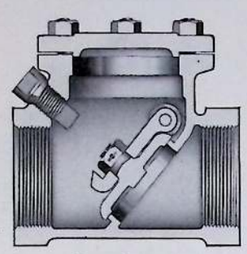
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T.E.C.

200-Pound Bronze Check Valves
Bolted Cap

5

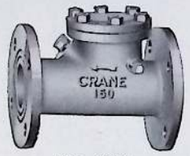
Swing Check



Cross Section
No. 4032



No. 4032
Horizontal Swing
Screwed



No. 4033
Horizontal Swing
Flanged

Valve Ends	Working Pressures: Steam 500° F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	200 pounds	400 pounds	600 pounds
Flanged	150 pounds	225 pounds	450 pounds

Service recommendations: The valves shown on this page are high quality bolted cap check valves. They are recommended for use on large pipe lines where bronze valves are wanted.

Strong and rugged, the valves are liberally proportioned to withstand severe operating strains; their bolted cap construction makes an exceptionally tight, strong, and serviceable joint.

Swing check valves: Nos. 4032 and 4033 Swing Check Valves have a body, cap, and disc made of Crane Special Bronze, a strong, hard, leaded tin bronze. Sizes 4-inch and smaller have a separate disc and hinge, as illustrated; larger sizes have a one-piece disc and hinge (not illustrated).

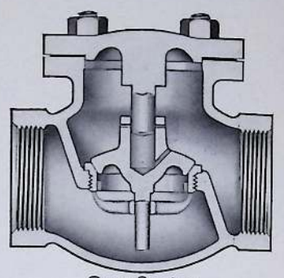
Sizes 4-inch and smaller can be reground without removing the body from the line. By removing the stop plug, a screw driver can be engaged with the slot in the disc spud, making it easy to rotate the disc when regrinding.

Lift check valves: Nos. 4062 and 4063 Horizontal Lift Check Valves have a Crane Special Bronze body, cap, and disc. The body seat ring is also Crane Special Bronze, a strong, hard, leaded tin bronze having good resistance to wear.

Flanged valves: End flanges conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to the MSS 150-Pound Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.

The No. 4032 and No. 4033 Swing Check Valves may also be used in a vertical position for upward flow.

Lift Check



Cross Section
No. 4062



No. 4062
Horizontal Lift
Screwed



No. 4063
Horizontal Lift
Flanged

List Prices and Dimensions

Size	Swing Check Valves: List Prices, Each: No. 4032 Screwed	Swing Check Valves: List Prices, Each: No. 4033 Flanged F. & D.	Swing Check Valves: Dimensions, in Inches: End to end: Screwed	Face to face: Flanged	Center to top	Flanges: Diameter	Flanges: Thickness	Lift Check Valves: List Prices, Each: No. 4062 Screwed	Lift Check Valves: List Prices, Each: No. 4063 Flanged F. & D.	Lift Check Valves: Dimensions, in Inches: End to end: Screwed	Face to face: Flanged	Center to top	Flanges: Diameter	Flanges: Thickness
Inches														
1½								Prices on request	Prices on request	5 5/16	5 7/8	3 3/8	5	7/16
2	57.00	69.00	5 3/8	7 3/8	3 3/4	6	½			6	6 7/8	3 5/8	6	½
2½	74.00	100.00	6 3/8	8 ½	4 3/8	7	9/16			7 1/4	8	4 5/8	7	9/16
3	100.00	130.00	7 1/4	9 1/8	5	7 ½	5/8			8 1/4	9 1/8	5	7 ½	5/8
3½		211.00		10 1/4	6	8 ½	11/16				10 3/8	5 1/8	8 ½	11/16
4		254.00		11 1/4	6 ½	9	11/16				11	5 3/4	9	11/16
5		305.00		12 7/8	7 1/4	10	¾				12 1/4	6 3/4	10	¾
6		408.00		14 3/8	8 1/4	11	13/16				14	7 3/4	11	13/16

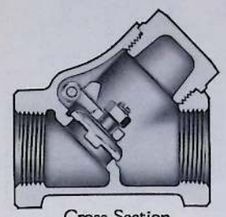
Valves for Marine Service . . . page 400

Templates for drilling . . . page 458

300-Pound Bronze Check Valves
Regrinding

5

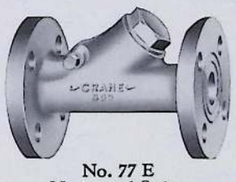
Y-Pattern Swing Check



Cross Section
No. 76 E



No. 76 E
Horizontal Swing
Screwed



No. 77 E
Horizontal Swing
Flanged

Swing Check Valves may also be used in a vertical position for upward flow.

Whether used horizontally or vertically, the valves should be installed with the pressure under the disc; an arrow cast on the body indicates correct direction of flow.

Valve Ends	Sizes	Working Pressures: Steam 550° F.	Working Pressures: Cold water, oil, or gas, non-shock	Hydrostatic Test Pressures
Screwed	¼ to 2-inch	300 pounds	1000 pounds	1500 pounds
	2½ and 3-inch	300 pounds	600 pounds	900 pounds
Flanged	All Sizes	300 pounds	500 pounds	900 pounds

New, Improved 300-Pound Swing Checks Featuring Full Area, Y-Pattern Design

No. 76 E and No. 77 E are heavy, ruggedly constructed valves recommended for severe service on steam, water, oil, or gas lines. Their Y-pattern design presents a marked improvement over conventional, regrinding type swing check valves.

The body, made of Crane Special Bronze, a strong, hard, leaded tin bronze, features full area and smooth interior contours. Pressure drop and flow resistance are reduced to a minimum.

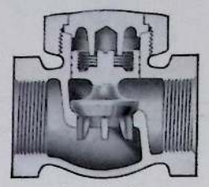
The cap and all internal parts are brass. The pressure-tight, easy-seating disc has a threaded spud which passes through a hole in the lower end of the hinge; a disc nut, screwed onto the spud, retains the parts. A hinge bumper prevents the disc from sticking in the open position. All parts are readily accessible and can be quickly replaced in the field.

The valves may be reground without removing the body from the line. A slot in the end of the disc-spud enables rotating the disc with a screw driver.

Flanged valves: End flanges conform to the MSS 300-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling to the MSS 300-Pound Standard; no deduction is made if valves are ordered faced only.

Use full face gaskets; see page 472.

Lift Check



Cross Section
No. 366 E



No. 366 E
Horizontal Lift
Screwed

Lift check valves: No. 366 E Horizontal Lift Check Valves are recommended for steam, water, oil, or gas, and especially for service where pulsations in the line are apt to cause an ordinary check valve to hammer. The dashpot formed above the piston type disc effectively cushions the disc.

The body and disc are Crane Special Bronze, a leaded tin bronze that resists wear exceptionally well.

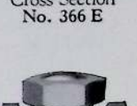
These valves can be reground without removing the body from the line.

When so ordered, the valves can be equipped with a spring above the disc to keep the valve normally closed when used on air or gas; prices will be furnished on application.

List Prices and Dimensions

Size	List Prices, Each: Swing: No. 76 E Screwed	List Prices, Each: Swing: No. 77 E Flanged F. & D.	List Prices, Each: Lift: No. 366 E Screwed	Dimensions, in Inches: No. 76 E: A	No. 76 E: C	No. 77 E: B	No. 77 E: C	No. 77 E: D	No. 77 E: E	No. 366 E: F	No. 366 E: G
Inches											
¼	6.00		6.30	2¼	1½					1 13/16	1
⅜	6.30		6.90	2¼	1½					2	1⅛
½	7.10		8.00	2⅝	1¾					2½	1⅜
¾	9.00		10.20	3⅛	2⅛					2 15/16	1⅞
1	10.40	31.00	11.70	3⅞	2½	6¼	2½	4⅞	19/32	3½	2
1¼	14.00	43.00	15.60	4½	3	6⅞	3	5¼	⅝	4 1/16	2⅜
1½	18.00	64.00	20.50	5⅛	3½	7⅞	3½	6⅛	11/16	4⅝	2⅝
2	26.50	89.00	29.00	6⅜	4¼	8¾	4¼	6½	¾	5¾	3¼
2½	50.00	134.00	53.00	7⅛	5	10⅛	5	7½	13/16	6⅞	3⅞
3	89.00	174.00	93.00	8⅜	6	11⅝	6	8¼	29/32	8	4½

No. 76 E or 77 E



No. 366 E

Valves for Marine Service . . . page 400

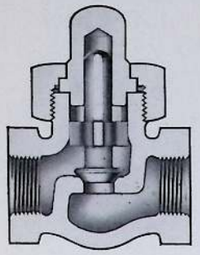
Ferrosteel Piston Type Disc Check Valves . . . page 412

Templates for drilling . . page 458

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Hydraulic Bronze Lift Check Valves

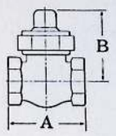
2000 - Pound



Cross Section
No. 234 H

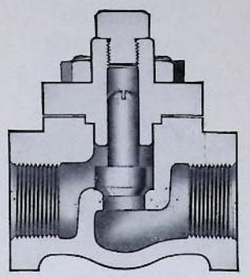


No. 234 H
Horizontal Lift
Screwed



No. 234 H

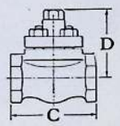
2500 - Pound



Cross Section
No. 238 H



No. 238 H
Horizontal Lift
Screwed



No. 238 H

WORKING PRESSURES

2000 pounds cold water, oil, or gas, non-shock

2500 pounds cold water, oil, or gas, non-shock

TEST PRESSURES

3000 pounds hydrostatic

3750 pounds hydrostatic

Service recommendations: Crane Hydraulic Bronze Check Valves are recommended for severe high pressure hydraulic service on lines not subjected to shock, and for high pressure gas lines.

Construction: The valves are exceptionally heavy and rugged. The top of the disc fits snugly in the valve cap, guiding the disc accurately and forming a dashpot that effectively cushions the action of the valve while in service. The No. 234 H Valves have a union cap; the No. 238 H Valves are made with a bolted cap.

Materials: The body and disc of these valves are made of Crane Special Bronze, a strong, hard, leaded tin bronze having excellent resistance to wear.

Seat opening: The diameter of the seat opening in both the No. 234 H and the No. 238 H Valves is slightly larger than the inside diameter of Double Extra Strong Pipe.

List Prices and Dimensions

Size	List Prices, Each Horizontal, Screwed		Dimensions, in Inches			
	No. 234 H	No. 238 H				
Inches	2000-Pound	2500-Pound	A	B	C	D
3/8	12.00		2 13/16	2 5/8		
1/2	13.00		2 13/16	2 5/8		
3/4	16.00		3 7/16	3 1/4		
1	21.00	36.00	4	3 7/8	4 1/2	3 5/8
1 1/4	31.00	40.00	4 11/16	4 7/16	4 15/16	4 1/8
1 1/2		55.00			5 1/2	4 5/8
2		79.00			6 3/8	5 3/8

For Higher Pressures and Temperatures Use Crane Steel Valves

Supplementing the Crane line of bronze check valves shown above and on the preceding pages is a wide assortment of steel check valves especially designed for severe services and for pressures and temperatures beyond the scope of bronze valves. They are made in a wide range of sizes and for all service conditions; for complete data, refer to:

Forged Steel Check Valves
Lift.....pages 250 and 251
Marine.....page 401

Cast Steel Check Valves
Swing.....pages 252 to 256
Ball.....page 251
Marine.....page 401



Forged Steel
600-Pound
No. 3674 X
Horizontal Lift
(Page 251)



Forged Steel
6000-Pound Hyd.
No. 227 H
Horizontal Lift
(Page 256)



Cast Steel
600-Pound
No. 175 X
Horizontal Swing
(Page 255)



Cast Steel
600-Pound
No. 3692 XS
Ball Check
(Page 251)

Brass and Bronze Quick-Opening, Radiator, and Hose Valves

Hose Fittings, Racks, and Cabinets

Quick-Opening Valves
125-Pound Globe.....page 54
125-Pound Gate.....page 56
150-Pound Globe.....page 55

Butterfly Valves.....page 57
Quick-Acting Throttle Valves.....page 57
Radiator Valves.....page 58

Hose Valves
Hose Gate.....page 60
Underwriters' Pattern.....page 60
Chicago Hose.....page 61
Angle Hose.....page 61
Garden Hose.....page 61

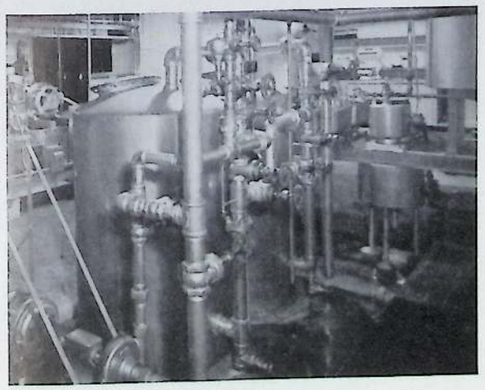
Hose Goods
Couplings and Clamps.....page 62
Nozzles, Pipes, and Fittings.....page 63
Racks and Cabinets.....page 64

Hose Threads, for Hose Valves.....page 59

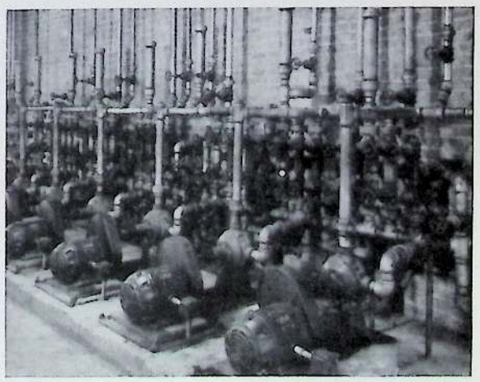
* * * * * * * * * *

In addition to the valves indexed above, Crane also manufactures an extensive line of Quick-Opening Valves made of other materials and a line of brass hose valves for marine service. These are shown in other sections of the catalog; see the pages referred to below:

Iron Body Quick-Opening Clamp Gate Valves.....page 75
Iron Body Quick-Opening Wedge Gate Valves.....page 80
Iron Body Butterfly Valves.....page 111
Bronze Chronometer Valves.....page 403
Brass Hose Gate Valves for Marine Service.....page 403



Crane brass valves and fittings in a bottling plant.



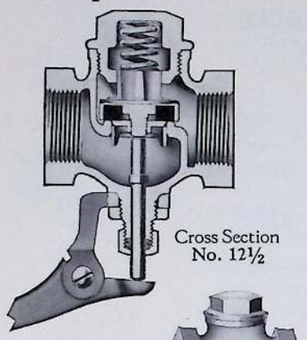
A typical Crane installation in a turpentine plant.

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125-Pound Brass Globe Valves

Quick-Opening—Self-Closing

Composition Disc



Cross Section No. 12½



No. 12½, Globe Screwed With Stuffing Box

Unless ordered otherwise, No. 12½ Valves are furnished with a No. 6 Disc for air or gas.

WORKING PRESSURES

No. 12½ Valves
125 pounds air or gas, 150° F.
(125 pounds saturated steam With No. 1 Disc)

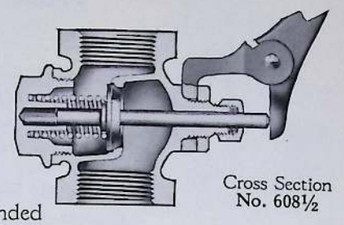
No. 608 and No. 608½ Valves
125 pounds saturated steam

SERVICE RECOMMENDATIONS

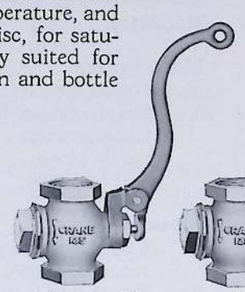
No. 12½ Valves are regularly recommended for air or gas up to 150° F. temperature, and when ordered with a No. 1 Disc, for saturated steam. They are ideally suited for cooking vats, soot blowers, can and bottle sterilizers, and similar service.

No. 608 and No. 608½ Valves are recommended for general industrial service on steam lines only. They are used to control the flow of steam to small apparatus such as steam presses, laundry machinery, can and bottle sterilizers, etc., and are often used in conjunction with whistles.

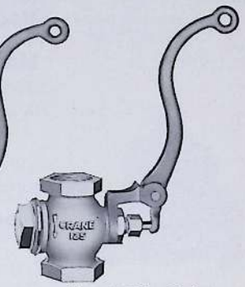
Brass Disc



Cross Section No. 608½



No. 608, Globe Screwed Without Stuffing Box



No. 608½, Globe Screwed With Stuffing Box

List Prices, Each

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2
Composition Disc	No. 12½		6.60	8.00	10.00	12.00	14.00	17.00	23.50	
Brass Disc	No. 608, without stuffing box			6.00	7.00	8.30	10.80	14.50	18.00	26.00
	No. 608½, with stuffing box			6.50	7.50	9.30	12.00	15.80	20.00	28.00

For list prices of composition discs, see page 133.

Materials and construction: All of these valves have a brass body and cap, a stainless steel spring, and a malleable iron lever. The lever can be turned to any desired position by loosening the locknut which holds the bracket to the valve body. The disc holder in the No. 12½ Valve is brass.

The Nos. 12½ and 608½ Valves have a stuffing box around the stem, assuring ample protection against leakage of fluid. This feature makes the valves particularly suitable for use in confined spaces and in installations requiring valves that will not leak at the stem under constant service. The stuffing box is filled with high grade packing.

Operation: The valves are easily operated. A short pull on the lever lifts the disc off its seat, opening the valve. When the lever is released, the spring above the disc automatically closes the valve.

Operation of larger size Nos. 608 or 608½ Valves used with whistles is facilitated when the pull is at right angles to the centerline of the whistle.

Installation: These valves always should be installed with the pressure above the disc. An arrow on the body indicates the direction of flow.

Composition discs: Unless otherwise ordered, No. 12½ Valves are furnished with a No. 6 Disc suitable for air or gas service. Valves ordered for steam service will be furnished with a No. 1 Cranite Disc. See page 133 for discs.

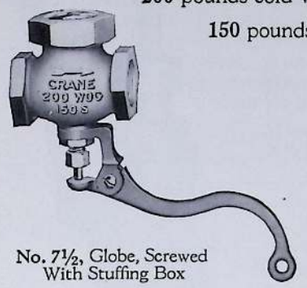
Dimensions, in Inches

Size			¼	⅜	½	¾	1	1¼	1½	2
No. 12½	End to end of body		2⅛	2⅜	2¾	3¼	3¾	4¼	5	
	Center to top of cap		17/16	1⅝	111/16	2	2⅜16	2½	215/16	
	Center of stem to end of lever, closed		3⅜	3⅜	43/16	59/16	6⅜	8⅛	8¼	
	Center of port to bottom of lever, open		3¾	3¾	5⅛	5⅛	6⅞	811/16	9½	
Nos. 608 or 608½	End to end of body			1⅞	23/16	2⅝	3⅛	3⅝	41/16	415/16
	Center of port to cap			1¼	13/8	111/16	2	2⅛	2⅝	2⅞
	Center of stem to end of lever, closed			33/16	3⅞	5⅝	6⅜	8⅛	8⅛	9¾
	Center of port to bottom of lever, open	No. 608		3¼	4¾	4¾	6¼	7¾	8½	10¼
		No. 608½		3⅝	5¼	5⅜	7¾	8¾	9½	12⅝

150-Pound Brass Globe Valves

Quick-Opening—Self-Closing

With Composition Disc



No. 7½, Globe, Screwed With Stuffing Box

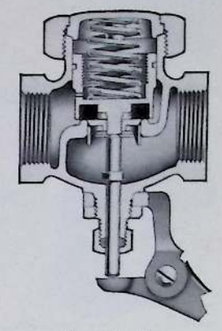
Unless otherwise ordered, No. 7½ Valves are furnished with a No. 6 Disc suitable for hot or cold water, for light oils or gasoline, or for air and gas. Orders should specify service conditions.

WORKING PRESSURES

200 pounds hot water, 200° F.
200 pounds cold water, light oils, gasoline, air, and gas, 150° F.
150 pounds saturated steam (with No. 1 Disc)

SERVICE RECOMMENDATIONS

The No. 7½ Valves are regularly equipped with a No. 6 Composition Disc suitable for 200 pounds hot water up to 200° F. and for 200 pounds of cold water, light oils, gasoline, air, and gas at atmospheric temperature (150° F. maximum). They can also be furnished, when so ordered, with a No. 1 Cranite Composition Disc, making them suitable for 150 pounds saturated steam.



Cross Section No. 7½

The valves are widely used on gasoline and oil loading racks, public showers, and in other services where high quality quick-opening, self-closing globe valves are needed. Valves for heavy oil service can be furnished when desired; prices on application.

List Prices

Size	Inches	½	¾	1	1¼	1½	2
No. 7½, Screwed, with Composition Disc	Each	12.50	16.80	20.30	25.00	40.00	55.00

For list prices of composition discs, see page 133.

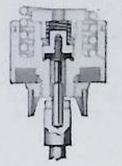
Operation: The valves are easily operated. A short pull on the lever lifts the disc off its seat, opening the valve. When the lever is released, the spring above the disc automatically closes the valve.

Materials: The body, cap, cap ring, stem, and disc holder are made of a good grade steam brass. The bracket and opening lever are malleable iron. The spring is stainless steel.

Construction: The No. 7½ Valves are ruggedly constructed throughout. They have a union ring cap joint which permits easy dismantling and reassembling for inspection, cleaning, or replacement of disc. The stuffing box around the stem is amply deep and large enough to remain pressure tight when the valve is open; it is filled with non-friction packing.

The top of the disc holder is piston shaped and is equipped with a piston ring. It fits snugly into the upper part of the valve body, forming a dashpot that effectively cushions the disc when closing, preventing hammering and destructive shock.

Pilot valve on 1½ and 2-inch: 1½ and 2-inch sizes have a pilot valve in the main valve, as illustrated here. When the valve is operated, the pilot valve opens first, equalizing the pressure around the main disc, thereby assuring easy operation. The pilot valve disc is also a composition material, having the same characteristics as the main valve disc; it is loaded for closing with a stainless steel spring.



Discs: Unless otherwise ordered, No. 7½ Valves are regularly furnished with a No. 6 Disc suitable for hot or cold water, for light oils or gasoline, and for air and gas.

When ordered for steam service, the valves are furnished with a No. 1 Cranite Composition Disc.

Installation: These valves always should be installed with the pressure above the disc. An arrow on the body indicates the direction of flow.

Dimensions, in Inches

Size	½	¾	1	1¼	1½	2
End to end of body	211/16	3⅜16	3¾	4¼	4¾	5¾
Center to top of cap	1¾	2	2¼	2⅝	3	3½
Center of stem to end of lever, closed	4⅛	5⅝	6¼	8⅛	8¼	9½
Center of port to bottom of lever, open	5⅜16	5½	7⅜	8	9¾	12⅝

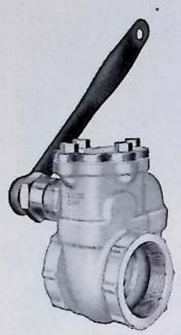
Quick-closing valves used on liquid lines may produce shock; see page 11.

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125-Pound Brass Gate Valves

Quick-Opening

Cam Action



No. 432
Screwed

WORKING PRESSURES

½ to 2-inch
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

2½ and 3-inch
100 pounds saturated steam
100 pounds cold water, oil, or gas, non-shock

Air Tested

Sliding Stem



No. 442, Screwed

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

When these valves are used on liquid lines, closing a valve quickly might cause "water hammer". When severe, water hammer must be eliminated by installing a suitable cushioning device in the piping. Otherwise the shock might damage the valves or the piping; see page 11.

List Prices

Size	Inches	½	¾	1	1¼	1½	2	2½	3
No. 432, Cam Action Valves	Each	9.70	10.80	13.70	17.00	21.00	28.00	56.00	75.00
No. 442, Sliding Stem Valves	Each		10.80	13.70	17.00	21.00	28.00	56.00	75.00

No. 432 Cam Action Valves: This superior line of quick opening wedge gate valves is recommended for service on steam, water, oil, or air lines.

The solid wedge disc is operated with a quick-opening lever through a specially designed cam arrangement, assuring fast and positive valve action.

Sizes 1-inch and smaller have a screwed cap; the larger sizes have a bolted cap as shown in the illustration at the top of the page.

To insure proper seating when closing the valves, a snappy action with plenty of force should be applied to the lever. The disc will not jam, and there is no danger of injuring parts because the valve has been designed to withstand such action.

Underwriters' Approval: No. 432 Gate Valves have been approved by the Underwriters' Laboratories, Inc., for hazardous liquid service at pressures not exceeding 50 pounds; this is the maximum pressure prescribed by the Underwriters' Laboratories for hazardous liquid equipment.

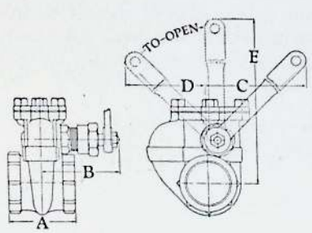
No. 442 Sliding Stem Valves: No. 442 Quick-Opening Gate Valves are of the parallel seat construction. They have a sliding stem and a double disc.

They are of ample proportions, are sturdily constructed, and only a short movement of the lever is required to operate the valve.

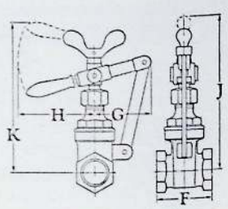
The wing nut at the top of the stem permits forcing the discs to the seats after the valve has been closed; it releases the discs before opening.

Dimensions, in Inches

Size	½	¾	1	1¼	1½	2	2½	3
A	1⅞	2⅛	2½	2¾	2⅞	3⅜	4	4¼
B	2 11/16	2⅞	3⅛	3½	3⅞	4¼	4⅞	5⅜
C	2⅛	3⅛	4	5½	6⅜	7⅝	8¾	10
D	3	3¼	3½	4⅝	5⅜	6⅜	7½	8⅛
E	5 9/16	6¼	6¾	8⅝	9 13/16	12	13⅞	15 5/16
F		2⅝	2 13/16	3¼	3⅞	4⅛	4⅝	5⅜
G		2⅝	3	3½	4	4⅜	4⅝	5¼
H		4⅞	5¾	7	7⅜	8⅜	9½	10⅝
J		7⅛	8⅝	10⅛	11	13¼	15	16⅞
K		7½	8¼	9⅞	10¾	13⅜	16½	17



Cam Action Valve



Sliding Stem Valve

Brass Butterfly Valves

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock



No. 44, Screwed
Brass Body
Brass Disc
Steel Stem

Crane Butterfly Valves provide easy, smooth operation in approximately one-quarter turn from the wide open to the closed position. Because the valves are not designed to close pressure-tight, they should be used only to control or regulate flow.

The body and disc are made of brass. The stem is steel.

For Iron Butterfly Valves, see page 111.

List Prices and Dimensions

Size		Inches	¾	1	1¼	1½	2
No. 44, Butterfly Valve		Each	7.20	8.60	10.00	12.00	15.60
Dimensions, in Inches	End to end		2¼	2 9/16	2¾	2 15/16	4 1/16
	Center to top		3 1/16	3¼	3 9/16	3⅞	4⅞
	Overall height		4 1/16	4 9/16	5 3/16	5 9/16	6¾
	Diameter of stem		11/32	⅜	7/16	7/16	½

Brass Quick-Acting Throttle Valves

WORKING PRESSURE
125 pounds saturated steam



All Brass with Malleable Iron Lever

No. 46, Screwed

These ruggedly built throttle valves are used extensively on hoisting and traction engines. They open or close completely in one-quarter turn of the lever and have an internal stop to limit the travel of the stem.

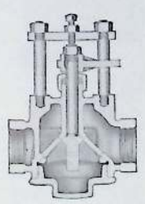
The valves are not recommended for use where pressure-tight seating is essential.

Except for the malleable iron lever, all parts are made of brass.

List Prices and Dimensions

Size	Inches	¾	1	1¼	1½	2
No. 46, Throttle Valve	Each	20.00	22.00	28.00	34.00	43.00
Dimensions, in Inches — End to end		2¾	3⅜	4	4½	5½
Center to top of stem		3½	3¾	4½	5⅛	6⅛
Center of stem to end of handle		6	6	8	10	11¼

Bronze Chronometer Valves



No. 4382
Screwed

Bronze Chronometer Valves are designed for regulating and governing purposes on steam lines where working pressures do not exceed 250 pounds.

The valves are available in a wide range of sizes with either screwed or flanged ends. They are easy to operate. A one-eighth turn of the lever opens or closes the valve completely. An adjusting screw at the stem end varies the pressure of the disc against the seat bearing, assuring smooth operation at all times. With proper adjustment, the valves can be operated by a float.

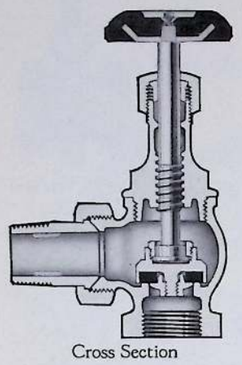
Prices and dimensions are shown on page 403.



No. 4383
Flanged

150-Pound Brass Radiator Valves

Government Pattern
With Composition Disc

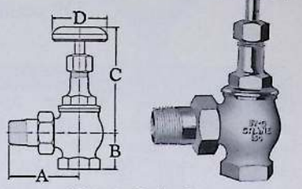


Cross Section

WORKING PRESSURE
150 pounds saturated steam

These valves are recommended for steam and hot water heating systems.

When wanted for gravity flow hot water, orders should so specify; such valves are drilled with a small hole through the seat to provide slow circulation when the valve is closed.



No. 67 G Angle

When so ordered, No. 67 G Valves will be furnished with lock shield at no extra charge.

Construction: These valves are heavy and are unusually sturdy. They have a rising stem and a gland in the stuffing box. The valves can be repacked when wide open and under pressure.

List Prices and Dimensions

Size		Inches	½	¾	1	1¼	1½
No. 67 G, Rough, nickel-plated		Each	6.00	7.40	9.40	12.50	16.00
Dimensions, in Inches	A		2⅜	3¼	3½	3⅞	4⅜
	B		1 3/16	1⅝	1¾	2	2¼
	C—Open		4½	5¼	6	7⅛	7½
	D		2¼	2½	2¾	3	3

For list prices of Composition Discs, see page 133.

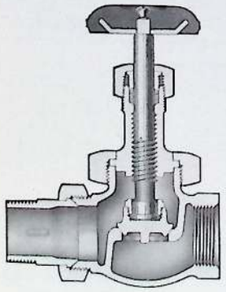
Discs: Unless otherwise ordered, the valves are furnished with a No. 1 Cranite Disc suitable for steam, or for hot water from 200° to 300° F. When ordered for hot water up to 200° F., they are furnished with a No. 6 Disc. For discs, see page 133.

Government and Navy Specifications: The valves comply with Government Specifications issued by the General Supervising Architect's Office and the Quartermaster General's Office.

The valves also comply with Navy Department (Bureau of Yards and Docks) Specification No. 66-P-1a(INT), dated September, 1944, on Power Plant Heating and Ventilating Apparatus and Piping (Shore Use).

200-Pound Bronze Radiator Valves

Union Bonnet with Metal Disc



Cross Section
No. 4270, Globe

WORKING PRESSURE
200 pounds saturated steam

List Prices and Dimensions

Size		Inches	⅜	½	¾	1
No. 4270	Globe, Rough body	Each	5.40	6.00	8.00	11.00
	Angle, Rough body	Each	5.40	6.00	8.00	11.00
Dimensions, in Inches	Center to female end		1	1 3/16	1⅜	1 11/16
	Center to union end		2 3/16	2 7/16	3	3¼
	Center to top, open		3¾	4⅛	4¾	5¾
	Diameter of wheel		2	2¼	2½	2¾

When ordering, specify whether globe or angle valves are wanted.

When so ordered, No. 4270 Valves will be furnished with lock shield at no extra charge.



No. 4270
Angle

No. 4270 Valves are recommended for high pressure steam and hot water systems. They are heavy, ruggedly constructed, and are furnished with a Crane Special Bronze body. The valves have a union bonnet and can be reground without removing the body from the line. The stuffing box on sizes ½-inch and larger is equipped with a gland; the ⅜-inch size does not have a gland. The valves, when wide open, can be repacked while under pressure. ⅜ and ½-inch valves have a one-piece disc and stem.

Hose Threads

Hose Thread Standards: The table shown below gives the basic dimensions of the American (National) Standard Hose Coupling Threads and of other hose coupling threads now in general use.

The upper portion of the table includes:

1. American Standard Hose Coupling Screw Threads (ASA B33.1-1935) sizes 2-inch and smaller for valves, hose couplings, nozzles, and other fittings used in direct connection with hose intended for fire protection or for domestic, industrial, and general service.

2. American (National) Standard Fire-Hose Coupling Screw Threads (ASA B26-1025) sizes 2½-inch and larger, for fire hose valves, couplings, hydrant outlets, stand-pipe connections, Siamese connections, and all other special fittings on fire lines.

The two ASA Standards mentioned above agree with the data in the Hose Thread section of the handbook of Screw-Thread Standards for Federal Services, No. H-28, 1944.

The lower portion of the table includes:

Other hose thread standards in general use: The Chicago Hose Thread, Chicago Fire Department Hose Thread, 2½ and 3-inch Iron Pipe Hose Threads, and the California Hose Thread.

Form of thread: The basic form of all Crane hose threads is the American (National) Standard, formerly known as the "U.S. Standard Form".

Ordering: Unless otherwise ordered, Crane Hose Valves are furnished with the threads specified on pages 60 and 61, their dimensions conforming to those shown in the table below.

Special hose threads: Other hose threads included in the table below but not mentioned on pages 60 and 61 can be furnished when so specified; prices on application. When orders are received for American Standard hose threads in sizes ½ or ¾-inch, the garden hose thread will be furnished, and in sizes 1 or 1½-inch the iron pipe hose thread will be furnished, unless otherwise specified. In addition, other types of special threads can be furnished at a special price; orders should be accompanied by a sample, preferably the male end of a hose coupling.

General Classification	Name of Hose Thread		Nominal Size of Hose, Inches	Number of Threads per Inch	Max. Major Dia. (O.D.) of Nipple Thread, Inches	Service Recommendations
American (National) Standard Hose Coupling and American (National) Standard Fire-Hose Coupling Screw Threads	Hose Coupling Screw Threads	Garden Hose Thread	½	11½	1.0625	Garden and similar service
			⅝			
			¾			
		Chemical Hose Thread	¾	8	1.3750	Chemical engine and booster hose
			1			
	American Standard (B33.1-1935)	Fire Protection Hose Thread	1½	9	1.9900	Fire protection hose
	Sizes 2-inch and smaller	Iron Pipe Hose Thread	½	14	.8248	Steam, water, air, oil, and all other hose connections
			¾		1.0353	
			1	11½	1.2951	
			1¼		1.6399	
			1½		1.8788	
			2		2.3528	
	American (National) Standard Fire-Hose Coupling Screw Threads (B26-1925) Sizes 2½-inch and larger		2½	7½	3.0686	Fire hose
			3	6	3.6239	
			3½		4.2439	
			4½	4	5.7609	
Other Hose Threads in General Use	Chicago Standard Hose Thread		½ or ¾	11½	1.0682	†Note: Iron Pipe Hose Threads sizes 2-inch and smaller are included in the American Standard B33.1-1935 and are shown above. The 2½ and 3-inch sizes, shown here, are not included in the American Standard.
			1		1.2797	
			1¼		1.6880	
			1½		1.9272	
			2	8	2.5129	
			3	7	3.6365	
	Chicago Fire Department Hose Thread		2½	7½	2.9916	
	†Iron Pipe Hose Threads		2½	8	2.8434	
			3		3.4412	
	California Standard (Pacific Coast) Hose Thread		½	11	1.0504	
			¾			
			1		1.3141	
			1¼		1.8561	
			1½		2.0870	
			2	10	2.5416	
			2½	7½	2.9916	

Hose Valves....pages 60 and 61

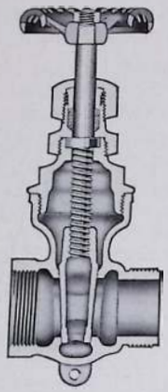
Hose Goods....pages 62 to 64

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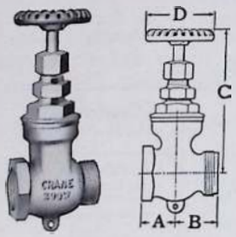
Brass Hose Gate Valves

Wedge Disc—Non-Rising Stem

For 200 Pounds Cold Water Working Pressure



Cross Section No. 451



No. 451, Screwed

The Hose Gate Valves shown on this page are strong and ruggedly constructed. They have a non-rising stem and a wedge disc. Their deep stuffing box is fitted with a gland.

Hose threads: The valves have an American Standard Taper Pipe Thread on the female end. Unless otherwise ordered, they are furnished with the following thread on the male end:

No. 451 Valves

1 to 2″ sizes — Chicago Standard Hose Thread
2½″ size — Chicago Fire Department Hose Thread

No. 453 Valves

1½″ size — Chicago Standard Hose Thread
2½″ size — American (National) Standard Fire-Hose Coupling Screw Thread

When so ordered, the male end can be supplied with the following threads at no additional charge:

No. 451 Valves

All sizes — Iron Pipe Hose Thread
All sizes — California Standard Hose Thread
1½″ size — American (National) Standard Fire Protection Hose Thread
2½″ size — American (National) Standard Fire-Hose Coupling Screw Thread

No. 453 Valves

Both sizes — Iron Pipe Hose Thread
Both sizes — California Standard Hose Thread
1½″ size — American (National) Standard Fire Protection Hose Thread
2½″ size — Chicago Fire Department Hose Thread

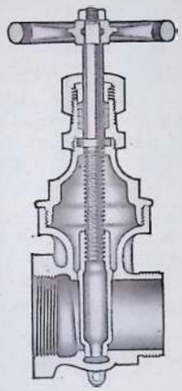
Orders for any other hose thread should be accompanied by a sample, preferably the male end of a hose coupling. For threads, see page 59.

Valves with brass cap and chain: When so ordered, any of the valves shown on this page will be furnished with a brass cap and chain, as illustrated at the lower left. An extra charge is made for the cap and chain. For extra prices, refer to the table shown below.

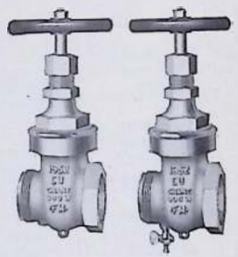


Underwriters' Specifications: The No. 453 Hose Gate Valves have been approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories for water working pressures up to 300 pounds. The valve body is marked "CU" and "FM".

For 300 Pounds Cold Water Working Pressure
Underwriters' Pattern



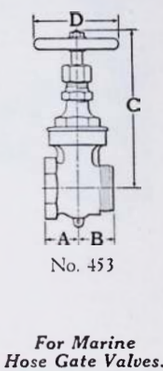
Cross Section No. 453



Without Drain Cock — With Drain Cock

No. 453, Underwriters' Screwed

Unless otherwise ordered, No. 453 Valves will be furnished without the drain cock.



No. 453

For Marine Hose Gate Valves, see page 403.

List Prices and Dimensions

	Catalog Number	Size	List Prices: Per Valve—Without Cap and Chain, Without Drain Cock	List Prices: Per Valve—Without Cap and Chain, With Drain Cock	List Prices: Add for brass cap and chain, per valve	Dimensions, in Inches: A	B	C	D
		Inches		*Specify*	*Specify*				
Hose Gate Valves with Rough Body, Plain	No. 451	1	9.30		2.80	1⅜	1⅝	5⅝	2¾
		1¼	12.00		3.20	1½	1⅞	6½	3 1/16
		1½	15.50		3.90	1⅝	2 1/16	7¼	3⅝
		2	22.00		5.00	1⅞	2¼	8⅝	4 1/16
		2½	31.00		7.70	2⅛	2⅝	10	4¾
	No. 453	1½	17.00	20.00	3.90	1⅝	2¼	7½	4½
		2½	40.00	44.00	7.70	2 5/16	2⅝	11	6

Unless otherwise ordered, valves are furnished without cap and chain and without drain cock.

Brass Hose Valves

Chicago Hose Valves

With Leather Disc
200 pounds cold water working pressure



Cross Section No. 50



No. 50, Screwed

The valves shown on this page are designed and constructed for long, dependable service.

Chicago Hose Valves: Chicago Hose Valves are excellent for use on outside standpipes.

Garden Hose Valves: Garden Hose Valves are ideal for garden and lawn hose service for homes, estates, greenhouses, cemeteries, golf courses, etc. They are ruggedly constructed.

Angle Hose Valves: Angle Hose Valves are recommended for use on standpipes and hose racks, and for similar service. They are regularly furnished with a Crane No. 6 Composition Disc; for description of discs, see page 133.

Hose threads: All of these valves have an American Standard Pipe Thread on the inlet. Unless otherwise ordered, they are furnished with the following thread on the male outlet:

½ to 2″ sizes — Chicago Standard Hose Thread
2½″ size — Chicago Fire Department Hose Thread

When so ordered, the outlet can be supplied with the following threads at no additional charge:

All sizes — Iron Pipe Hose Thread
All sizes — California Standard Hose Thread
1½″ size — American (National) Standard Fire Protection Hose Thread
2½″ size — American (National) Standard Fire-Hose Coupling Screw Thread

Orders for any other hose thread should be accompanied by a sample, preferably the male end of a hose coupling. For threads, see page 59.

Garden Hose Valves

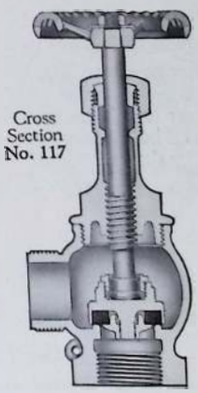
With Leather Disc



No. 56 Screwed — No. 58 Screwed

Angle Hose Valves

With Crane Composition Disc
250 pounds cold water working pressure



Cross Section No. 117



Without cap and chain — With and c

*No. 117, Screwed

*No. 117 Valves are furni with a brass cap and only if orders so specify extra prices in table.

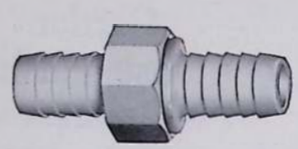
For list prices of compos discs for No. 117 Valv see page 133.

List Price and Dimensions

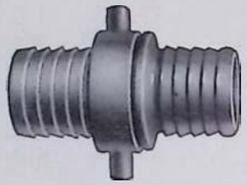
	Catalog Number and Type	Size	List Prices: Per Valve	List Prices: Add for brass cap and chain, per valve	Dimensions, in Inches: Center to hose end	Over-all height, open	Length of handle or diameter of wheel
		Inches					
Hose Valves with Rough Body, Plain	No. 50 Chicago	1	7.50		2½	8⅛	5⅛
		1¼	9.00		3	9⅝	5¾
		1½	13.00		3	10½	6½
		2	16.70		3½	11⅞	8¼
		2½	21.00		4 1/16	13⅞	8¼
	No. 56 Garden	½	3.60		1⅞	4 9/16	2 1/16
		¾	4.00		1⅞	4¾	2 1/16
		1	5.00		2¼	5 13/16	2 9/16
		1¼	9.50		2¾	7½	3 1/16
		1½	13.00		3 1/16	8⅝	3⅝
		2	17.00		3¾	9⅜	4 1/16
	No. 58 Garden	½	3.60		1⅜	4 9/16	2 1/16
		¾	4.00		1⅜	4¾	2 1/16
		1	5.00		1⅝	5 13/16	2 9/16
		1¼	9.50		2 1/16	7½	3 1/16
		1½	13.00		2¼	8⅝	3⅝
		2	17.00		2⅝	9⅜	4 1/16
	*No. 117 Angle	¾	9.00	2.50	1 9/16	7 3/16	2¾
		1	10.50	2.80	1¾	7 13/16	3 1/16
		1¼	14.00	3.20	2¼	9⅛	3⅝
		1½	17.60	3.90	2⅜	9⅞	4 1/16
		2	26.00	5.00	2¾	12 3/16	5⅜

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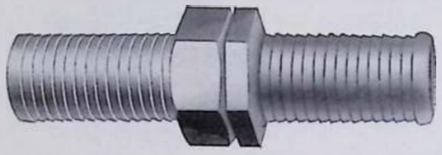
Hose Couplings



No. 17C-A
Brass Water Hose Couplings
Sizes 1-inch and smaller—Without lugs



No. 89-A
Brass Water Hose Coupling
Sizes 1¼ to 2½-inch—Lugs on female half



No. 90-A
Brass Steam Hose Coupling

All of the couplings shown above are made of high grade cast brass.

Water hose couplings have deep, long-cut threads to effect fast connections. Larger sizes are available; they have lugs on both the male and female half.

Steam hose couplings have semi-finished swivels, recessed for washers. The tailpieces are long and extra heavy with smooth, chamfered ends.

Sizes and Thread Connections

Catalog No.	Size of Hose, Inches	Connections Available, in Inches: Regular	Connections Available, in Inches: On Order
No. 17C-A	½, ⅝, ¾	¾ HPT	¾ IPT
	1	1 IPT	—
No. 89-A	1¼, 1½, 2, 2½	IPT	As specified
No. 90-A	¼, ⅜	IPT	—
	½, ⅝, ¾	¾ IPT	½ IPT
	1, 1¼, 1½	IPT	—
	2, 2½, 3	IPT	—

HPT—Chicago Hose Thread
IPT —Iron Pipe Thread

Hose Clamps

No. 1923-A, Galvanized Steel
No. 3935-A, Stamped Sheet Brass



These clamps hold the hose evenly and completely around the outside. Easily tightened, their top is formed to prevent the nut from turning. No. 1923-A are heavy, high quality strip steel, plated to resist corrosion. No. 3935-A are stamped sheet brass.

Sizes and Dimensions

Size of Hose, Inches	Hose Ply	Inside Diameter, in Inches: No. 1923-A Steel Clamp, For Water Hose	No. 1923-A Steel Clamp, For Steam Hose	No. 3935-A Brass Clamp, For Water Hose	No. 3935-A Brass Clamp, For Steam Hose
3/16	3	7/16	—	7/16	—
¼	3	½	—	½	—
⅜	2	9/16	—	9/16	—
	3	⅝	—	⅝	—
	4	11/16	—	11/16	—
½	2	¾	—	¾	—
	3	⅞	—	⅞	—
	4	15/16	1 1/16	15/16	—
	5	1	1 3/16	—	—
	6	—	1¼	—	—
⅝	2	1	—	—	—
	3	1 1/16	—	1 1/16	—
	4	1⅛	—	1⅛	—
¾	2	1 1/16	—	1 1/16	—
	3	1⅛	—	1⅛	—
	4	1 3/16	1⅜	1 3/16	1⅜
	5	1¼	1 7/16	1¼	1 7/16
	6	—	1½	—	1½
1	2	1 5/16	—	1 5/16	—
	3	1⅜	—	1⅜	—
	4	1 7/16	1 11/16	1 7/16	1 11/16
	5	1½	1¾	1½	1¾
	6	—	1 13/16	—	1 13/16
1¼	2	1 5/8	—	—	—
	3	1 11/16	—	1 11/16	—
	4	1 13/16	1 15/16	1 13/16	1 15/16
	5	1⅞	2	—	2
	6	—	2 1/16	—	—
1½	3	2	—	2	—
	4	2⅛	2¼	2⅛	—
	5	2 3/16	2 5/16	—	—
	6	—	2⅜	—	2⅜
1¾	3	2¼	—	—	—
	4	2⅜	—	—	—
2	3	2 7/16	—	2 7/16	—
	4	2 9/16	2⅝	2 9/16	2⅝
	5	2 11/16	2¾	—	—
	6	—	2⅞	—	—
	Suction	3	—	—	—
2¼	3	2¾	—	—	—
	4	2 13/16	2 15/16	—	2 15/16
	5	—	3	—	3
	6	—	3 1/16	—	—
2½	3	2 15/16	—	2 15/16	—
	4	3	—	3	—
	5	3 1/8	—	—	—
2¾	4	3¼	—	—	—
3	3	3½	—	3½	—
	4	3½	—	3½	—

Other Sizes Available
Large size, extra heavy steel clamps are available with the following size inside diameters:

2¾"	4¼"
2⅞	4⅜
3	4½
3⅛	4⅝
3¼	4¾
3⅜	4⅞
3½	5
3⅝	5¼
3¾	5⅜
3⅞	5½
4	6
4⅛	6½

Ordering Hose Clamps: Orders for hose clamps should include the following information: catalog number, size and hose ply, quantity, and whether for water or steam hose.

Prices on application

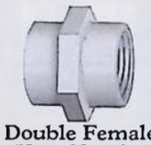
Brass Hose Fittings



Male
Hose Nipples
No. 91-A



Male
and Female
Hose Nipples
No. 92-A



Double Female
Hose Nipples
No. 9200-A



Male
and Female
Hose Reducers
No. 9301-A
(Small sizes without lugs)
No. 93-A
(Large sizes with lugs)



Male
and Female
Hose Bushings
No. 94-A
(Small Sizes)
No. 94L-A
(Large Sizes)

Sizes and Thread Connections

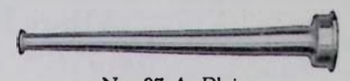
Catalog Number	Sizes, in Inches, and Threads		
No. 91-A Nipples Male Ends	⅜ IPT* × ⅜ IPT ½ IPT* × ½ IPT ½ IPT × ¾ HPT		
	¾ IPT × ¾ IPT* ¾ IPT × ¾ HPT ¾ HPT × 1 IPT ¾ IPT* × 1 IPT		
	1 IPT* × 1 IPT 1 IPT × 1¼ IPT* 1 IPT × 1½ IPT*		
	1¼ 1½ 2	For these straight sizes, specify threads wanted	
	2½ 3 3½ 4		
No. 92-A Nipples Male × Female	¾ HPT × ½ IPT ¾ IPT × ¾ HPT ¾ HPT × ¾ IPT 1 IPT* × 1 IPT		
	1¼ 1½ 2	For these straight sizes, specify threads wanted	
	2½ 3 3½		
No. 9200-A Nipples Female Ends	½ IPT × ¾ HPT ¾ IPT × ¾ HPT 1 IPT × 1 HPT		
	Larger sizes available; specify threads wanted.		
No. 9301-A Reducers Male × Female	½ IPT* × ¾ HPT ¾ HPT × 1 IPT*		
No. 94-A Bushings Male × Female	¾ HPT × ½ IPT* 1 IPT* × ¾ HPT		
No. 93-A Reducers and No. 94L-A Bushings Male × Female	1¼ × 1 × ¾	For these reducing sizes, specify threads wanted.	
	1½ × 1¼ × 1 × ¾		
	2 × 1½ × 1¼ × 1 × ¾		
	2½ × 2 × 1½ × 1¼ × 1 × ¾		
	3 × 2½ × 2		

HPT—Chicago Hose Thread.
IPT (without asterisk)—Taper Iron Pipe Thread.
*IPT (with asterisk)—Straight Iron Pipe Thread.

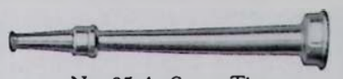
Hose fittings are made of high grade cast brass. When ordering, include the type of thread connection wanted.

Prices on application

Brass Hose Nozzles



No. 97-A, Plain



No. 95-A, Screw Tip

Specify catalog number, quantity, size, thread, and length. Sizes 1¼-inch and larger are recessed for washers.

Sizes and Dimensions

Sizes, Inches: No. 97-A Nozzle	Sizes, Inches: No. 95-A Nozzle	Length, Inches	Discharge, Inches
¾	—	3	¼
¾	¾	6	¼
—	¾	7	¼
1	—	4	5/16
	—	8	5/16
1¼	—	10	⅜
	—	12	⅜
1½	—	10	½
	—	12	½
	—	15	⅝
2	—	12	9/16
2½	—	12	1
	—	15	1

Nozzles are furnished with various standard hose threads, including iron pipe hose threads; specify thread desired. Other size discharges are available at additional cost.

Brass Hose Caps

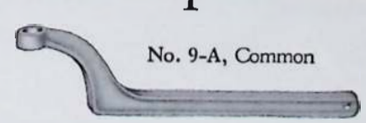


No. 120-A

No. 120-A is available in sizes ¾, 1, 1¼, 1½, 2, 2½, 3, 3½, and 4-inch.

Sizes ¾ and 1-inch do not have spanner lugs. A chain, charged as an extra, can be furnished on sizes 1½-inch and larger, when specified. When ordering Hose Caps, specify threads wanted.

Hose Spanners



No. 9-A, Common

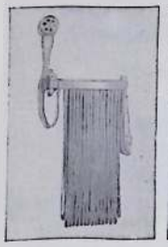
The No. 9-A Hose Spanner is furnished in sizes 1½ x 9, 2 x 10, 2½ x 10¾, 3 x 11, and 4 x 12 inches.

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Hose Racks and Cabinets

Allen Bowes Swinging Hose Racks

For Unlined Linen Hose



No. 137-A
Style E



No. 138-A
Style F



No. 139-A
Style G

For 1¼ to 2½-inch hose in capacities of 50, 75, and 100 feet. These racks can be furnished with pipe clamps, wall brackets, or rack nipples. When ordering, specify style, size of hose, and finish desired.

No. 137-A: Style E is mounted by attaching the rack to the wall.

No. 138-A: Style F is mounted by clamping the rack to a riser. Size of pipe clamp must be specified.

No. 139-A: Style G has a swivel back which swings on a nipple screwed into the valve. It is used with or without a cabinet. The swivel back size corresponds with the size of hose; i.e., a 1½-inch hose rack has a 1½-inch collar for a 1½-inch valve and nipple.

Recessed Cabinet for Bowes Hose Rack



No. 262-A
Available with door labeled "Fire Hose."

The doors (front and back) of this cabinet are pressed from one piece of furniture steel without joints or rivets and are accurately fitted into a rabbet to exclude dust and dirt. The channel steel inner construction of the door assures additional rigidity, yet is adjustable so as to hold either plate glass panel, D.S.A. glass panel, or clear wire glass panel.

This cabinet is made with a 1¼-inch projecting trim or with a flat trim. The 1¼-inch projecting trim gives the maximum capacity of cabinet with a minimum of wall recess requirements. Any depth of trim can be had at additional cost.

The cabinet is equipped with sturdy brass nickel-plated hinges on the right hand side, to permit full opening of the door. Hinges on the left hand side can be furnished when specified. Lever handle catch is brass, nickel-plated. Bullet catch and pull handle can be furnished.

Cabinets regularly have a baked-on white enamel finish on the inside and a white priming coat on the outside. Any special color or graining applied when specified.

Bronze cabinets, made of hard copper, bronze plated, instead of steel, bronze plated, can also be furnished.

Capacity		Cabinet Sizes in Inches						
Hose Feet	Valve Size Inches	Inside Width	Inside Height	Inside Depth	Trim Width	Trim Height	Glass Size	Valve Inlet From Top
50	1¼-1½	19¾	28¾	5½	24½	33½	15×24	3¼
75	1¼-1½	20¾	30¾	5½	25½	35½	16×26	3¼
100	1¼-1½	22¾	32¾	5½	27½	37½	18×28	3¼
50	2	19¾	28¾	6½	24½	33½	15×24	3⅝
75	2	22¾	32¾	6½	27½	37½	18×28	3⅝
100	2	24¾	34¾	6½	29½	39½	20×30	3⅝
50	2½	19¾	28¾	7½	24½	33½	15×24	4
75	2½	22¾	32¾	7½	27½	37½	18×28	4
100	2½	24¾	34¾	7½	29½	39½	20×30	4

Outside Wall Fire Hose Cabinets



Outside wall cabinets are available in any size.

They are recommended for use where the protection of a hose cabinet is needed but where insufficient wall depth prohibits the use of a recessed cabinet.

The cabinets can be furnished with either a full glass panel or a duo-panel door. Orders must specify if knockouts and hinges are to be on left or right hand side.

No. 262A-A: Made of Alenco Hollow Metal. In estimating wall space required, add 3¾ inches to inside dimensions.

No. 262N-A: Made of Nella Sheet Steel. In estimating wall space required, add 3 inches to inside dimensions.

Prices on application

Brass Stops and Brass, Bronze, and Iron Cocks

Brass Stops
- Rough....page 66
- Ground Key....page 66
- Hydrant....page 67
- Gas Service....page 68

Brass and Bronze Cocks
- Brine....page 66
- Pet....page 67
- Gauge....page 67
- Cylinder....page 67
- Spring Loaded....page 68
- 125-Pound....page 69
- 250-Pound....page 69

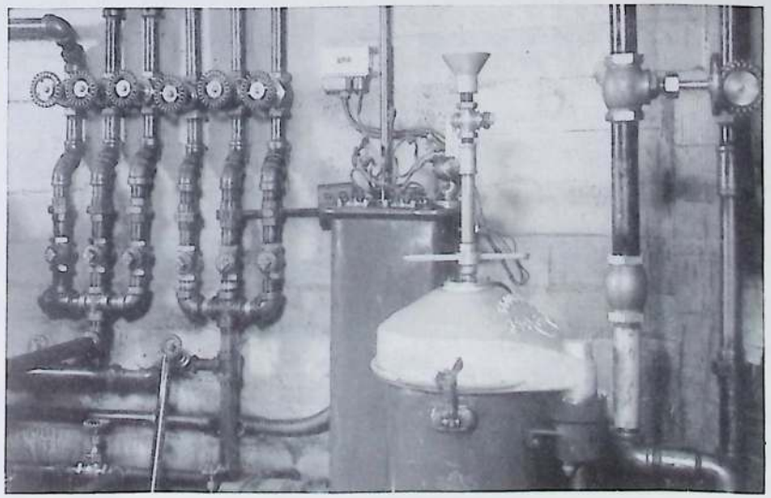
Iron Cocks
- 125-Pound W.O.G....page 70
- 200-Pound W.O.G....page 70
- Essex Pattern....page 70
- Gas Line....page 71
- Spring Loaded....page 71

Brass Ground Key Faucets....page 66

Accessories
- Hydrant Clamps and Handles....page 67
- Street Washer Keys....page 67
- Wood Rod Couplings....page 67
- Wrenches for Cocks....page 72

For Brass Try Cocks, see page 361.

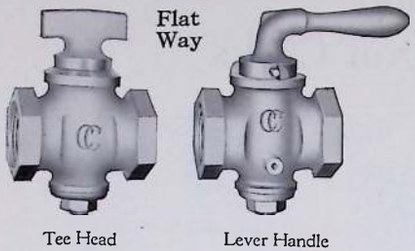
7



Industrial plants, small and large, utilize Crane products.

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Brass Rough Stops



Tee Head — Lever Handle



No. 812 Tee Head — No. 812½ Lever Handle

Without Check or Drain
No. 804 — No. 804½ (not shown)

With Check and Drain
No. 806 (not shown) Drilled Drain — No. 806½ Tapped Drain

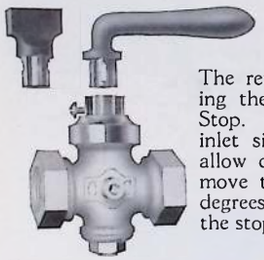
7

The drain on the Nos. 806 and 806½ is used to drain the outlet side of the line after the Stop is shut off. In this position, a small hole in the outlet side of the plug allows the water to drain into the port opening in the plug, which is now aligned with the drain hole in the body. Complete drainage of the outlet line requires proper venting, which is easily accomplished by opening a valve on the outlet side. The drain on the No. 806½ is tapped for a drain tube; drain tubes ($17/64$-inch O.D. with 27 threads per inch) are extra.

List Prices, Each, and Dimensions, in Inches

Size		Inches	⅜	½	⅝	¾	1	1¼	1½	2
Flat Way	No. 804			2.60		3.40	4.90	6.80	9.30	15.40
	No. 804½		2.10	2.60		3.40	4.90	6.80	9.30	15.40
	No. 806			2.80	3.20	3.60	5.20	7.10	10.50	18.20
	No. 806½		2.50	2.80		3.60	5.20			
	End to end		1⅞	2⅛	2½	2 11/16	3⅛	3 5/16	3 15/16	4 7/16
Round Way	No. 812			3.10	4.00	4.50	6.50			
	No. 812½			3.10		4.50	6.50			
	End to end			2⅜	2 13/16	2⅞	3 9/16			

Brass Ground Key Stops



No. 821, Removable Lever Handle
No. 824, Removable Tee Head

With Reversible Check and Tapped Drain

The reversible check permits draining the inlet or outlet side of the Stop. To effect drainage from the inlet side when the plug is set to allow drainage from the outlet, remove the collar, turn the plug 180 degrees, and then re-locate the collar; the stop will now drain from the inlet side. Drain tubes ($17/64$-inch O.D. with 27 threads per inch) are extra.

List Prices and Dimensions

Size	Inches	½	⅝	¾	1
No. 821 or No. 824	Each	3.90	4.20	5.00	6.80
End to end	Inches	2⅞	3⅛	3¼	3 11/16

Brass Brine Cocks

With Male and Female Ends

The No. 814 Brine Cocks with lever handle were designed for cold storage plant installations on lines handling brine, but they can be used on many other services requiring a brass cock having male and female end connections.



No. 814 Lever Handle

List Prices and Dimensions

Size	Inches	⅜	½	¾	1
No. 814	Each	2.30	2.80	3.40	5.00
End to end	Inches	2¼	2½	2⅞	3⅜

Brass Ground Key Faucets

When ordering, specify whether Rough or Polished Faucets are wanted.



No. 800, Plain

List Prices

Size		Inches	⅜	½	¾	1
No. 800	Rough	Each	2.40	2.80	3.60	5.40
	Polished	Each	3.70	4.10	5.00	6.90
No. 801	Rough	Each		3.20	4.20	6.30
	Polished	Each		4.50	5.60	7.80
	Size of hose thread			¾"	¾"	1"

No. 801 Faucets have Chicago Hose Threads on the outlet.

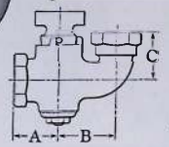


No. 801, For Hose

Brass Hydrant Stops



No. 816, Tee Head
With Check and Drain



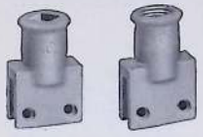
The No. 816 Brass Hydrant Stop is made primarily for underground installations. The elbow-shaped outlet permits assembly of the riser pipe for the hydrant without using any intervening fittings. When the Stop is shut off, the riser pipe and hydrant will drain through the drain hole, thereby preventing freezing in cold weather.

The hydrant should be open to vent for complete drainage.

List Prices and Dimensions

Size	Inches	½	¾	1
No. 816	Each	4.20	5.00	7.00
A	Inches	1 3/16	1 9/16	1 9/16
B	Inches	1 13/16	2⅛	2 7/16
C	Inches	1 9/16	1⅞	2⅛

Hydrant Clamps



For Square Rod — Tapped For Pipe

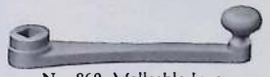
No. 850
Malleable Iron

Orders should specify whether with square hole or tapped for pipe.

List Prices

			Square Rod		Pipe Tap	
Size of rod or pipe		Inches	⅜	½	⅜	½
Width of slot		Inches	7/16	½	½	½
No. 850	Black	Each	.20	.30	.20	.30
	Galv.	Each			.30	.40

Hydrant Handle

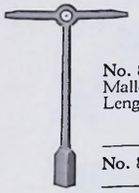


No. 860, Malleable Iron
To fit ⅜-inch Square Rod

List Price

No. 860		Each	.60

Street Washer Keys



No. 856
Malleable Iron
Length, 8¾ Inches

List Prices, Black

No. 856	To fit ⅜-inch square rod	Each	.50
	To fit ½-inch square rod	Each	.60

Wood Rod Couplings



No. 854, Malleable Iron

Pipe thread is ⅜-inch; the couplings may be used with 1 or 1⅛-inch square rod.

List Prices, Per Set

No. 854	Black	1.50
	Galv.	1.60

Brass Pet Cocks



No. 700, Tee Head



No. 702, Lever Handle

Brass Gauge Cocks



Male
No. 708, Tee Head



Female
No. 712, Tee Head



Male and Female
No. 744, Tee Head

List Prices

Size		Inches	⅛	¼	⅜	½
Pet Cocks	No. 700	Each	1.10	1.20	1.30	1.50
	No. 702	Each	1.40	1.50		
Gauge Cocks	No. 708	Each	1.40	1.60		
	No. 712	Each	1.60	1.90	2.20	
	No. 744	Each		2.00		
Cylinder Cock	No. 724	Each	2.70	3.00	*	*

Brass Cylinder Cocks



No. 724
Lever Handle

*For No. 724 Cylinder Cocks in sizes larger than ¼-inch, use No. 800 Ground Key Faucets; see page 66.

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Brass Gas Service Stops



No. 270, Flat Head



No. 272, Square Head



No. 276, Tee Head



No. 278, Tee Head With Check



No. 284, Flat Head With Lockup



"Gas Stove Stop"

No. 298, Lever Handle With Check

List Prices and Dimensions

Size			Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 270			Each	1.70	1.90	2.20	2.80	3.60	5.00	6.70	11.00
No. 272			Each	1.70	1.90	2.20	2.80	3.60	5.00	6.70	11.00
No. 276			Each	1.70	1.90	2.20	2.80				
End to end			Inches	1⅝	1⅞	2 1/16	2⅜	2 11/16	3 5/16	3 11/16	4 9/16
Stops with Check	No. 278		Each	2.00	2.20	2.60	3.20				
	No. 298		Each	2.10	2.40	2.70	3.30	4.30			
	End to end		Inches	1⅝	1⅞	2 1/16	2⅜	2 11/16			
Stop with Lockup	No. 284		Each			2.80	3.60	4.60	6.00		
	End to end		Inches			2⅛	2⅝	3 1/16	3 5/16		

Crane Brass Gas Service Stops are made with flat head, square head, tee head, or lever handle, as illustrated here. The No. 284 has a lockup which permits locking the Stop in the closed position; a lock is not included in the price of the Stop.

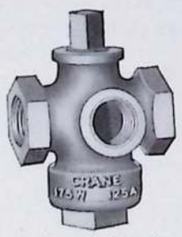
The No. 298, often referred to as a "Gas Stove Stop", is commonly used in the gas line to gas stoves (or other appliances) so that the gas can be shut off at the appliance without shutting off the entire supply in the building.

Brass Spring-Loaded Cocks

WORKING PRESSURES
125 pounds air—175 pounds cold water, non-shock
Air Tested



Square Head
No. 305



Square Head
No. 306, Three-Way



Square Head
No. 307, Four-Way

List Prices and Dimensions

Size		Inches	¼	⅜	½
No. 305	Price	Each	5.00	5.50	6.20
	Center to end	Inches	3 1/32	3 1/32	1 3/32
No. 306	Price	Each	6.00	7.50	9.50
	Center to end	Inches	3 1/32	1 1/16	1 3/32
No. 307	Price	Each	7.00	8.70	11.00
	Center to end	Inches	1 1/16	1⅛	1 9/32

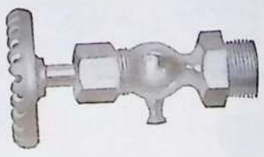
Spring loaded cocks have a steel spring between the plug and the cap. The spring compensates for wear, assures tightness between the body and plug, and permits easy operation.

Iron Spring-Loaded Cocks . . . . page 71

Brass Try Cocks



125-Pound
No. 730
(Short Pattern)



250-Pound
No. 734
With Stuffing Box

Crane manufactures a variety of brass try cocks suitable for services ranging from 15 pounds to 250 pounds steam working pressures. For complete description and list prices, see page 361.

Wrenches . . . page 72

125-Pound Brass Cocks

125 pounds working pressure
Air Tested



No. 250
Square Head



No. 252
Flat Head



No. 254
Square Head
With Check



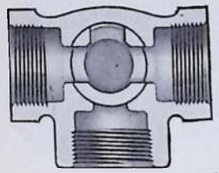
No. 256
Tee Head



No. 258
Tee Head
With Check



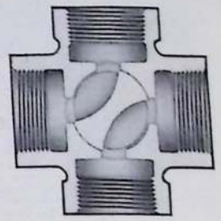
No. 266
Male and Female
Flat Head



No. 268
Square Head with Check
Three-Way

No. 269 Four-Way Cocks are made to order only.





No. 269
Square Head with Check
Four-Way

List Prices and Dimensions

Size			Inches	⅛	¼	⅜	½	¾	1	1¼	1½	2
List Prices	No. 250, Square Head		Each		2.00	2.30	3.00	3.90	5.40	7.00	9.30	15.00
	No. 252, Flat Head		Each		2.00	2.30	3.00	3.90	5.40	7.00	9.30	15.00
	No. 254, Square Head with Check		Each				3.60	4.60	6.30	8.40	10.80	17.00
	No. 256, Tee Head		Each	2.00	2.00	2.30	3.00					
	No. 258, Tee Head with Check		Each	2.30	2.30	2.70	3.60					
	No. 266, Flat Head, Male and Female		Each		2.30	2.60	3.50	4.40	6.00			
	No. 268, Three-Way, Square Head		Each		3.00	3.60	4.70	6.00	7.60	11.00	14.00	22.00
	No. 269, Four-Way, Square Head		Each				6.50	9.50	13.50	18.00	23.00	32.00
Dimensions in Inches	End to end	No. 250, 252, 254, 256, or 258		1⅝	1⅝	1¾	2 1/16	2 7/16	3	3½	3 13/16	4 9/16
		No. 266			1 15/16	2 3/16	2½	2⅞	3⅜			
	Center to end	No. 268			⅞	1 31/32	1¼	1 17/32	1⅝	2	2 3/16	2 19/32
		No. 269					1¼	1 17/32	1⅝	2	2 3/16	2 19/32

250-Pound Bronze Cocks



No. 80 E
Square Head

250 pounds working pressure
Air Tested

The body and plug are made of Crane Special Bronze, a leaded tin bronze having unusual strength and hardness.

List Prices and Dimensions

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 80 E	Each	3.00	4.00	5.50	7.40	11.00	16.00	23.00	33.00
End to end	Inches	1¾	2	2⅜	2 11/16	3 5/16	4	4½	5¼

Wrenches . . . page 72

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asbestosclaims.law/library/21276/54

125-Pound W.O.G. Iron Cocks

WORKING PRESSURE
125 pounds cold water, oil, air, or gas, non-shock



Square Head
No. 320, All-Iron

No. 324
With Brass Plug and Washer



Flat Head
No. 320½, All-Iron

No. 324½

Air Tested

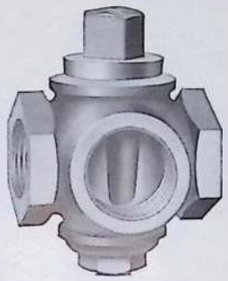
All of these Cocks are regularly fitted with an iron nut.

When so ordered, these Cocks can be furnished with a check, at an extra price.



Square Head
Flanged

No. 325, All-Iron



Three-Way, Square Head
No. 326, All-Iron

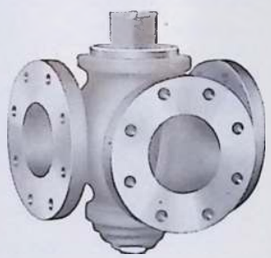
No. 330
With Brass Plug and Washer

List Prices, Black, and Dimensions, in Inches

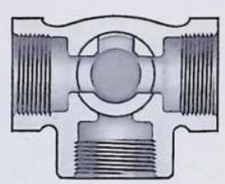
Size		Inches	½	¾	1	1¼	1½	2	2½	3	4
Screwed	No. 320	Each	2.50	2.90	3.30	4.30	5.30	7.00	16.00	26.00	43.00
	No. 320½	Each	2.50	2.90	3.30	4.30	5.30	7.00			
	No. 324	Each	3.60	4.30	5.20	7.00	10.00	13.50	28.00	43.00	75.00
	No. 324½	Each	3.60	4.30	5.20	7.00	10.00	13.50			
	No. 326	Each		4.00	4.50	5.60	6.80	9.40	21.00	29.00	52.00
	No. 330	Each		5.50	6.50	8.50	12.00	16.00	31.00	47.00	85.00
	End to end		2¼	2¾	3⅜	4⅛	4⅝	5¼	6⅜	7¾	9⅞
	Ctr. to outlet end (3-way)		1 7/16	1 11/16	2 1/16	2¼	2⅝	3 3/16	3⅞	5 1/16	
Flanged F. & D.	No. 325	Each						16.00	24.00	32.00	51.00
	No. 331	Each						27.00	35.00	43.00	59.00
	Face to face							6⅜	8⅝	9⅝	12⅛
	Center to face of side opening (3-way)							4⅛	4 5/16	4 13/16	6 1/16
	Diameter of flanges							6	7	7½	9
	Thickness of flanges							5/8	1 1/16	¾	1 5/16

End flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Prices include drilling to this Standard. No deduction is made if cocks are ordered faced only.

Templates for drilling, page 459.



Three-Way, Square Head
No. 331, All-Iron Flanged



Cross Section Three-Way

Iron Cocks



200-Pound W.O.G.

WORKING PRESSURE
200 pounds cold water, oil, air, or gas, non-shock

Air Tested

Flat Head
No. 334, All-Iron

No. 337
With Brass Plug and Washer

List Prices, Black, and Dimensions

Size	Inches	½	¾	1	1¼	1½	2
No. 334	Each	3.50	4.20	5.00	6.00	8.50	12.00
No. 337	Each	4.60	6.00	7.50	10.30	14.00	18.00
End to end	Inches	3	3⅝	4	4¾	5⅜	6⅞

Wrenches for Iron Cocks . . . . page 72

Iron Lock Cocks

Essex Pattern

WORKING PRESSURE
175 pounds cold water, oil, air, or gas, non-shock

Air Tested

Can be locked open or closed. One slotted opening in the body and two in the plug permit the hasp to be inserted in either position.



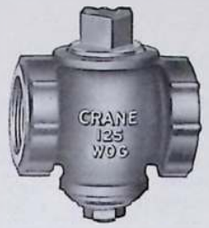
Square Head
No. 321, With
Iron Plug and Brass Washer

List Prices, Black, and Dimensions

Size	Inches	2	3	4
No. 321	Each	10.50	28.00	47.00
End to end	Inches	6¾	8⅝	10
Center to top	Inches	4¼	5½	7¾
Center to bottom	Inches	4⅝	6	6⅞

Prices do not include lock.

Iron Gas Line Cocks



Square Head
No. 1228
With Brass Plug and Washer

WORKING PRESSURE
125 pounds cold water, oil, air, or gas, non-shock

Air Tested

These sturdy, compact, full area cocks are especially suited for gas lines. They have a brass plug and washer, a cast iron body, and an iron nut.

All sizes of No. 1234 Cocks have a ½-inch hole for Lockup in which a padlock or sealing pin may be used.

No. 1236 Cocks, ideal for underground installations, have a ⅛-inch recess at each end, which protects the threads and assists in supporting the pipe.



Flat Head, with Lockup
No. 1234
With Brass Plug and Washer



Flat Head
No. 1232
With Brass Plug and Washer

List Prices, Each, and Dimensions

Size	Inches	½	¾	1	1¼	1½	2
No. 1228	Black	2.00	2.30	2.80	3.70	5.40	8.00
	Galv.	2.10	2.40	3.00	4.00	5.70	8.30
No. 1232	Black	2.00	2.30	2.80	3.70	5.40	8.00
	Galv.	2.10	2.40	3.00	4.00	5.70	8.30
No. 1234	Black	2.30	2.70	3.30	4.30	6.20	9.00
	Galv.	2.40	2.80	3.50	4.60	6.50	9.30
End to end	Inches	2¼	2⅝	3¼	3¾	4¼	5 1/16
No. 1236	Galv.		3.00	3.60	4.60		
End to end	Inches		3⅝	4¼	4¾		

When so ordered, the No. 1228 Cocks can be furnished with a check, at an additional price.



Flat Head, with Recessed Ends
No. 1236
With Brass Plug and Washer

Iron Spring-Loaded Cocks

Mine Cocks

WORKING PRESSURES
125 pounds air
175 pounds cold water, non-shock

Air Tested



No. 319
Square Head
With
Brass Plug

All-Iron Mine Cocks also are available; prices are furnished on application.

Four-Way Cocks

WORKING PRESSURES
250 pounds air
350 pounds cold water, non-shock

Air Tested

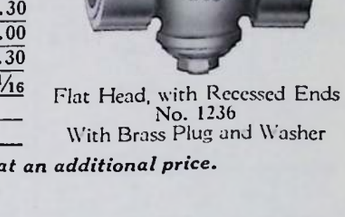
No. 339 Four-Way Cocks are used on hydraulic or air cylinders, hydraulic presses, etc. The diagrams below illustrate how they operate:

Upper diagram: Supply fluid diverted to one end of cylinder; fluid from opposite end passes into exhaust line.

Lower diagram: With wrench turned 90°, action is reversed, moving piston in opposite direction.

Installation must be as indicated. The cocks have an equalizing duct in the body which leads from the inlet port to the chamber beneath the plug. Use series "M" wrenches shown on page 72.

No. 339
Four-Way
Square Head
with
Brass Plug



List Prices and Dimensions

Size		Inches	½	¾	1	1¼	1½	2
No. 319	Price	Each	5.10	5.50	6.00	8.00	10.50	15.00
	End to end	Inches	2¼	2⅝	3⅛	4	4¼	5⅛
No. 339	Price	Each	8.50	9.70	14.00	22.00	32.00	48.00
	Center to end	Inches	1 5/16	1 9/16	1 15/16	2¼	2⅝	3½

Spring-loaded: Spring-Loaded Cocks have a steel spring between the plug and the cap. The spring compensates for wear, assures tightness between the body and plug, and permits easy operation.

Brass Spring-Loaded Cocks....page 68

Wrenches for Cocks . . . . page 72

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Malleable Iron Wrenches

For Brass, Bronze, and Iron Cocks

List Prices



Square Head



Flat Head

Square Head
For No. 319 and No. 339



Square Head Wrenches

Catalog Number of Wrench	List Price Each	Length from Center of Head to End Inches	Suitable for Brass or Bronze Cocks: No. 80 E	Nos. 250 254 272	Nos. 268 269	Nos. 305 306	No. 307	Iron Cocks: Nos. 320 321 324 325 326 330 331	No. 1228
1-S	.14	3	¼	¼	¼				
2-S	.16	3½	⅜	⅜		¼, ⅜, ½	¼, ⅜		
3-S	.16	4		½	⅜		½		½
4-S	.22	5	½	¾	½			½	¾
5-S	.28	6½	¾	1	¾			¾	1
6-S	.36	8	1	1¼	1				1¼
6½-S	.42	7⅝						1	
7-S	.54	9½	1¼	1½	1¼, 1½				1½
7½-S	.68	8½						1¼	
8-S	.80	12	1½	2	2			1½	2
9-S	1.30	14½	2					2	
10-S	2.00	17						2½	
11-S	2.70	22						3	
12-S	7.50	30						4	

Flat Head Wrenches

Catalog Number of Wrench	List Price Each	Length from Center of Head to End Inches	Suitable for Brass Cocks: Nos. 252 266 270 284	Iron Cocks: Nos. 320½ 324½ 334 337	Nos. 1232 1234 1236
1-F	.14	3	¼		
2-F	.16	3½	⅜		
3-F	.16	4	½		½
4-F	.22	5	¾	½	¾
5-F	.28	6½	1	¾	1
6-F	.36	8	1¼	1	1¼
7-F	.54	9½	1½		1½
8-F	.80	12	2		2
23-F	.74	9¾		1¼	
24-F	.94	10½		1½	
25-F	1.30	12½		2	

Square Head Wrenches
(For Nos. 319 and 339 Cocks Only)

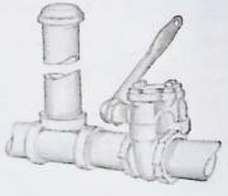
Catalog Number of Wrench	List Price Each	Length from Center of Head to End Inches	Suitable for No. 319 Iron Cock	No. 339 Iron Cock
1-M	.50	5½	½	
2-M	.60	8	¾, 1	½, ¾
3-M	.70	11	1¼, 1½	
4-M	.90	11		1
5-M	1.20	14	2	1¼, 1½
6-M	2.40	18		2



Crane Cocks in an intricate pumping system.

Shock on Liquid Lines!

When a quick-opening valve in a liquid line is suddenly closed, thereby instantly stopping the flow, a momentary but very high pressure builds up in the line. This pressure, called "water hammer" or "shock", can do serious damage to the piping. To protect the system, install an air cushioning-chamber—an assembly of a tee, a length of pipe, and a cap—just ahead of the quick-opening valve, or use a shock absorber especially designed for this purpose.



Iron Body Wedge Gate Valves

Clamp Gate Valves.....pages 74 and 75

Wedge Gate Valves
25-Pound.....page 76
125-Pound.....pages 77 to 81
250-Pound.....pages 82 and 83
Underwriters' Pattern.....page 80
Quick-Opening Type.....page 80

Accessories
By-Passes.....page 84
Cleanouts.....page 84
Indicators.....page 84
Gearing.....page 85

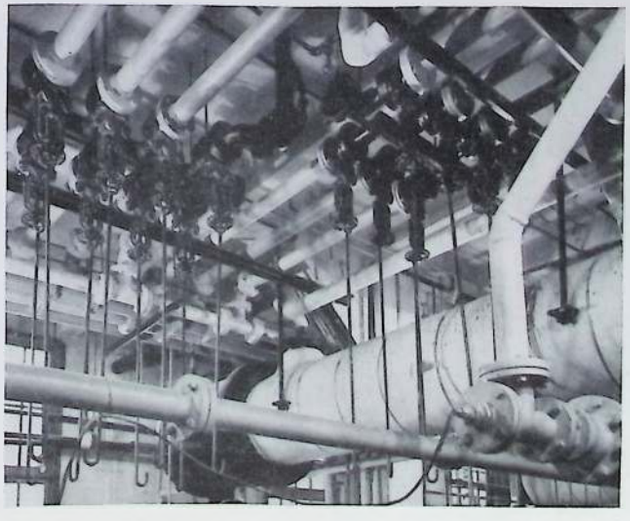
Dimensions
Valves with Gearing or By-Pass.....page 86

8

For Valves for Marine service, see pages 400 and 405.
For Alloy Cast Iron Valves for Process Industries, see page 385.

Crane offers the user an unusually complete line of Iron Body Wedge Gate Valves. The line includes valves for steam pressures up to 250 pounds and for water, oil, or gas pressures up to 500 pounds. It includes brass trimmed valves in all pressure classes, all-iron valves in all pressure classes except the 25-Pound, Valves with "18-8 Mo" trimmings (see Alloy Cast Iron Valves, page 385), Ni-Resist Valves (see page 384) and Valves for Marine service (see page 405).

The Crane high standard of quality in design, materials, and workmanship is maintained in these valves, assuring the user satisfactory and long-time service.



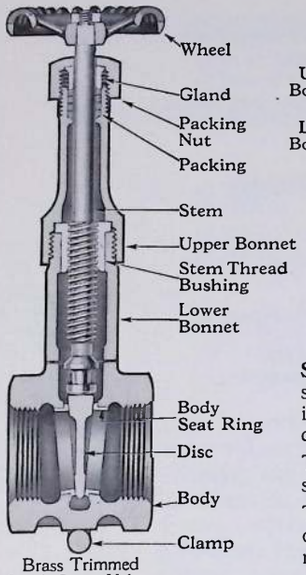
An overhead installation of Crane Iron Body Clamp Gate Valves.

Crane Clamp Gate Valves, compact and sturdy, have an especially wide acceptance among process industries, and in oil field or oil refinery installations

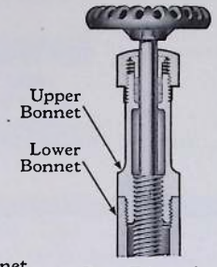
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Clamp Gate Valves
Wedge Disc

Brass Trimmed



Brass Trimmed Inside Screw Valves
Sizes 1¼ to 4-inch



Brass Trimmed Inside Screw Valves
Sizes ¼ to 1-inch
(¼ to ½-inch sizes do not have a gland.)

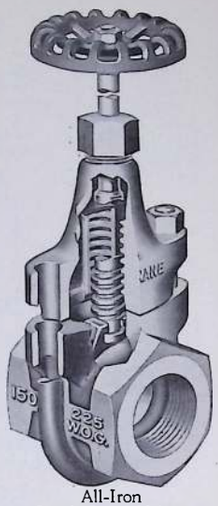
WORKING PRESSURES

Size Inches	Saturated steam	Cold water, oil, or gas, non-shock
Screwed Valves		
¼ to 2	150 pounds	225 pounds
2½ to 4	125 pounds	175 pounds
Flanged Valves		
1 to 2	125 pounds	200 pounds
2½ to 4	125 pounds	175 pounds

Air Tested

For list prices and dimensions, see page 75.

All-Iron

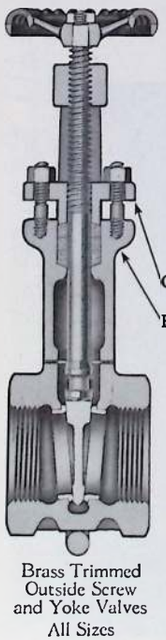


All-Iron Inside Screw Valves
Illustration shows partially sectioned All-Iron Inside Screw Valve, featuring free-draining bonnet. Bonnet has no flats or pockets to trap fluid.

Service recommendations: These valves are suited for a wide variety of service in process industries, in oil fields or refineries, and wherever compact, sturdy valves are needed.

The brass trimmed valves are recommended for steam, water, air, or non-corrosive oil lines.

The all-iron valves are recommended for oil, gas, or gasoline, or for fluids that corrode brass but not iron or steel. For special corrosive services, all-iron valves can be made with a malleable iron disc; prices are furnished on application.



Brass Trimmed Outside Screw and Yoke Valves
All Sizes

Construction: All valves are made with lugs on both the body and bonnet. A U-shaped clamp passes through these lugs assuring a snug, accurately aligned bonnet joint. In addition, the clamp construction enables quick dismantling of the valve for inspection, cleaning, or repairs.

Brass trimmed valves: Brass trimmed valves have brass body seat rings, disc, and stem.

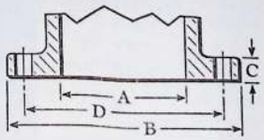
In inside screw valves ¼ to 1-inch, the upper portion of the bonnet engages the stem threads; it is made of brass and is renewable. Sizes 1¼-inch and larger have a brass renewable stem thread bushing in the bonnet. This construction provides a full stem thread engagement, brass-to-brass, and assures long life of the stem threads.

Outside screw and yoke valves have a cast iron bolted gland.

All-iron valves: All-iron valves have seats cast integral with the body. The disc is forged steel. The stem is steel; the portion coming in contact with the stuffing box packing is nickel-plated.

All-Iron Inside Screw Valves have a one-piece free-draining bonnet with an interrupted thread for engagement with the stem. This construction, shown at the upper right, permits free passage on either side of the stem from the upper part of the bonnet, preventing the entrapment of line fluids. The interrupted threads have a wiping action on the stem, preventing sticking in heavy fluid service.

Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced with a smooth finish.

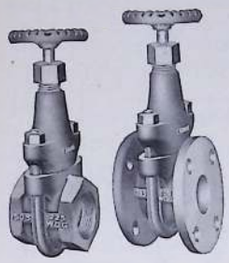


Dimensions of Flanges, in Inches

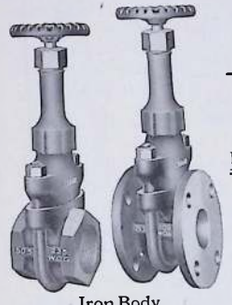
Size	A	B	C	D	No. of bolts	Dia. of bolts
1	1	4¼	7/16	3⅛	4	½
1¼	1¼	4⅝	½	3½	4	½
1½	1½	5	9/16	3⅞	4	½
2	2	6	⅝	4¾	4	⅝
2½	2½	7	11/16	5½	4	⅝
3	3	7½	¾	6	4	⅝
4	4	9	15/16	7½	8	⅝

Clamp Gate Valves
Wedge Disc — Brass Trimmed or All-Iron

Inside Screw Rising Stem

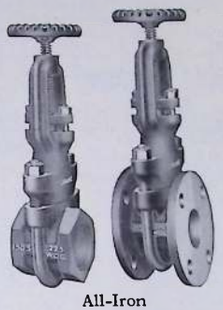


All-Iron
No. 488 Screwed
No. 488½ Flanged



Iron Body Brass Trimmed
No. 490 Screwed
No. 490½ Flanged

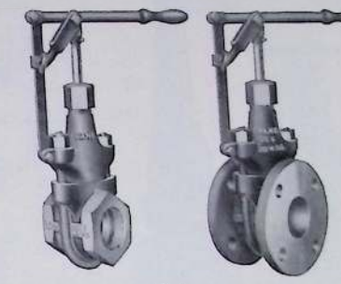
Outside Screw and Yoke



All-Iron
No. 484½ Screwed
No. 485½ Flanged

Iron Body, Brass Trimmed
No. 486½ Screwed
No. 487½ Flanged

Quick-Opening



All-Iron
No. 492 Screwed
No. 492½ Flanged

Iron Body, Brass Trimmed
No. 494 Screwed
No. 494½ Flanged

List Prices, Each

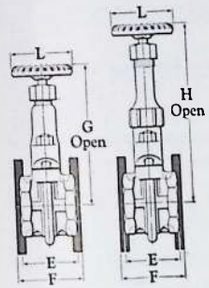
Size	Inside Screw, Rising Stem				Outside Screw and Yoke				Quick-Opening			
	Screwed		Flanged, F. & D.		Screwed		Flanged, F. & D.		Screwed		Flanged, F. & D.	
Inches	No. 488	No. 490	No. 488½	No. 490½	No. 484½	No. 486½	No. 485½	No. 487½	No. 492	No. 494	No. 492½	No. 494½
¼	6.70	7.00										
⅜	6.70	7.00										
½	7.00	7.40			11.60	12.00			13.30	13.70		
¾	7.30	7.90			12.00	12.60			14.20	14.80		
1	7.60	9.10	12.60		12.50	14.00	17.50		15.00	16.50		
1¼	8.40	10.60	13.80		13.40	15.60	18.80		16.00	18.20		
1½	9.40	12.20	16.00	18.70	15.50	18.40	22.00	25.00	17.50	20.50		
2	12.20	15.80	19.50	23.00	18.80	22.50	26.00	29.50	21.00	25.00	28.50	32.00
2½	18.20	25.00	25.50	32.50	25.00	32.00	33.00	39.50	28.00	35.00	35.50	42.00
3	25.00	35.00	32.50	42.50	32.00	42.00	40.00	50.00	35.00	45.00	42.50	52.50
4	56.00	71.50	64.50	80.00	64.00	80.00	72.50	88.00	67.00	82.50	75.50	91.00

Drilling: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made for valves ordered faced only.

Shock: Quick-Opening Valves used in liquid lines should be installed with a suitable cushioning device to protect against water hammer; see page 11.

Dimensions, in Inches

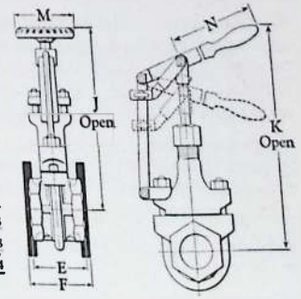
Size	E	F	G	H	J	K	L	M	N
¼	1⅞		49/16	4⅞			1¾		
⅜	2		49/16	4⅞			1¾		
½	2⅛		55/16	6¼	6⅝	7 7/16	2 1/16	2 9/16	6
¾	2⅝		6¼	7½	7½	8¾	2 9/16	2 9/16	7
1	2 9/16	3 3/16	7⅜	8½	9⅛	9⅛	2¾	2¾	7
1¼	2⅞	3½	9	10⅛	10⅛	12	3 1/16	3 1/16	7
1½	3⅛	3¾	9 9/16	11¼	12¼	13¼	3⅝	3⅝	9
2	3⅝	4¼	11¾	13½	14¼	15¾	4 1/16	4 1/16	9
2½	4⅛	4 15/16	13	15¾	16¼	18	4¾	4¾	10⅞
3	4 9/16	5 1/16	15⅛	18¼	18⅞	21 11/16	5⅜	5⅜	10⅞
4	5 9/16	6¾	19¾	24⅛	24	24⅞	9	9	14¾



No. 488
No. 488½
Inside Screw, Rising Stem

No. 490
No. 490½

Dimensions "E" (end to end) and "F" (face to face) apply also to Quick-Opening Valves.



Outside Screw and Yoke
Quick-Opening

Templates for drilling . . . . page 459

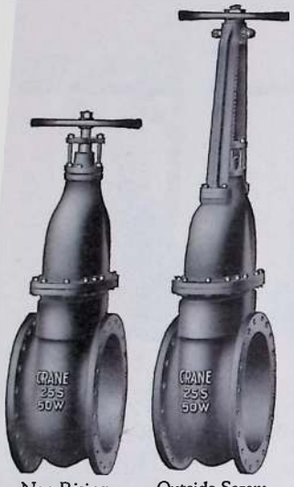
For working pressures and description, see the preceding page

Thread engagement . . . . page 494

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25-Pound Iron Body Wedge Gate Valves

Brass Trimmed



Non-Rising Stem Flanged
No. 491 Brass Stem

Outside Screw and Yoke Flanged
No. 493, Steel Stem
No. 496, Brass Stem

RATINGS IN POUNDS PER SQUARE INCH

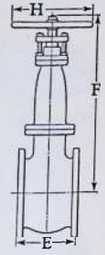
Size of valve	Working Pressures: Saturated steam	Working Pressures: Cold water, non-shock	Hydrostatic: Cold gas	Hydrostatic: Shell test	Hydrostatic: Seat test
12 to 24-inch	25	50	25	75	65
30 and 36-inch	25	43	25	75	55

List Prices and Dimensions

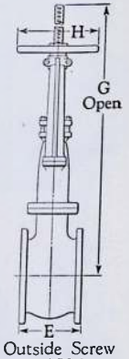
Size Inches	List Prices, Each Faced and Drilled: Non-Rising Stem No. 491	List Prices, Each Faced and Drilled: Outside Screw and Yoke No. 493 or No. 496	Dimensions, in Inches: E	F	G	H	No. of turns to open
12	300.00	360.00	11	32¾	59	16	25
14	358.00	452.00	13½	37¾	64½	16	29
16	537.00	650.00	14	42½	71½	18	33
18	805.00	950.00	14½	46	79¼	18	37
20	1095.00	1265.00	15½	50½	88	20	41½
*24	1976.00	2170.00	17	60	106	22	49½
*30	3380.00	3725.00	21	70	127¾	24	62
*36	4920.00	5400.00	24	82	150½	30	74

*Should have by-pass; see page 84. For dimensions, see page 86.

Larger sizes, 42 to 72-inch, can be made to order. Prices and dimensions furnished on application.



Non-Rising Stem



Outside Screw and Yoke

25-Pound Iron Body Wedge Gate Valves are especially suited for exhaust and low pressure saturated steam, and for gas or water lines. They are well proportioned; sizes 24-inch and smaller have straight through ports.

Brass trimmed: The body seat rings and the disc faces are brass. Body seat rings are screwed in on sizes 24-inch and smaller and rolled in on 30 and 36-inch sizes; disc faces are rolled into the disc on all sizes.

Non-rising stem valves have a Cast Manganese Bronze stem; the disc is brass-bushed where it engages the stem threads.

Outside screw and yoke valves have a brass stem or a steel stem, as ordered. On steel stems, that portion which comes in contact with the stuffing box packing is nickel plated.

Stuffing box: The stuffing box is filled with high grade packing and is equipped with a two-piece ball-type gland and gland flange; the gland is made of Ihrigized steel. The valves can be repacked when wide open and under pressure.

By-passes: Sizes 24-inch and larger should have a by-pass to enable equalizing the pressure on both sides of the disc before opening the main valve. See page 84 for description and page 86 for dimensions.

Gearing: See page 85 for description and page 86 for dimensions.

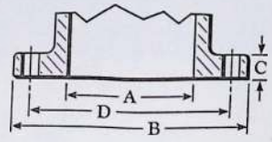
Vacuum service: When valves for vacuum exhaust lines are desired, orders must specify. Such valves are especially air-tested to assure absolute tightness. An extra charge is made for air-testing.

Hub end valves: When 25-Pound Hub End Valves are required, use the Double Disc Gate Valves described on page 90.

Flange dimensions, facing, and drilling: The dimensions and drilling of the end flanges conform to the 25-Pound American Tentative Cast Iron Flange Standard (B16b2-1931).

When so ordered, the end flanges can be drilled to the American Standard, Class 125. A full face gasket should be used.

List prices include facing and drilling to the 25-PoundAmerican Tentative Cast Iron Flange Standard. No deduction is made if valves are ordered faced only.



Dimensions of Flanges, in Inches

Size	A	B	C	D	No. of bolts	Dia. of bolts
12	12	19	1	17	12	⅝
14	14	21	1⅛	18¾	12	¾
16	16	23½	1⅛	21¼	16	¾
18	18	25	1¼	22¾	16	¾
20	20	27½	1¼	25	20	¾
24	24	32	1⅜	29½	20	¾
30	30	38¾	1½	36	28	⅞
36	36	46	1⅝	42¾	32	⅞

Bottom outlet valves are made to order.

Motor or cylinder operation . . . pages 124 to 129

Templates for drilling . . page 459

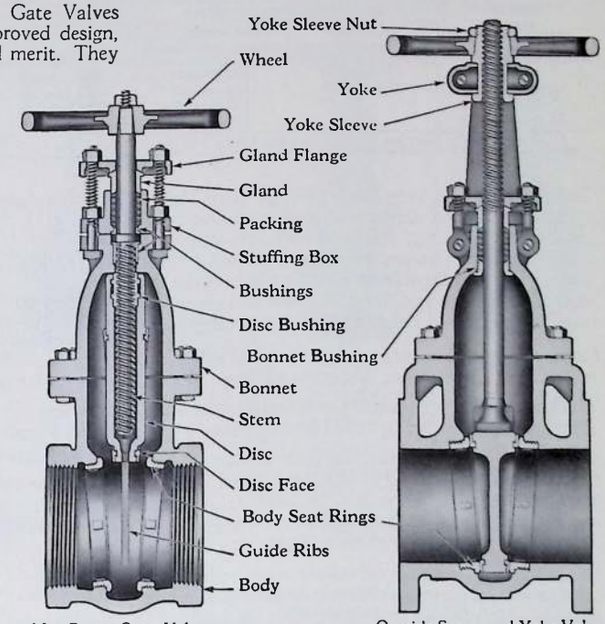
125-Pound Iron Body Wedge Gate Valves

General Description

Crane 125-Pound Iron Body Wedge Gate Valves sizes 12-inch and smaller are an improved design, embodying many features of unusual merit. They set a new peak for quality in iron body wedge gate valves, having greater strength, longer life, and better all-around adaptability for all types of services.

The line, unusually complete, includes the following valves:

Brass trimmed valves.....pages 78 and 79
All-iron valves.....pages 78 and 79
Underwriters' pattern valves.....page 80
Quick-Opening valves.....page 80
Valves for process industries.....page 385
Valves for marine service.....page 405



Non-Rising Stem Valve
Brass Trimmed—Open

Outside Screw and Yoke Valve
Brass Trimmed—Closed

These illustrations are representative of sizes 12-inch and smaller only; larger sizes are made similar to the 250-Pound Wedge Gate Valves described on page 82.

Body and bonnet: The cast iron body and bonnet are oval-shaped; liberal metal sections combined with proper metal distribution assure maximum strength. Flanged valves sizes 24-inch and smaller have straight through ports with tie ribs between the bonnet flange and the end flanges, providing additional resistance to line strains.

Disc: The disc is made of cast iron, and in brass trimmed valves has large brass seating faces rolled securely into machined dovetails.

The disc is of the solid web type. Non-rising stem valves in all sizes and outside screw and yoke valves in sizes 14-inch and larger have the disc built up at the center to accommodate the stem hole. In the non-rising stem, brass trimmed valves, the portion of the disc that engages the stem threads is brass-bushed.

The valves have long disc guides consisting of ribs in the body and machined grooves in the disc. This minimizes the drag on the seating surfaces and thereby prolongs their life. In sizes 12-inch and smaller, where the disc guide is at least 50 per cent of the port diameter, the engaging surfaces are tapered to prevent a line bearing contact which would cause excessive wear of the guides.

Stem: The stem is of liberal diameter and amply strong. Stem threads have long engagement in the disc or yoke sleeve. Outside screw and yoke valves sizes 12-inch and smaller have a tee-head disc-stem connection; larger sizes have a threaded disc-stem connection locked together with a pin.

Gland and stuffing box: These valves have a two-piece ball-type gland, consisting of a gland and a gland flange. This construction maintains an even load on the packing and prevents binding on the stem even when the gland bolt nuts are not pulled up evenly.

In sizes 12-inch and smaller, the non-rising stem valves have through bolts holding the stuffing box to the bonnet, and the stem collar recess in the brass trimmed valves is brass-bushed, top and bottom, to minimize friction and to prevent corrosion. Outside screw and yoke valves in these sizes have swinging gland eye bolts which move out of the way when the stuffing box is being repacked but which will not become detached and lost.

The stuffing box is exceptionally deep and is filled with high grade packing.

Repacking: These valves, when wide open, can be repacked while under pressure.

Outside screw and yoke brass trimmed valves in sizes 12-inch and smaller have a brass bonnet bushing, offering a better back seat for the stem and making this point non-corrosive.

Yoke sleeve: The yoke sleeve used in outside screw and yoke valves is made of Cast Manganese Bronze.

Yoke: The yoke in O. S. & Y. valves 4-inch and smaller is cast integral with the bonnet. In larger sizes, the yoke consists of two halves which are bolted together at the top, and also to the bonnet.

Wheel: Wheels are malleable iron, assuring maximum strength; they have an oval-shaped rim, affording an easy grip.

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125-Pound Iron Body Wedge Gate Valves

Brass Trimmed or All-Iron

Size of valve	Working pressures			Hydrostatic test pressures	
	Screwed or flanged valves		Hub end valves	Screwed, flanged, or hub end valves	
	Saturated steam	Cold water, oil, or gas, non-shock	Cold water or gas, non-shock	Shell test	Seat test
2 to 12-inch	125 pounds	200 pounds	200 pounds	350 pounds	225 pounds
14 and 16-inch	125 pounds	150 pounds	150 pounds	250 pounds	175 pounds
18 to 24-inch	*	150 pounds	150 pounds	250 pounds	175 pounds
30 to 48-inch	*	120 pounds	120 pounds	200 pounds	150 pounds

*For steam lines larger than 16-inch, Crane 150-Pound Cast Steel Gate Valves are recommended; see page 229.

Crane 125-Pound Iron Body Wedge Gate Valves are sturdy, rugged valves with a wide application in nearly every kind of industry. All sizes feature a solid web disc. Flanged valves 24-inch and smaller have straight through ports with tie ribs between the bonnet flange and end flanges. These and other features are described below or on the preceding page.

Brass trimmed valves: Brass trimmed valves are recommended for steam, water, or oil lines.

The body seat rings are brass, screwed into the body. The disc faces are brass, rolled into the disc.

In non-rising stem valves, the stem is Cast Manganese Bronze, and the disc is brass-bushed where it engages the stem threads. In sizes 12-inch and smaller, brass bushings are used above and below the stem collar to reduce friction and prevent corrosion.

Outside screw and yoke valves are made with a brass stem or a steel stem, as ordered; on steel stems, that portion which comes in contact with the packing is nickel plated. Sizes 12-inch and smaller have a tee-head disc-stem connection with a renewable brass bushing in the top of the bonnet.

All-iron valves: All-iron valves are recommended for oil or gas, or for fluids that corrode brass.

The seats are cast integral with the body and disc. Valves with screwed-in body seat rings can be supplied to order; prices on application.

The stem is steel, and the portion which comes in contact with the packing is nickel plated.

Stuffing box: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Gland: These valves have a two-piece gland, consisting of a malleable iron gland flange and an Ihrigized steel gland.

In sizes 12-inch and smaller, brass trimmed valves have Cast Manganese Bronze gland bolt nuts, and all-iron valves have zinc-plated steel gland bolts and gland bolt nuts. The outside screw and yoke valves in these sizes have swinging type gland eye bolts.

Hub end valves: Instead of a wheel, hub end valves have a 2-inch square operating nut. Hubs on hub end valves fit Class "A", "B", "C", or "D" cast iron pipe.

The following sizes are suitable for use with Transite pipe. Specify pipe size and class on orders.

For machined end or rough end Transite pipe:
3 to 8-inch valves....for Class 50, 100, and 150 pipe
10 and 12-inch valves....for Class 50 and 100 pipe

For machined end Transite pipe only:
4-inch valves.....for Class 200 pipe

By-passes: A by-pass is recommended on sizes 14-inch and larger. The by-pass enables equalizing the pressure on both sides of the disc before opening the main valve. See page 84 for description and page 86 for dimensions.

Gearing: To facilitate operation, sizes 24-inch and larger should be equipped with gears. See page 85 for description and page 86 for dimensions.

Motor or cylinder operation: Valves installed in inaccessible locations or used for emergency purposes should preferably be equipped with some easy means of operation. An electric or air motor drive, or an operating cylinder, is ideal for this purpose. For description, see pages 124 to 129.

Indicators: The stem of an outside screw and yoke valve indicates the position of the disc. Non-rising stem, wheel operated valves, sizes 12-inch and smaller, can easily be equipped with a "Universal" indicator; see page 84.

Disc rollers: Brass trimmed valves, 30-inch and larger, ordered for use in a horizontal line with the valve stem horizontal, will be equipped with a brass track in the lower side of the body and brass rollers in the lower side of the discs.

Cleanouts: For use on lines carrying an unusual amount of sediment, flanged valves 12-inch and smaller can be equipped with a cleanout on the side of the body to facilitate cleaning; see page 84.

Standards: Flanged valves conform (except for marking) to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. This Standard includes sizes 2, 2½, 3, 4, 6, 8, 10, and 12-inch.

Flanged valves also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 125-Pound Cast Iron Wedge Gate Valves. This Standard includes sizes 2 to 24-inch, inclusive.

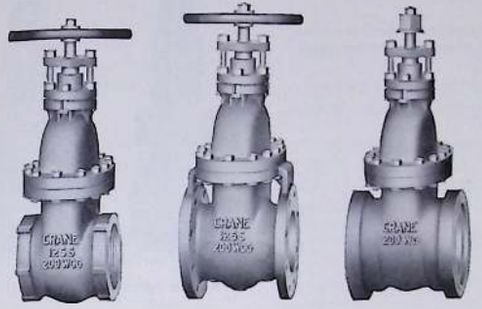
Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced with a smooth finish. Flange dimensions are shown on page 81.

Additional description.....page 77
Valves for Marine service....page 405
Quick-Opening and Underwriters' Pattern Valves....page 80
Alloy Cast Iron Valves for process industries.....page 385

125-Pound Iron Body Wedge Gate Valves

Brass Trimmed or All-Iron

Non-Rising Stem

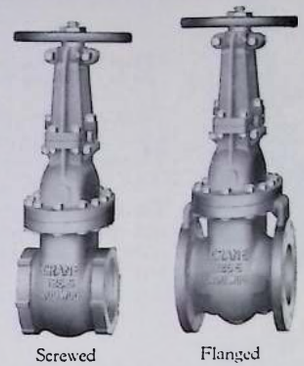


Screwed
No. 460 Brass Seats Brass Stem
No. 472 All-Iron

Flanged
No. 461 Brass Seats Brass Stem
No. 473 All-Iron

Hub Ends
No. 462 Brass Seats Brass Stem

Outside Screw and Yoke



Screwed
No. 464 Brass Seats Steel Stem
No. 464½ Brass Seats Brass Stem
No. 475 All-Iron

Flanged
No. 465 Brass Seats Steel Stem
No. 465½ Brass Seats Brass Stem
No. 475½ All-Iron

For working pressures and description, see the preceding page.

List Prices, Each

Size	Non-Rising Stem					Outside Screw and Yoke					
	Screwed		Flanged, F. & D.		Hub Ends	Screwed			Flanged, F. & D.		
Inches	No. 460 Brass Seats and Stem	No. 472 All-Iron	No. 461 Brass Seats and Stem	No. 473 All-Iron	No. 462 Brass Seats and Stem	No. 464 Brass Seats, Steel Stem	No. 464½ Brass Seats and Stem	No. 475 All-Iron	No. 465 Brass Seats, Steel Stem	No. 465½ Brass Seats and Stem	No. 475½ All-Iron
For sizes smaller than 2-inch, use Clamp Gate Valves; see page 75.											
2	34.00	34.00	37.50	37.50	34.00	40.00	40.00	40.00	43.50	43.50	43.50
2½	35.50	35.50	40.00	40.00		43.00	43.00	43.00	47.50	47.50	47.50
3	39.50	39.50	44.50	44.50	39.50	51.50	51.50	51.50	56.50	56.50	56.50
3½	46.00		52.50			60.50	60.50		67.00	67.00	
4	54.50	54.50	62.50	62.50	54.50	71.00	71.00	71.00	79.00	79.00	79.00
5	76.00		84.50	84.50		93.50	93.50		102.00	102.00	102.00
6	93.00	93.00	102.00	102.00	93.00	117.00	117.00	117.00	126.00	126.00	126.00
8	163.00		175.00	175.00	163.00				210.00	210.00	210.00
10			276.00	276.00	276.00				330.00	330.00	330.00
12			395.00	395.00	395.00				468.00	468.00	468.00
*14			535.00						645.00	645.00	645.00
*16			763.00						895.00	895.00	895.00
*18			1025.00						1185.00	1185.00	1185.00
*20			1580.00						1760.00	1760.00	1760.00
*†24			2500.00						2735.00	2735.00	2735.00
*†30			4275.00						4600.00	4600.00	4600.00
*†36			6450.00						6975.00	6975.00	6975.00
*†42			8680.00						10260.00	10260.00	10260.00
*†48			11840.00						14200.00	14200.00	14200.00

*Sizes 14-inch and larger should have a by-pass; see page 84 for description and page 86 for dimensions.
†Sizes 24-inch and larger should be geared; see page 85 for description and page 86 for dimensions.

Drilling: Flanged valves are furnished faced and drilled (F. & D.), unless ordered faced only. List prices include facing and drilling to the American Cast Iron Flange Standard, Class 125. When valves are ordered faced only, they will be furnished at the same price as for faced and drilled.

Dimensions....page 81 *By-passes and gearing....pages 84 to 86* *Indicator Posts....page 132*

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Iron Body Wedge Gate Valves

Underwriters' Pattern



Non-Rising Stem
Hub Ends
No. 462½

WORKING PRESSURE
175 pounds cold water, non-shock

HYDROSTATIC TEST PRESSURES
350 pounds shell
200 pounds seat

These valves, designed for fire protection service, are similar to the valves described on the preceding three pages.

These valves have been approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories. The valves are marked "CU" and "FM".

Trimmings: The body seat rings are made of brass and are screwed into the body. The disc faces, also made of brass, are rolled into the disc.

The stem is brass, and the bonnet and stuffing box are brass-bushed where they come in contact with the stem. In non-rising stem valves, the disc is brass-bushed where it engages the stem threads. The brass to brass contacts prevent corrosion and assure easy operation.

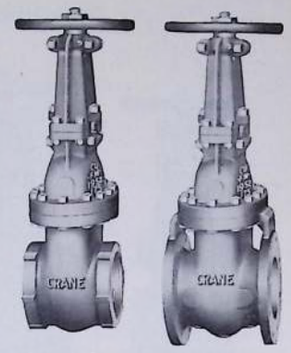
The gland, made of Ihrigized steel, is of the ball type. The gland flange is made of malleable iron and the gland nuts are made of brass.

Flanged valves: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125.

No deduction will be made if flanged valves are ordered faced only.

List Prices, Each

Size Inches	No. 462½ Hub Ends	No. 467½ Screwed	No. 467 Flanged F. & D.
2½		51.00	53.00
3		59.00	62.00
4	74.00	77.50	83.50
5			110.00
6	118.00		127.00
8	195.00		213.00
10	323.00		350.00
12			522.00



Outside Screw and Yoke Valves
Screwed No. 467½ Flanged No. 467

Outside Screw and Yoke Valves are usually used indoors. The rising stem indicates whether the valve is open or closed.

Hub end valves: A square flange cast integral with the bonnet permits bolting on an indicator post (see page 132) when the valve is installed underground.

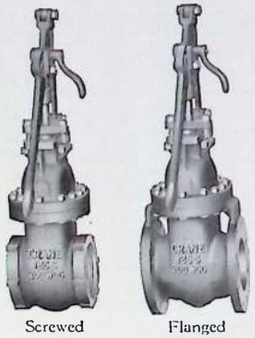
Hub ends fit Class "D" cast iron pipe.

Sizes indicated below are suitable for use with Transite pipe; specify pipe size and class on orders.

For machined end or rough end Transite pipe:
4 to 8-inch valves.....for Class 50, 100, or 150 pipe
10-inch valves.....for Class 50 or 100 pipe
For machined end Transite pipe only:
4-inch valves.....for Class 200 pipe

125-Pound Iron Body Wedge Gate Valves

Quick-Opening—Brass Trimmed



Screwed No. 470 Brass Trimmed
Flanged No. 471 Brass Trimmed

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

HYDROSTATIC TEST PRESSURES
350 pounds shell 225 pounds seat

List Prices, Each

Size Inches	No. 470 Screwed	No. 471 Flanged F. & D.
For sizes smaller than 3", use Clamp Gate Valves (page 75).		
3	55.50	60.50
4	71.00	79.00
5		102.50
6	112.00	121.00
8		198.00
10		330.00
12		460.00

Dimensions of 125-Pound Wedge Gate Valves....page 81

These valves, except for the quick-opening mechanism and the disc-stem connection, are the same as the outside screw and yoke valves described on the three preceding pages. *To secure the extra rigidity necessary in this type of valve, the disc is threaded on the stem and pinned to it.*

Drilling: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. (No deduction for valves ordered faced only.)

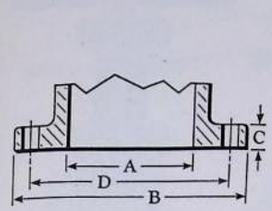
Shock: Closing one of these valves quickly on liquid lines may cause "water hammer". When severe, water hammer must be eliminated by installing a suitable cushioning device; see page 11.

Additional description....pages 77 and 78

125-Pound Iron Body Wedge Gate Valves

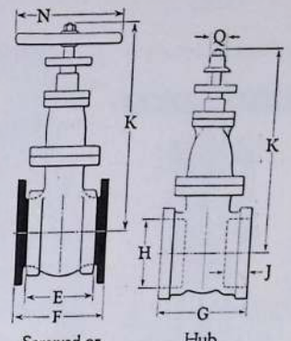
Dimensions, in Inches

For general description of 125-Pound Valves, see pages 77 to 80.

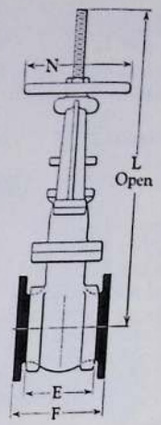


Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948).

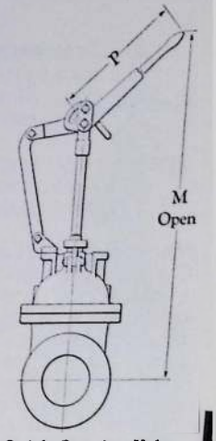
The flanges are plain faced, with a smooth finish.



Screwed or Flanged — Hub Ends
Non-Rising Stem Valves Without By-Pass



Screwed or Flanged
O.S. & Y. Valves Without By-Pass



Quick-Opening Valve
Dimensions "E" and "F" apply also to Quick-Opening Valves

Size	Flanges A	B	C	D	Bolts No.	Bolts Dia.	E	F	G	H	J	K	L	M	N	P	Q	No. of turns to open
2	2	6	5/8	4¾	4	5/8	6⅛	7	8¾	3.25	2.75	12⅞	14¾		8		2	7
2½	2½	7	11/16	5½	4	5/8	6½	7½				13¾	17		8			8½
3	3	7½	¾	6	4	5/8	6¾	8	9¼	4.66	2.75	15½	19½	27⅝	9	12	2	10½
3½	3½	8½	13/16	7	8	5/8	7⅜	8½				16½	21¼		9			12
4	4	9	15/16	7½	8	5/8	7⅝	9	10⅜	5.70	3.00	18⅝	23¾	35⅛	10	15½	2	9
5	5	10	15/16	8½	8	¾	8½	10				21⅜	28¾	40	12	23		11
6	6	11	1	9½	8	¾	8⅞	10½	11¼	7.80	3.00	23⅛	32⅝	45⅞	12	23	2	13
8	8	13½	1⅛	11¾	8	¾	10¼	11½	13	10.00	3.50	27½	41⅞	59⅛	16	29	2	17
10	10	16	13/16	14¼	12	⅞		13	13¾	12.10	3.50	33	50½	76⅛	20	41	2	21
12	12	19	1¼	17	12	⅞		14	14½	14.20	3.50	36½	58	83¼	20	41	2	25½
14	14	21	1⅜	18¾	12	1		15				39¼	67¾		20			30
16	16	23½	17/16	21¼	16	1		16				48¼	75½		22			34
18	18	25	1⅝16	22¾	16	1⅛		17				48¾	83½		24			38
20	20	27½	111/16	25	20	1⅛		18				52½	91¼		24			42¼
24	24	32	1⅞	29½	20	1¼		20				63½	109		30			50
30	30	38¾	2⅛	36	28	1¼		24				75½	138		36			95
36	36	46	2⅜	42¾	32	1½		28				92	160		42			
42	42	53	2⅝	49½	36	1½		33				106	191		42			
48	48	59½	2¾	56	44	1½		36				114	209		42			

Face to face: The face to face dimensions of flanged valves conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. This Standard includes sizes 2, 2½, 3, 4, 6, 8, 10, and 12-inch.

Flanged valves also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 125-Pound Cast Iron Wedge Gate Valves. This Standard includes sizes 2 to 24-inch inclusive.

By-passes and gearing: Sizes 14-inch and larger should have a by-pass to enable equalizing the pressure on both sides of the main valve before opening.

To facilitate operation, valves 24-inch and larger should be equipped with gears. For dimensions of valves equipped with by-pass or gearing, see page 86.

Bevel geared valves with by-pass: Bevel geared valves with by-pass have the by-pass on the bottom, with the stem of the by-pass valve parallel to the pinion shaft; see page 84 for illustration.

Hub dimensions: Hub ends fit Class "A", "B", "C", or "D" cast iron pipe. For hub end valves used with Transite pipe, see pages 78 and 80.

List prices....pages 79 and 80 *Thread engagement....page 494* *Templates for drilling....page 459*

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250-Pound Ferrosteel Wedge Gate Valves

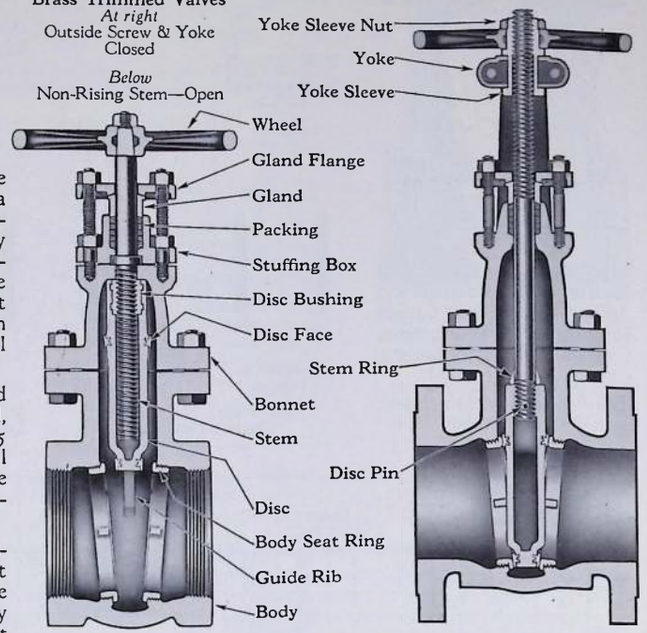
Brass Trimmed or All-Iron

WORKING PRESSURES
250 pounds steam, **450°** F.
500 pounds cold water, oil, or gas, non-shock

HYDROSTATIC TEST PRESSURES
1000-pound shell test
550-pound seat test

Brass Trimmed Valves
At right
Outside Screw & Yoke
Closed

Below
Non-Rising Stem—Open



Crane 250-Pound Ferrosteel Wedge Gate Valves are admirably suited for a wide variety of service conditions requiring the use of rugged, substantially constructed valves. They will give excellent results on steam lines where the pressure and temperature do not require the use of steel valves, on high pressure cold water lines, on natural gas lines, oil pipe lines, etc

Body and bonnet: The body and bonnet are made of Crane Ferrosteel, a high grade iron, approximately 35 per cent stronger than cast iron. Metal sections are more than ample, and the metal is distributed to provide maximum strength.

Wedge disc: The disc is a single casting with tapered faces. Two ribs cast in opposite sides of the body engage machined slots in the disc. They guide the disc, and prevent contact between the seating surfaces until the valve is practically closed. In brass trimmed valves, the faces are securely rolled into machined dovetails in the disc, assuring tightness under pressure.

Brass trimmed valves: Brass trimmed valves are recommended for steam, water, or oil, or for other fluids that do not corrode brass or iron. The screwed-in body seat rings are made of Crane Special Bronze, a leaded tin bronze of high strength and hardness. The disc is Crane Special Bronze in the 2-inch size and cast iron faced with Crane Special Bronze in larger sizes.

The stem in non-rising stem valves is Cast Manganese Bronze; the disc is brass-bushed where it engages the stem threads, except on 2-inch valves which have a solid Crane Special Bronze disc.

Outside screw and yoke valves have a brass or a steel stem. The brass stem serves as a safeguard against corrosion.

All-iron valves: All-iron valves are recommended for gas or oil service, or for fluids that corrode brass but not iron. They have seats cast integral with the body and disc. Valves with screwed-in body seat rings can be supplied when ordered; prices on application. The stem is steel, the portion in contact with the packing being nickel plated.

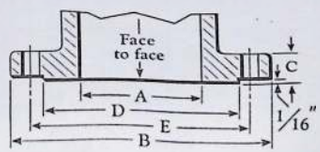
Stuffing box: The stuffing box has high grade packing. The valves, when wide open, can be repacked while under pressure.

Gland: A two-piece gland, consisting of a gland flange and a gland, prevents binding on the valve stem and assures an even load on the packing. The gland flange is made of steel or malleable iron. The gland is made of Ihrigized steel.

Wheels: Wheels are made of malleable iron to assure maximum strength. Their oval-shaped rim assures an easy grip.

Flange dimensions and facing: Dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 250 (B16b-1944).

End flanges have a 1/16-inch raised face. The raised face is finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.



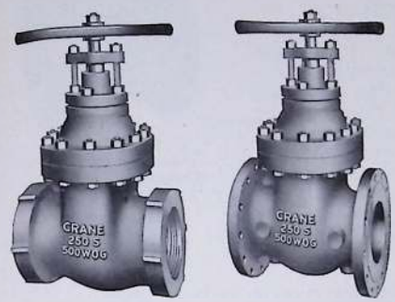
Dimensions of Flanges, in Inches

Size	A	B	C	D	E	Bolts No.	Bolts Dia.
2	2	6½	⅞	4 3/16	5	8	⅝
2½	2½	7½	1	4 15/16	5⅞	8	¾
3	3	8¼	1⅛	5 11/16	6⅝	8	¾
3½	3½	9	1 3/16	6 5/16	7¼	8	¾
4	4	10	1¼	6 15/16	7⅞	8	¾
5	5	11	1⅜	8 5/16	9¼	8	¾
6	6	12½	1 7/16	9 11/16	10⅝	12	¾
8	8	15	1⅝	11 15/16	13	12	⅞
10	10	17½	1⅞	14 1/16	15¼	16	1
12	12	20½	2	16 7/16	17¾	16	1⅛

250-Pound Ferrosteel Wedge Gate Valves

Brass Trimmed or All-Iron

Non-Rising Stem



No. 2 E, Screwed
No. 3 E, Flanged
Crane Special Bronze Seats
Brass Stem

For working pressures and description, see the preceding page.

Outside Screw and Yoke



No. 6 E, Screwed
No. 7 E, Flanged
Crane Special Bronze Seats
Steel Stem

No. 6½ E, Screwed
No. 7½ E, Flanged
Crane Special Bronze Seats
Brass Stem

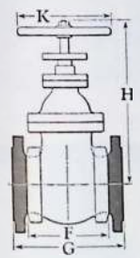
No. 14 E, Flanged
All-Iron

List Prices, Each

Size	Non-Rising Stem		Outside Screw and Yoke			Dimensions, in Inches						
	No. 2 E	No. 3 E	No. 6 E or No. 6½ E	No. 7 E or No. 7½ E	No. 14 E All-Iron							
Inches	Screwed	Flanged F. & D.	Screwed	Flanged F. & D.	Flanged F. & D.	F	G	H	J	K	L	Turns to open
2	60.00	65.00	70.00	75.00	75.00	7	8½	11	14½	8	8	15
2½	76.00	82.00	87.00	93.00	93.00	8	9½	13¼	17½	9	9	15½
3	94.00	102.00	106.00	114.00	114.00	9	11⅛	14¾	20½	10	10	14
3½		115.00		136.00			11⅞	15½	22	10	10	16½
4	118.00	133.00	142.00	157.00	157.00	11	12	17½	24¾	12	12	18½
5		174.00		208.00	208.00		15	20¼	29¾	14	14	23
*6		225.00		260.00	260.00		15⅞	23	34½	16	16	27
*8		403.00		470.00	470.00		16½	30¾	42¾	20	20	35
*10		542.00		630.00	630.00		18	36	52¾	22	22	38
*12		775.00		900.00	900.00		19¾	39¾	60	24	24	46

*Sizes 6-inch and larger should have a by-pass; see page 84 for description and page 86 for dimensions.

By-passes: A by-pass is recommended on 250-Pound Valves sizes 6-inch and larger. See page 84 for description and page 86 for dimensions.



Non-Rising Stem
Screwed or Flanged

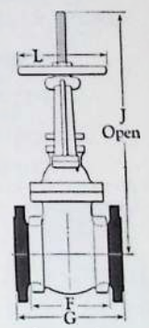
Motor or cylinder operation: Valves used for emergency purposes or installed in inaccessible locations should preferably be equipped with some easy means of operation, such as an electric or air motor drive or an operating cylinder. See pages 124 to 129.

Gearing: To facilitate operation, the larger size valves should be equipped with gears. See page 85 for description and page 86 for dimensions.

Standards: Flanged valves conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. The Standard does not include sizes 3½ and 5-inch.

Flanged valves also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939) for 250-Lb. Cast Iron Flanged Wedge Gate Valves.

Drilling: End flanges are faced and drilled to the American Standard, Class 250; no deduction for "faced only" valves.



Outside Screw and Yoke
Screwed or Flanged

Templates for drilling . . . . page 460

Thread engagement . . . . page 494

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Accessories for Iron Wedge Gate Valves

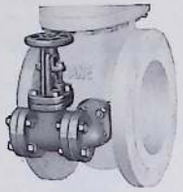
By-Passes

For Water Service



By-Pass on Non-Rising Stem Gate Valve

Non-Rising Stem Gate Valve Used in By-Pass



By-Pass on Outside Screw & Yoke Gate Valve

Outside Screw and Yoke Gate Valve Used in By-Pass

For dimensions, see page 86.

When so ordered, larger size Crane Flanged End and Hub End Iron Body Wedge Gate Valves can be furnished with a by-pass. A by-pass facilitates operation of the main valve by enabling equalization of the pressure on both sides of the disc, and in the case of steam service, permits slow warming up of the outlet side before opening the larger main valve.

For Steam Service

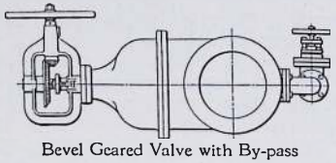


By-Pass on Non-Rising Stem or Outside Screw & Yoke Gate Valve

Globe Valve Used in By-Pass

25-Pound and 125-Pound Valves can be supplied with a large size by-pass, suitable for water (or oil or gas) service. The valve in the by-pass is a gate valve. It is of the non-rising stem construction when the main valve is non-rising stem, and outside screw and yoke construction, when the main valve is outside screw and yoke.

Unless otherwise ordered, on regular wheel operated and spur geared valves the by-pass will be attached to the side of the main valve with the stem of the main valve and of the by-pass valve parallel, pointing vertically upward. Bevel geared valves with by-pass have the by-pass on the bottom of the main valve, as shown below.



Bevel Geared Valve with By-pass

Extra List Prices for By-Passes

Pressure Class of Main Valve	Size of Main Valve	For Water Service On Flanged or Hub End Valves			For Steam Service On Flanged End Valves	
		Size of By-Pass	Non-Rising Stem By-Pass	Outside Screw & Yoke By-Pass	Size of By-Pass	Globe By-Pass
	Inches	Inches	Each	Each	Inches	Each
25 Pound Page 76	14	2	*Prices on Application*			
	16 to 20	3				
	24 and 30	4				
	36	6				
125 Pound Page 79	12 and 14	2	*Prices on Application*			
	16 to 20	3				
	24 and 30	4				
	36 and 42	6				
	48	8				
250 Pound Page 83	5 and 6	1¼	*Prices on Application*		¾	*Prices on Application*
	8	1½			¾	
	10	1½			1	
	12	2			1	

Brass trimmed valves are furnished with a brass trimmed by-pass; all-iron valves are furnished with an all-iron by-pass.

Cleanouts

For 125-Pound Flanged Wedge Gate Valves

Sizes 12-inch and smaller



Side Cleanout (For Flanged Valves)

Cleanouts can be furnished for 125-Pound Iron Body Flanged Wedge Gate Valves. They should be used where sediment may accumulate in a valve. The cleanout can be installed on the side of the valve body.

Prices on Application

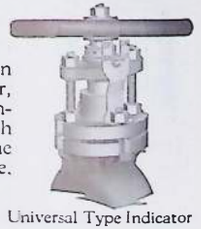
Indicators

For No. 460 and No. 461 Wedge Gate Valves

Sizes 12-inch and smaller

The "Universal" type indicator, easily applied to valves in stock or in service, consists of an indicator plate, sleeve, and pointer, all made of brass. Directions for installation are furnished with each indicator. Orders must specify the size and catalog number of the valve.

Indicator	List Price, Each
	7.00

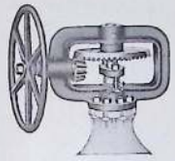


Universal Type Indicator

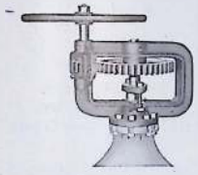
Accessories for Iron Wedge Gate Valves

Gearing

Non-Rising Stem



Style U Bevel Gearing



Style S Spur Gearing

Pressure Class of Valve	Size of Valve Inches	Extra List Price per Valve			
		Non-Rising Stem		Outside Screw & Yoke	
		Bevel	Spur	Bevel	Spur
25-Pound Page 76	14	*Prices on Application*		*Prices on Application*	
	16				
	18				
	20				
	24				
	30				
	36				
125-Pound Page 79	12	*Prices on Application*		*Prices on Application*	
	14				
	16				
	18				
	20				
	24				
	30				
	36				
	42				
	48				
250-Pound Page 83	8	*Prices on Application*		*Prices on Application*	
	10				
	12				

Outside Screw and Yoke



Style N Bevel Gearing



Style O Bevel Gearing



Style P Spur Gearing

When desired, larger size Crane Iron Body Wedge Gate Valves can be supplied with gears, which greatly facilitate operation.

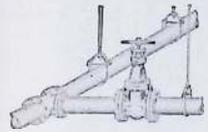
Bevel gearing: Unless otherwise ordered, non-rising stem bevel geared valves are furnished with the pinion shaft extending at right angles to the run of the valve. They can also be furnished with the shaft parallel to the run.

With Style N bevel gearing for outside screw and yoke valves, the pinion shaft extends at right angles to the run of the valve; with Style O, parallel to the run. Unless otherwise ordered, Style N will be furnished.

For dimensions of geared valves, see page 86.

8

Every Pipe Line Needs Support!



Piping won't stand up and work efficiently without adequate support. Its own weight plus the weight of the fluid will cause a break in the line or will strain joints to the point of leakage and distort or ruin valve seats.

An amply strong pipe hanger or support at about 10-foot intervals is considered good practice for the average or ordinary installation, but the spacing will vary considerably with the size and type of system. Place the hangers close to valves and heavy pieces of equipment. This catalog shows many pipe hangers and supports; see pages 429 to 442. For spacing, see page 550.

Use Crane Steel Gate Valves For Higher Pressures and Temperatures

For pressures and temperatures that are beyond the scope of iron valves and for unusually severe services, Crane manufactures a complete line of Cast Steel Wedge Gate Valves.

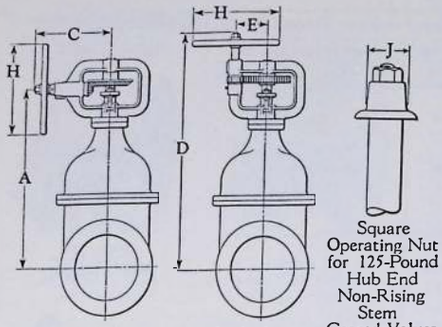
Of outstanding quality, Crane Steel Gate Valves are made in a wide range of sizes and with screwed, flanged, butt-welding, or socket-welding ends.

The valves are available for pressures as high as 2500 pounds at 1000° F., or 6000 pounds at 100° F. See page 210 and pages 221 to 234.

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Iron Wedge Gate Valves with Gearing or By-Pass

Dimensions, in Inches

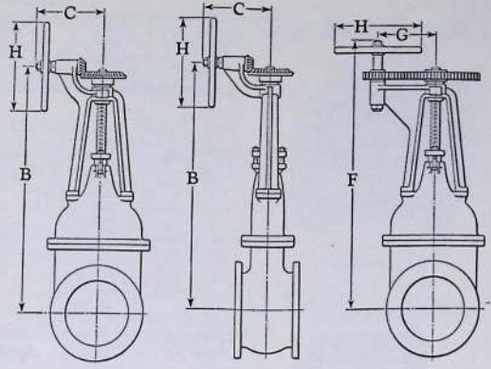


Style U
Bevel Gearing

Style S
Spur Gearing

Square Operating Nut for 125-Pound Hub End Non-Rising Stem Geared Valves

Non-Rising Stem Valves with Bevel or Spur Gears



Style N
Bevel Gearing

Style O
Bevel Gearing

Style P
Spur Gearing

Outside Screw and Yoke Valves with Bevel or Spur Gears

For dimensions of valves without gearing or by-pass, refer to the following pages:

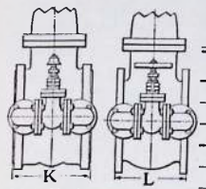
25-Pound	125-Pound	250-Pound
Page 76	Page 81	Page 83

Gearing: Face to face and end to end dimensions are the same for valves with or without gears.

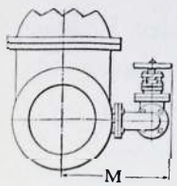
Valves with by-pass: The face to face dimension of valves with by-pass is the same as for valves without by-pass, except on 12-inch hub end and 36-inch flanged end 125-Pound Valves. On these sizes, 125-Pound Valves with by-pass have a longer face to face dimension.

Center to top and wheel diameter dimensions are the same for valves with or without by-pass.

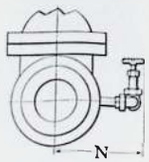
Flanged and Hub End Valves with By-Pass



Hub End *Flanged



By-Pass For Water Service



By-Pass For Steam Service

Size of Main Valve	Valves with Gears: Bevel Geared A	B	C	Spur Geared D	E	F	G	H	J	No. of turns to open	K	*L	Valves with By-Pass: By-Pass for Water Size	M	By-Pass for Steam Size	N
25-Pound Wedge Gate Valves																
14	33⅝	50¼	12⅝	43¾	6	53¾	10	14		58		*13½	2	23¼		
16	39	55⅜	13	50	6	59½	12	18		66		*14	3	27¼		
18	42⅝	61¼	13	53½	6	65⅜	12	18		74		*14½	3	28¼		
20	46⅛	67½	13	57¼	6	71⅝	12	18		83		*15½	3	29¼		
24	55½	81⅝	16⅞	69½	8	87½	14¾	22		148		*17	4	35¼		
30	64⅝	96⅜	16⅞	78⅝	8	102¼	14¾	22		186		*21	4	38¼		
36	75⅛	113⅞	20½	91¼	10 13/16	119⅜	17	27		259		*24	6	43¾		
125-Pound Wedge Gate Valves																
12	32⅝	45⅞	13	43⅝	6	50¼	12	18	2	50	16	*14	2	22¼		
14	37¾	53⅝	13	48⅝	6	58	12	18		60		*15	2	23¼		
16	43⅞	60⅝	17	57⅞	8	66½	14 11/16	22		102		*16	3	27¼		
18	45¾	65¼	17	59¾	8	71	14 11/16	22		114		*17	3	28¼		
20	49⅛	71⅛	17	63⅛	8	77	14 11/16	22		127		*18	3	29½		
24	57⅝	85⅛	20½	73⅝	10 13/16	90¾	17	27		175		*20	4	35¼		
30	71⅜	106⅛	23	87⅞	12	112	19	30		380		*24	4	38⅝		
36	84¾	123	26¼	103	15	127¾	20⅛	30		560		32	6	45		
42	101⅞	146	31½	123½	19⅜	151½	22⅞	36		785		*33	6	50		
48	107⅞	160	31½	129½	19⅜	164¾	22⅞	36		900		*36	8	57¾		
250-Pound Wedge Gate Valves																
5												*15	1¼	15	¾	11¾
6												*15 7/8	1¼	14¾	¾	12½
8	24⅞	35	13	35⅞	6	39¼	12	18		70		*16½	1½	19¼	¾	13¼
10	30	43	15½	42¼	7	47⅝	14	20		95		*18	1½	19¼	1	16½
12	33½	48	15½	45¾	7	52¾	14	20		115		*19¾	2	23¼	1	17¾

*Dimension "L", the face to face of flanged valves with by-pass, includes the ⅛-inch raised faces on 250-Pound Valves. Dimensions identified by an asterisk are the same as for valves without by-pass.

Description of gears . . . page 85 *Description of by-passes . . . page 84* *Templates for drilling . . . pages 459 and 460*

Iron Body Double Disc Gate Valves

A.W.W.A. Valves

Names of Parts . . . . . page 88

Iron Body Valves
General Description . . . . . pages 88 and 89
25-Pound . . . . . pages 90 and 91
100-Pound W.O.G. . . . . pages 92 and 93
200-Pound W.O.G. . . . . pages 96 and 97
A. W. W. A. . . . . pages 94 and 95

Ferrosteel Valves
General Description . . . . . pages 88 and 89
500-Pound W.O.G. . . . . page 98
800-Pound W.O.G. . . . . page 99

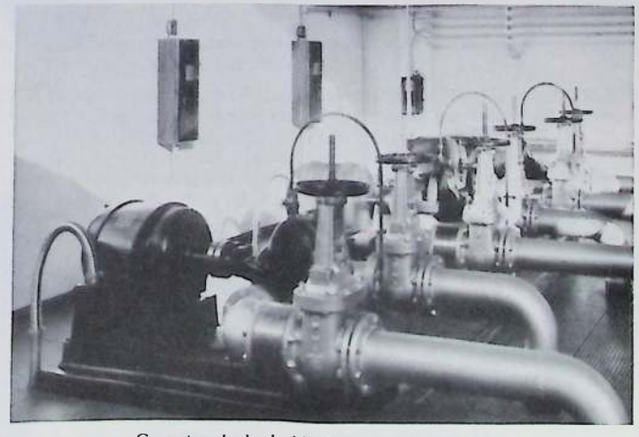
Accessories
By-Passes . . . . . page 102
Gearing . . . . . page 102
Cleanouts . . . . . pages 91, 93, and 102
Indicators . . . . . page 102

Dimensions
Valves with Gearing or By-Pass . . . . . pages 100 and 101

Cast Steel Pipe Line Gate Valves . . . . pages 232 and 233

The Crane line of Iron Body Double Disc Gate Valves includes valves for water, oil, or gas pressures up to 800 pounds as well as valves for low pressure steam. Brass Trimmed, All-Iron, and A.W.W.A. Valves are available.

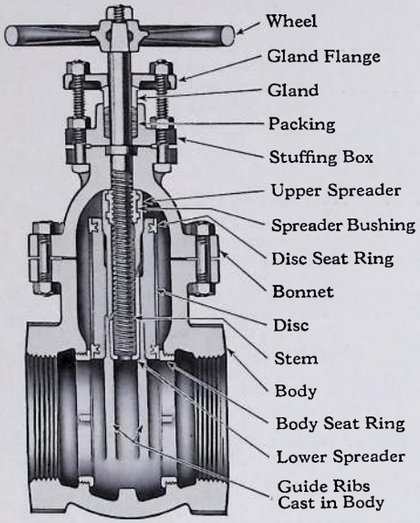
The uniformly superior quality that distinguishes all Crane products has been maintained in this line. Excellence of design, high grade materials, and workmanship of the highest order assure dependability in service.



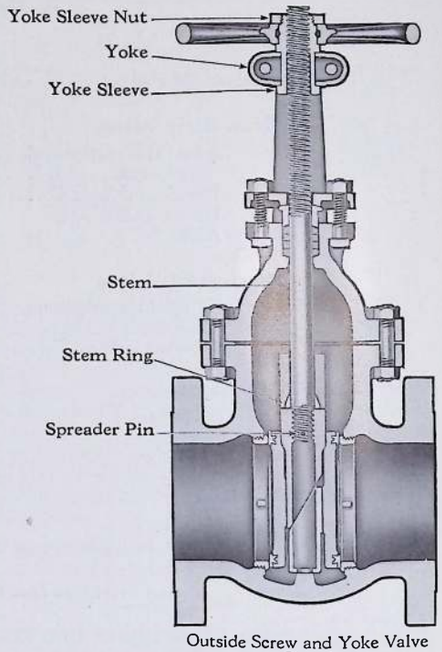
Crane iron body double disc gate valves installed in the pipe lines of a large pumping station.

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Iron Body Double Disc Gate Valves

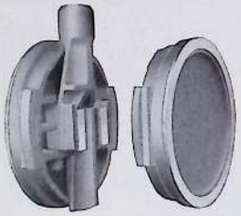


Non-Rising Stem Valve
Open

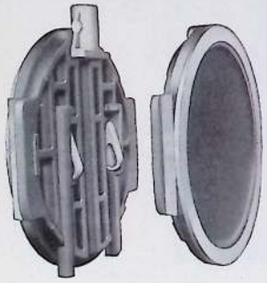


Outside Screw and Yoke Valve
Closed

Flanged end bodies for 500 and 800-Pound W.O.G. Valves have straight through ports; see page 89.



Discs with Spreaders



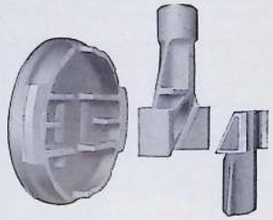
Discs with Wedges

The Discs

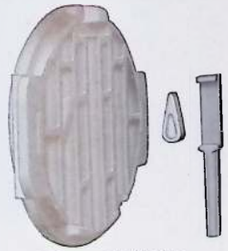
Depending upon the size of the valve and the pressure class, two types of disc construction are used in Crane Iron Body Double Disc Gate Valves.

Discs with spreaders: The upper spreader, engaging the valve stem, raises and lowers the discs. When the valve is being closed, the lower spreader strikes a stop in the bottom of the body; further rotation of the wheel brings the wedging surfaces of the spreaders into contact, and the spreaders force the discs outward against the seats.

Discs with wedges: A disc nut, engaging the valve stem, raises and lowers the discs. When the valve is being closed, two hooks, carrying Manganese Bronze wedges, strike a stop in the bottom of the body; further rotation of the wheel forces the wedges between the discs, and the wedges force the discs outward against the seats.



Discs with Spreaders



Discs with Wedges

General Description

The general characteristics of Crane Iron Body and Ferrosteel Double Disc Gate Valves are illustrated on the preceding page. Except for their proportions and for the materials used, the various lines are very similar in construction.

Double discs: The seats in the valves are parallel. The disc mechanism, illustrated and described on the preceding page, assures positive, tight seating and easy opening.

Except for certain small size valves having brass or Crane Special Bronze discs, brass trimmed valves have cast iron or Ferrosteel discs with brass or Crane Special Bronze seating faces. The faces are securely rolled into machined dovetails in the discs, assuring tightness under pressure.

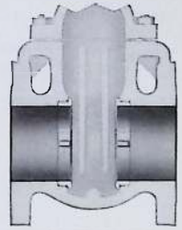
In all-iron valves, the seating faces are cast integral with the discs.

In non-rising stem brass trimmed valves, the portion of the discs that engages the stem threads is brass or brass-bushed.

In brass trimmed valves with spreader type discs, the lower spreader is brass in the smaller sizes, and cast iron with brass wedging faces in the larger sizes.

Body and bonnet: All lines of valves have oval-shaped bodies and bonnets. Metal sections are more than ample, and the metal is distributed to assure maximum strength.

Flanged end 500 and 800-Pound W.O.G. Valves have straight through ports, as shown in the illustration at the right. The metal sections adjacent to the bonnet and end flanges are heavily reinforced.



Straight Through Ports in Flanged End 500 and 800-Pound W.O.G. Valves

Body seat rings: In brass trimmed valves, the body seat rings are brass or Crane Special Bronze.

In brass trimmed 25-Pound Valves 14-inch and larger, the body seat rings are rolled into machined dovetails in the body. In 10 and 12-inch 25-Pound Valves, and in all brass trimmed valves for higher pressures, the body seat rings are screwed into the body.

All-iron valves are regularly furnished with the seats integral with the body. However, they can be furnished with screwed-in body seat rings when so ordered; prices on application.

Stem: The stem in non-rising stem brass trimmed valves is made of Crane Cast Manganese Bronze or rolled brass, depending upon the pressure class.

Outside screw and yoke brass trimmed valves are made with a rolled brass stem.

All-iron valves have a steel stem; the portion coming in contact with the packing is nickel plated.

Gland and stuffing box: All valves have a two-piece ball-type gland, consisting of an Ihrigized steel gland and a malleable iron gland flange.

This construction provides for even distribution of the compressive loading on the packing, the ball-type bearing between the gland and flange compensating for unequal adjustment of the bolts. Binding on the valve stem and frequent stuffing box maintenance are avoided.

Repacking: These valves, when wide open, can be repacked while under pressure.

In non-rising stem valves, jamming the disc in the wide open position forces the stem collar against the machined top of the bonnet, making a pressure-tight joint.

In outside screw and yoke valves, when the valve is jammed wide open, the tapered stem ring engages a tapered machined surface in the under side of the top of the bonnet, forming a tight joint.

Yoke: In smaller size outside screw and yoke valves, the yoke is cast integral with the bonnet. In larger sizes, the yoke is made in two halves, bolted to the bonnet and bolted together at the top.

Yoke sleeve: The yoke sleeve is made of Crane Cast Manganese Bronze.

Wheel: Wheels are made of malleable iron to assure maximum strength. They have an oval-shaped rim, affording an easy grip.

In non-rising stem valves, the wheel has a tapered square hole fitting the tapered square end of the stem, and is held in place by a steel nut.

In outside screw and yoke valves, the hole in the wheel is hexagonal and tapered; and fits the tapered hexagonal top of the yoke sleeve. The wheel is held in place by a malleable iron nut.

In both types of valves, the wheel is attached securely, yet can be removed easily.

Flange dimensions and facing: The dimensions and drilling of the end flanges on flanged valves conform to the American Cast Iron Flange Standard for their respective working pressures.

The flanges on 25-Pound, 100-Pound W.O.G., and 200-Pound W.O.G. valves are plain faced with a smooth finish.

500-Pound W.O.G. flanged valves are regularly furnished with a raised face 1/16-inch high on the end flanges.

800-Pound W.O.G. flanged valves are regularly furnished with a 1/4-inch male face (large male) on the end flanges.

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25-Pound Iron Body Double Disc Gate Valves

Brass Trimmed

Size of valve	Working pressures					Hydrostatic test pressures	
	Flanged valves			Hub end valves		Flanged or hub end valves	
	Saturated steam	Cold gas	Cold water non-shock	Cold gas	Cold water non-shock	Shell test	Seat test
10 to 24-inch	25 pounds	25 pounds	50 pounds	25 pounds	50 pounds	75 pounds	65 pounds
30 & 36-inch	25 pounds	25 pounds	43 pounds	25 pounds	43 pounds	75 pounds	55 pounds
42 & 48-inch	25 pounds	25 pounds	35 pounds			50 pounds	45 pounds

Crane 25-Pound Iron Body Double Disc Gate Valves, illustrated on the opposite page, are admirably suited for a great variety of service conditions that do not require the use of "Standard" or "125-Pound" weight valves. They will give excellent service in low pressure steam, water, or gas lines, in exhaust or condenser piping, in water works, irrigation, filtration, or sewage disposal systems, in pumping engine suction lines, or in by-product coke installations.

They are short and compact, occupying a minimum of space in the pipe line.

Brass trimmed: The body seat rings are brass. In sizes 10 and 12-inch valves, they are screwed into the body. In the larger sizes, they are rolled into the body. When so ordered, screwed-in rings can be furnished in the larger sizes; prices on application.

The discs are cast iron with brass seating faces. The stem is brass (Cast Manganese Bronze in the larger sizes of non-rising stem valves). In non-rising stem valves, the portion of the discs that engages the stem threads is brass or brass-bushed.

The valves have a two-piece ball-type gland, consisting of an Ihrigized steel gland and a malleable iron gland flange.

Stuffing boxes: The stuffing boxes are filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Hub end valves: In place of a wheel, hub end valves are equipped with a square operating nut.

The hubs fit Class "A" or "B" cast iron pipe.

Sizes indicated below are suitable for use with Transite pipe; specify pipe size and class on orders.

For machined or rough end Transite pipe:
10 and 12-inch valves....for Class 50 or 100 pipe
14 to 36-inch valves....for Class 50 pipe

For machined end Transite pipe only:
14 to 18-inch valves.....for Class 100 pipe

By-passes: Sizes 24-inch and larger should have a by-pass, to enable equalizing the pressure on both sides of the valve before opening. See pages 100 to 102 for dimensions and description.

Gearing: To facilitate operation, 42 and 48-inch valves should be equipped with gears. See pages 100 to 102 for dimensions and description.

Motor or cylinder operation: Valves installed in inaccessible locations or used for emergency purposes should be equipped with some easy means of operation, such as an electric or air motor drive, or an operating cylinder; see pages 124 to 129.

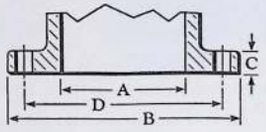
Vacuum or air service: Valves for vacuum exhaust lines or for air service should be specially air-tested; an extra charge is made. Unless orders specify air-tested, water-tested valves are furnished.

Disc rollers: Brass trimmed valves, 14-inch and larger, ordered for use in a horizontal line with the valve stem horizontal, will be equipped with a brass track in the lower side of the body, and brass rollers and brass scrapers in the lower side of the discs.

Cleanouts: When so ordered, these valves can be furnished with cleanouts; see the opposite page.

Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the 25-Pound American Tentative Cast Iron Flange Standard (B16b2-1931). The flanges are plain faced, with a smooth finish.

On special order, valves can be drilled to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). When so drilled, full face gaskets should be used to avoid distorting the end flanges.



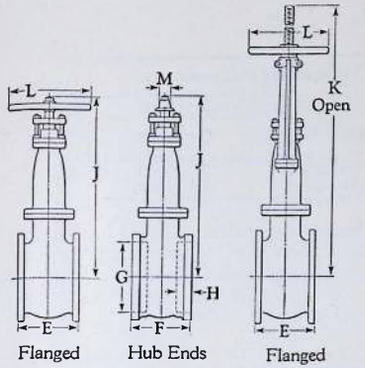
Dimensions of Flanges, in Inches

Size	A	B	C	D	No. of bolts	Dia. of bolts
10	10	16	7/8	14 1/4	12	5/8
12	12	19	1	17	12	5/8
14	14	21	1 1/8	18 3/4	12	3/4
16	16	23 1/2	1 1/8	21 1/4	16	3/4
18	18	25	1 1/4	22 3/4	16	3/4
20	20	27 1/2	1 1/4	25	20	3/4
24	24	32	1 3/8	29 1/2	20	3/4
30	30	38 3/4	1 1/2	36	28	7/8
36	36	46	1 5/8	42 3/4	32	7/8
42	42	53	1 3/4	49 1/2	36	1
48	48	59 1/2	2	56	44	1

Additional description....pages 88 and 89

25-Pound Iron Body Double Disc Gate Valves

Brass Trimmed



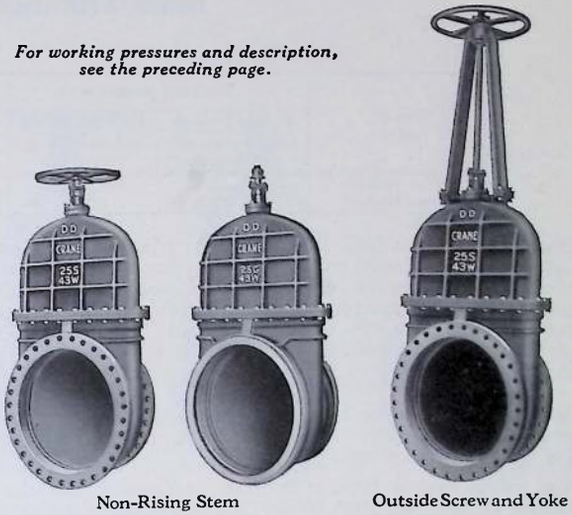
Flanged | Hub Ends | Flanged

Non-Rising Stem Valves Without By-Pass

Outside Screw and Yoke Valve Without By-Pass

Hubs on hub end valves will accommodate Class "A" or "B" cast iron pipe, and in some sizes, are suitable for use with certain classes of Transite pipe; refer to the preceding page.

For working pressures and description, see the preceding page.



Non-Rising Stem

No. 791 Flanged | No. 798 Hub Ends

Outside Screw and Yoke

No. 793½ Flanged

List Prices and Dimensions

Size	List Prices, Each			Dimensions, in Inches								
	Non-Rising Stem		Outside Screw and Yoke									
Inches	No. 791 Flanged F. & D.	No. 798 Hub Ends	No. 793½ Flanged F. & D.	E	F	G	H	J	K	L	M	No. of turns to open
10	185.00	173.00	218.00	9½	12⅜	12.10	3.50	27¾	47	12	2	22
12	230.00	210.00	276.00	10	12⅝	14.20	3.50	30¾	54¼	12	2	26
14	358.00	333.00	412.00	10½	13⅛	16.10	3.50	34	64¾	14	2	29
16	506.00	470.00	570.00	11	14⅛	18.40	4.00	37	71¾	14	2	33
18	690.00	640.00	760.00	11½	14 7/16	20.50	4.00	42¼	80¾	18	2	38
20	880.00	825.00	965.00	12	15 3/16	22.60	4.00	45½	88½	18	2	42
*24	1335.00	1235.00	1460.00	13	15¾	26.80	4.00	52¼	104	20	2	49
*30	2600.00	2450.00	2800.00	14½	17⅞	33.00	4.50	64	128	22	2	124
*36	3950.00	3700.00	4260.00	16	18½	39.30	4.87	74¾	148½	27	3	147
*†42			5800.00	17½					176½	30		131
*†48			7800.00	19					200¾	36		149

*Sizes 24-inch and larger should have a by-pass; see pages 100 to 102 for dimensions and description.
†Sizes 42 and 48-inch should be geared; see pages 100 to 102 for dimensions and description.

Flanged valves in sizes larger than listed above (up to 72-inch) are furnished to order; prices and dimensions on application.



Double Cleanout

Cleanout: When so ordered, these valves on sizes 14-inch and larger can be fitted with two side cleanouts as illustrated at the left; prices furnished on application.

The cleanouts are useful on valves installed in gas lines. They permit passing a rod through the valve between the seats to dislodge coke or other sediment.

Drilling: Flanged valves are furnished faced and drilled (F. & D.) unless ordered faced only. List prices include facing and drilling to the 25-Pound American Tentative Cast Iron Flange Standard.

When valves are ordered faced only, they will be furnished at the same price as for faced and drilled.

Templates for drilling....page 459

By-passes and gearing....pages 100 to 102

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 65 of 314
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100-Pound W.O.G.
Iron Body Double Disc Gate Valves
Brass Trimmed

Size of valve	Working pressures		Hydrostatic test pressures	
	Flanged valves	Hub end valves	Flanged or hub end valves	
	Cold water, oil, or gas non-shock	Cold water or gas non-shock	Shell test	Seat test
4 to 24-inch	100 pounds	100 pounds	200 pounds	125 pounds
30 and 36-inch	80 pounds		150 pounds	100 pounds

Crane 100-Pound W.O.G. Iron Body Double Disc Gate Valves, illustrated on the opposite page, are recommended for service conditions that do not require the use of Standard or 125-Pound weight valves but that are too severe for low pressure valves. They are particularly suitable for moderate water, oil, or gas pressures.

Brass trimmed: The body seat rings are brass, screwed into the body. The discs are cast iron or Ferrosteel with brass seating faces.

The valves have a brass stem (Cast Manganese Bronze in non-rising stem valves); the bonnet and stuffing box are brass-bushed at points of contact with the stem. In non-rising stem valves, the portion of the discs that engages the stem threads is brass or brass-bushed.

The valves have a two-piece, ball-type gland consisting of an Ihrigized steel gland and a malleable iron gland flange.

Stuffing box: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Hub end valves: In place of a wheel, hub end valves are equipped with a square operating nut.

The hubs will accommodate Class "A", "B", or "C" cast iron pipe.

Sizes indicated below are suitable for use with Transite pipe:

For machined or rough end Transite pipe:
4 to 24-inch valves....for Class 50 or 100 pipe
4 to 8-inch valves....for Class 150 pipe

For machined end Transite pipe only:
4-inch valves.....for Class 200 pipe

Orders for valves intended for use with Transite pipe should specify the pipe size and class.

By-passes: Sizes 18-inch and larger should have a by-pass, to enable equalizing the pressure on both sides of the valve before opening. See pages 100 to 102 for dimensions and description.

Gearing: To facilitate operation, valves 30-inch and larger should be equipped with gears. See pages 100 to 102 for dimensions and description.

Motor or cylinder operation: Valves installed in inaccessible locations or used for emergency purposes should preferably be equipped with some easy means of operation, such as an electric or air motor drive, or an operating cylinder. See pages 124 to 129.

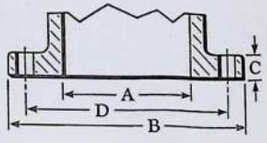
Air service: Valves for air service should be specially air-tested to assure absolute tightness; an extra charge is made. Orders must specify air-tested, otherwise water-tested valves will be furnished.

Disc rollers: When ordered for use in a horizontal line with the valve stem horizontal, valves 14-inch and larger will be equipped with a brass track in the lower side of the body, and with brass rollers and brass scrapers in the lower side of the discs.

Cleanouts: When so ordered, 100-Pound W.O.G. Valves 14-inch and larger can be fitted with two side cleanouts, as shown on the opposite page.

Indicators: The stem of an outside screw and yoke valve indicates the position of the disc. Non-rising stem valves 12-inch and smaller can be furnished with an indicator; see page 102.

Flange dimensions and facing: Dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.



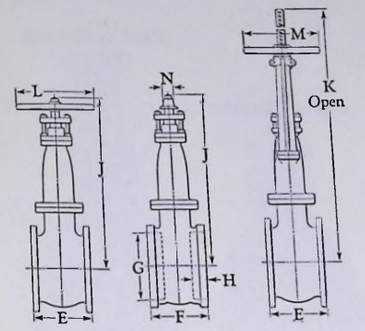
Dimensions of Flanges, in Inches

Size	A	B	C	D	No. of bolts	Dia. of bolts
4	4	9	15/16	7½	8	⅝
6	6	11	1	9½	8	¾
8	8	13½	1⅛	11¾	8	¾
10	10	16	1 3/16	14¼	12	⅞
12	12	19	1¼	17	12	⅞
14	14	21	1⅜	18¾	12	1
16	16	23½	1 7/16	21¼	16	1
18	18	25	1 9/16	22¾	16	1⅛
20	20	27½	1 11/16	25	20	1⅛
24	24	32	1⅞	29½	20	1¼
30	30	38¾	2⅛	36	28	1¼
36	36	46	2⅜	42¾	32	1½

Additional description....pages 88 and 89

100-Pound W.O.G.
Iron Body Double Disc Gate Valves
Brass Trimmed

For working pressures and description, see the preceding page.



Flanged — Hub Ends — Flanged

Non-Rising Stem Valves Without By-Pass

Outside Screw and Yoke Valve Without By-Pass

Hubs on hub end valves will accommodate Class "A", "B", or "C" cast iron pipe, and in some sizes, are suitable for use with certain classes of Transite pipe; see the preceding page.



Non-Rising Stem — Outside Screw and Yoke

No. 776 Flanged — No. 777 Hub Ends — No. 778 Flanged

List Prices and Dimensions

Size	List Prices, Each			Dimensions, in Inches									
	Non-Rising Stem		Outside Screw and Yoke										
Inches	No. 776 Flanged F. & D.	No. 777 Hubs Ends	No. 778 Flanged F. & D.	E	F	G	H	J	K	L	M	N	No. of turns to open
4	55.00	52.00	63.00	8	11¾	5.70	4.00	15¾	22¾	9	9	2	13½
6	89.00	83.00	104.00	8¾	12½	7.80	4.00	20	31¼	10	10	2	13¼
8	138.00	128.00	160.00	10	13¼	10.00	4.00	24¾	40½	12	12	2	17½
10	235.00	220.00	270.00	11	14	12.10	4.00	28¼	47¾	12	12	2	22
12	330.00	312.00	380.00	12	14½	14.20	4.00	32⅛	56	14	14	2	26
14	445.00	415.00	500.00	13½	15¼	16.45	4.00	35¾	62½	14	14	2	30
16	665.00	622.00	730.00	15	15½	18.80	4.00	40¾	71¼	16	16	2	34
*18	875.00	815.00	950.00	16½	16½	20.92	4.00	44	78¾	18	18	2	38
*20	1090.00	1025.00	1175.00	18	18	23.06	4.00	48½	86½	20	20	2	42
*24	1630.00	1500.00	1750.00	19½	19½	27.32	4.00	57	102½	24	24	2	50½
*†30	4200.00		4400.00	23				72¼	130¼	30	30		63½
*†36	6100.00		6450.00	25½				86	153¾	36	36		114

*Sizes 18-inch and larger should have a by-pass. See pages 100 to 102 for dimensions and description.
†Sizes 30-inch and 36-inch should be geared. See pages 100 to 102 for dimensions and description.

Larger size flanged valves, 42 to 66-inch, can be made to order. Prices and dimensions will be furnished on application.



Double Cleanout

Cleanouts: 100-Pound W.O.G. Valves 14-inch and larger can be fitted with two side cleanouts as illustrated at the left. Prices are furnished on application.

The cleanouts are useful on valves installed in gas lines. They permit passing a rod through the valve between the seats to dislodge coke or other sediment.

Drilling: Flanged valves are furnished faced and drilled (F. & D.) unless ordered faced only. List prices include facing and drilling to the American Cast Iron Flange Standard, Class 125.

When valves are ordered faced only, they will be furnished at the same price as for faced and drilled.

By-passes and gearing....pages 100 to 102

Templates for drilling....page 459

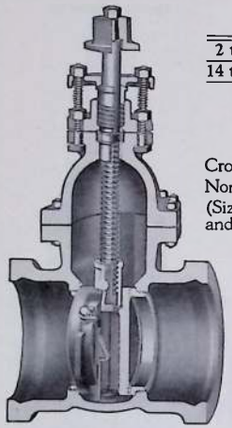
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A.W.W.A. Iron Body Double Disc Gate Valves

Brass Trimmed

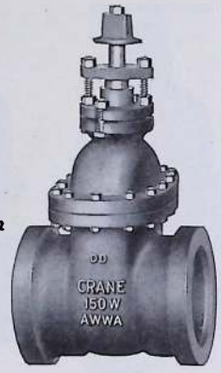
Sizes	Working Pressures (Non-Shock)	Hydrostatic Test Pressures	
		Shell	Seat
2 to 12-inch	200 pounds cold water	350 pounds	225 pounds
14 to 36-inch	150 pounds cold water	300 pounds	175 pounds

Dimensions are shown on the opposite page.

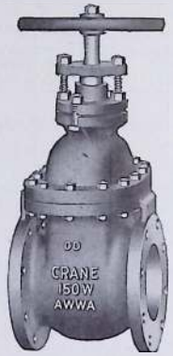


Cross Section
Non-Rising Stem
(Sizes 12-inch and smaller)

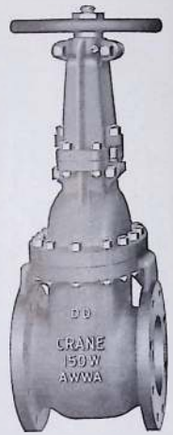
Prices on application



Non-Rising Stem
No. 480½, Hub Ends
With Square Operating Nut
Sizes 2 to 36-inch



Non-Rising Stem
No. 2485, Flanged
With Hand Wheel
Sizes 2 to 24-inch



Outside Screw and Yoke
No. 2495, Flanged
With Hand Wheel
Sizes 2 to 24-inch

Larger sizes, up to 48-inch, can be made to order.

9

These valves comply in design and materials with specifications for Gate Valves for Ordinary Water Works Service, 7F.1-1939, effective May 1, 1939, as adopted jointly by the American Water Works Association and the New England Water Works Association.

Body and bonnet: The body and bonnet, oval in shape with uniformly thick metal sections to provide maximum strength, are made of cast iron in the smaller sizes and of Ferrosteel in the larger sizes. Flanged bodies have straight-through ports permitting uninterrupted fluid flow; tie ribs between the bonnet flange and end flanges assure proper support of the body and guard against line strains.

Double discs: The parallel seat and double disc construction contributes to the accurate operation of these valves. Depending upon the valve size, either wedges controlled by hooks, or upper and lower spreaders force the discs outward upon seating or release the discs from their seats at the first opening movement; see page 88 for description. Wherever necessary to prevent corrosion, the operating parts are made of brass or are brass faced or bushed.

Seats and discs: The body seat rings, made of brass, are screwed into the body. The discs in sizes 3-inch and smaller are brass; in the larger sizes, they are made of iron with a brass face.

Stem: Non-rising stem valves have a stem made of Crane Cast Manganese Bronze, an alloy of unusually high tensile and torsional strength with excellent wearing quality. A brass-bushed stem collar, set between graphited stem bearings, assures long trouble-free service. Outside screw and yoke valves have a brass stem and a brass bonnet bushing.

Gland: The valves have a two-piece gland consisting of an Ihrigized steel gland and a malleable iron gland flange. Zinc-plated gland bolts and brass gland bolt nuts eliminate the possibility of corrosion.

Stuffing box: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Hub end valves: Hub end valves, made with a non-rising stem, have a 2-inch square operating nut.

The hubs will accommodate Class "A", "B", "C", or "D" cast iron pipe.

Sizes indicated below are suitable for use with Transite pipe; specify pipe size and class on orders.

For machined or rough end Transite pipe:
3 to 36-inch valves....for Class 50 pipe
3 to 24-inch valves....for Class 100 pipe
3 to 8-inch valves....for Class 150 pipe
For machined end Transite pipe only:
30 and 36-inch valves....for Class 100 pipe
4-inch valves....for Class 200 pipe

Flanged valves: Flanged valves conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 125-Lb. Cast Iron Flanged Double Disc Gate Valves. This Standard includes sizes 2 to 12-inch, inclusive.

Disc rollers: When valves 16-inch and larger are ordered for use in a horizontal line with the stem horizontal, they are equipped with a brass track in the lower side of the body, and with brass rollers and brass scrapers in the lower side of the discs.

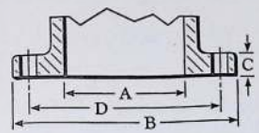
By-passes: Sizes 16-inch and larger can be equipped with a by-pass when so ordered.

Gearing: To facilitate operation, sizes 24-inch and larger should be equipped with gears. Dimensions are shown on the opposite page.

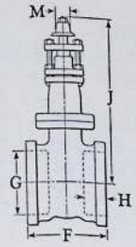
Dimensions of A.W.W.A. Gate Valves

Valves Without Gears

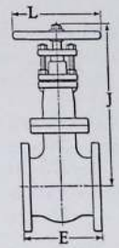
Flange Dimensions and Facing



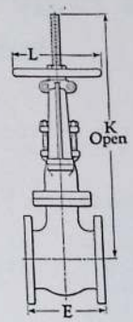
The dimensions and drilling of end flanges on flanged valves conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.



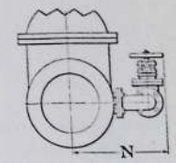
No. 480½
Non-Rising Stem
Hub Ends



No. 2485
Non-Rising Stem
Flanged



No. 2495
Outside Screw and Yoke
Flanged



By-Pass on Side

Dimension "N", showing clearance of by-pass, also applies to valves having the by-pass installed on the bottom.

Dimensions, in Inches

Size	Flanges A	B	C	D	Bolts No.	Bolts Dia.	E Without by-pass	E With by-pass	F Without by-pass	F With by-pass	G	H	J	K	L No. 2485	L No. 2495	N	Size of by-pass
2	2	6	5/8	4 3/4	4	5/8	7		9 1/4		3.38	3.00	13 1/2	16 1/4	8	9		
3	3	7 1/2	3/4	6	4	5/8	8		11		4.66	3.50	16 7/8	21 5/8	9	12		
4	4	9	15/16	7 1/2	8	5/8	9		12 1/4		5.70	4.00	18 1/2	24 5/8	10	12		
6	6	11	1	9 1/2	8	3/4	10 1/2		13 1/4		7.80	4.00	22 1/4	31 1/4	12	12		
8	8	13 1/2	1 1/8	11 3/4	8	3/4	11 1/2		13 3/4		10.00	4.00	25 3/4	41 1/4	14	16		
10	10	16	1 3/16	14 1/4	12	7/8	13		14 1/2		12.10	4.00	30 1/2	51 1/2	16	18		
12	12	19	1 1/4	17	12	7/8	14		15		14.20	4.00	34	58 5/8	18			
14	14	21	1 3/8	18 3/4	12	1	15 3/4		17 1/4		16.45	4.00	40	67	20			
16	16	23 1/2	1 7/16	21 1/4	16	1	17	26 1/2	18	21 1/2	18.80	4.00	45 1/2	75 5/8	22	26	3	
18	18	25	1 5/16	22 3/4	16	1 1/8	18 1/2	27	19	22 1/2	20.92	4.00	48 7/8	83 1/2	24	27 1/4	3	
20	20	27 1/2	1 11/16	25	20	1 1/8	20	28	20	23 1/2	23.06	4.00	52 3/4	93	24	28 5/8	3	
24	24	32	1 7/8	29 1/2	20	1 1/4	24	32	22	26 3/4	27.32	4.00	64 3/4	109 3/4	30	32 1/2	4	
30									24	32 3/4	33.74	4.50	78			37 5/8	4	
36									27	32	40.16	4.50	88			44 1/2	6	

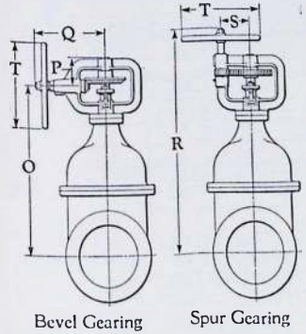
Dimension M, the size of the square operating nut, is 2 inches for all No. 480½ Valves.

Flanged valves in sizes 30 to 48-inch and hub end valves in sizes 42 and 48-inch are made to order; dimensions on request.

Valves With Gears

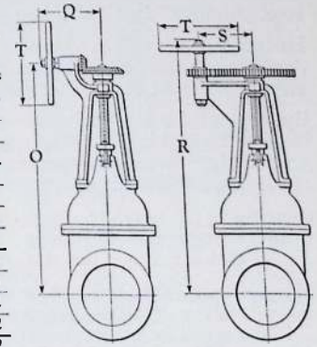
Dimensions, in Inches

Dimensions not given for valves with gears are the same as those shown for valves without gears.



Bevel Gearing Spur Gearing
Non-Rising Stem Valves

	Size	O	P	Q	R	S	T
Non-Rising Stem	12	30 3/4	6	13	41 3/4	6	18
	14	35 3/8	6	13	46 1/2	6	18
	16	40 7/8	7 1/2	17	55	8	22
	18	44 3/8	7 1/2	17	58 1/2	8	22
	20	47 1/4	7 1/2	17	61 1/4	8	22
	24	56 1/4	8 3/4	20 1/2	72 1/4	10 13/16	27
	30	67 7/8	9 1/4	23	84 1/2	12	30
	36	79	10 3/4	26 1/4	97 1/2	15	30
Outside Screw and Yoke	12	46		12 3/4	50 1/4	12	18
	14	52 5/8		12 3/4	56 7/8	12	18
	16	59 5/8		17	65 1/2	14 3/4	22
	18	65 1/4		17	71	14 3/4	22
	20	72		17	77 3/4	14 3/4	22
	24	85 3/8		20 1/2	91	17	27



Bevel Gearing Spur Gearing
Outside Screw and Yoke Valves

Templates for drilling....page 459

These valves, regularly made to open to the left, can be made to open to the right when so ordered.

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200-Pound W. O. G.
Iron Body Double Disc Gate Valves
Brass Trimmed or All-Iron

WORKING PRESSURES
2 to 12-inch — 200 pounds cold water, oil, or gas, non-shock
14 to 24-inch — 150 pounds cold water, oil, or gas, non-shock

HYDROSTATIC TEST PRESSURES
2 to 12-inch—350-pound shell test
—225-pound seat test
14 to 24-inch—250-pound shell test
—175-pound seat test

Air tested

Crane 200-Pound W.O.G. Iron Body Double Disc Gate Valves, illustrated on the opposite page, are especially recommended for use in the oil and gas industry, and for water lines requiring rugged, substantially constructed valves. In oil or gas fields, in oil refineries, and in stations for storing and dispensing gasoline or oil, they are exceptionally well suited for general utility service in oil, gas, or water lines.

Brass trimmed valves: Brass trimmed valves are recommended for water, oil, or gas lines.

The body seat rings are brass, screwed into the body. The discs in sizes 3-inch and smaller are brass; in larger sizes, they are cast iron with a brass face.

Brass trimmed valves have a brass stem (Cast Manganese Bronze in non-rising stem valves). In non-rising stem valves, the portion of the discs that engages the stem threads is brass or brass-bushed.

All-iron valves: All-iron valves are recommended for oil or gas, or for fluids that corrode brass.

The seats are cast integral with the body and discs. Valves with screwed-in body seat rings can be made to order; prices on application.

The stem is steel, and that portion which comes in contact with the packing is nickel plated.

Stuffing box: The stuffing boxes are filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Gland: The two-piece gland consists of an Ihrigized steel gland and a malleable iron gland flange.

Hub end valves: Hub end valves conforming to the American Water Works Association specifications are available; see page 94 for description.

By-passes: Sizes 14-inch and larger should have a by-pass, to enable equalizing the pressure on both sides of the valve before opening; see pages 100 to 102 for dimensions and description.

Gearing: To facilitate operation, 24-inch valves should be equipped with gears; see pages 100 to 102 for dimensions and description.

Disc rollers: When ordered for use in a horizontal line with the valve stem horizontal, valves 16-inch and larger will be equipped with a brass track in the lower side of the body and with brass rollers and scrapers in the lower side of the discs.

Motor or cylinder operation: Valves installed in inaccessible locations or used for emergency purposes should preferably be equipped with some easy means of operation. An electric or air motor drive, or an operating cylinder, is ideal for this purpose. For details, see pages 124 to 129.

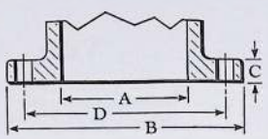
Cleanouts: For use on lines carrying an unusual amount of sediment, tarry fluids, etc., flanged valves 12-inch and smaller can be equipped with a side cleanout to facilitate cleaning; see page 102.

Indicators: The stem of the outside screw and yoke valves indicates the position of the disc. Non-rising stem valves 12-inch and smaller can be furnished with an indicator; see page 102.

Standards: Flanged valves without by-pass conform (except for marking) to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. This Standard includes sizes, 2, 2½, 3, 4, 6, 8, 10, and 12-inch.

Flanged valves without by-pass also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 125-Lb. Cast Iron Flanged Double Disc Gate Valves. This Standard includes sizes 2 to 12-inch inclusive.

Flange dimensions and facing: The end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948).



Flanges are plain faced, with a smooth finish.

Dimensions of Flanges, in Inches

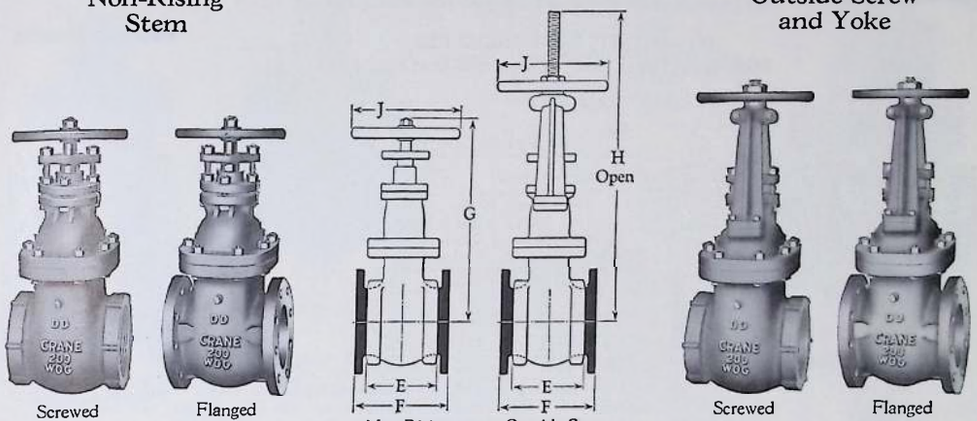
Size	A	B	C	D	No. of bolts	Dia. of bolts
2	2	6	5/8	4¾	4	5/8
2½	2½	7	11/16	5½	4	5/8
3	3	7½	¾	6	4	5/8
4	4	9	15/16	7½	8	5/8
5	5	10	15/16	8½	8	¾
6	6	11	1	9½	8	¾
8	8	13½	1⅛	11¾	8	¾
10	10	16	1 3/16	14¼	12	⅞
12	12	19	1¼	17	12	⅞
14	14	21	1⅜	18¾	12	1
16	16	23½	1 7/16	21¼	16	1
18	18	25	1 9/16	22¾	16	1⅛
20	20	27½	1 11/16	25	20	1⅛
24	24	32	1⅞	29½	20	1¼

Additional description . . . pages 88 and 89

200-Pound W. O. G.
Iron Body Double Disc Gate Valves
Brass Trimmed or All-Iron

Non-Rising Stem

Outside Screw and Yoke



Screwed No. 480 Brass Trimmed

Flanged No. 481 Brass Trimmed No. 1081 All-Iron

Non-Rising Stem Valves Without By-Pass

Outside Screw and Yoke Valves Without By-Pass

Screwed No. 482 Brass Trimmed

Flanged No. 483 Brass Trimmed No. 1083 All-Iron

For working pressures and description, see the preceding page.

List Prices and Dimensions

Size	List Prices, Each						Dimensions, in Inches					
	Non-Rising Stem			Outside Screw and Yoke								
Inches	No. 480 Screwed	No. 481 Flanged F. & D.	No. 1081 Flanged F. & D.	No. 482 Screwed	No. 483 Flanged F. & D.	No. 1083 Flanged F. & D.	E	F	G	H	J	No. of turns to open
2	34.50	38.00	38.00	40.50	44.00	44.00	5½	7	12	14¾	8	7½
2½	36.00	40.50	40.50	43.50	48.00	48.00	6¼	7½	12½	16	8	9
3	40.00	45.00	45.00	52.00	57.00	57.00	7	8	14	19	9	10½
4	55.50	63.50	63.50	72.00	80.00	80.00	7½	9	17⅜	23⅜	10	9
5		85.50			103.00			10	19¾	28⅛	12	11
6	94.00	103.00	103.00	118.00	127.00	127.00	11¼	10½	21¼	32¾	12	13
8		179.00	179.00		212.00	212.00		11½	26	41	14	18
10		295.00	295.00		345.00	345.00		13	30	49¾	16	22
12		420.00	420.00		492.00	492.00		14	34⅜	57	18	26
* 14		570.00			676.00			15¾	40	67	20	31
* 16		815.00			945.00			17	45¼	75½	22	35
* 18		1120.00			1275.00			18½	48⅞	83½	24	39
* 20		1660.00			1835.00			20	52¾	92½	24	44
*†24		2615.00			2845.00			24	63⅝	109½	30	52

*Sizes 14-inch and larger should have a by-pass; see pages 100 to 102 for dimensions and description.
†Size 24-inch should be geared; see pages 100 to 102 for dimension and description.

Drilling: Flanged valves are furnished faced and drilled (F. & D.) unless ordered faced only. List prices include facing and drilling to the American Cast Iron Flange Standard, Class 125. When valves are ordered faced only, they will be furnished at the same price as for faced and drilled.

Larger size flanged valves: When so desired, the No. 481 and No. 483 Brass Trimmed Flanged Valves can be furnished in sizes 30 to 48-inch inclusive. In such sizes, the valves are made to order only; prices and dimensions will be furnished on application.

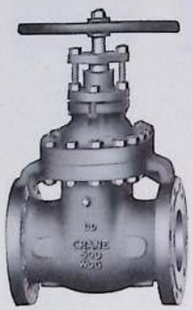
By-passes and gearing . . . pages 100 to 102 *Templates for drilling . . . page 459* *Thread Engagement . . . page 494*

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 68 of 314
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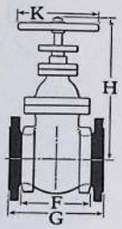
500-Pound W.O.G.
Ferrosteel Double Disc Gate Valves
Brass Trimmed



Non-Rising Stem
No. 340 E, Screwed



Non-Rising Stem
No. 341 E, Flanged



Screwed or Flanged
Non-Rising Stem
Without By-Pass

WORKING PRESSURE
500 pounds cold water, oil, or gas, non-shock

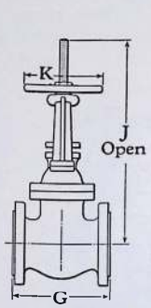
HYDROSTATIC TEST PRESSURES
1000-pound shell test 550-pound seat test

Air tested

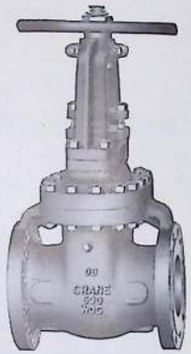
List Prices, Each

Size	Screwed	Flanged F. D. & S. F.	
Inches	No. 340 E Non-Rising	No. 341 E Non-Rising	No. 343 E O. S. & Y.
2	65.00	80.00	85.00
2½	75.00	92.00	98.00
3	88.00	105.00	112.00
4	152.00	171.00	186.00
* 6		242.00	268.00
*† 8		418.00	472.00
*†10		612.00	690.00
*†12		830.00	930.00

*Sizes 6-inch and larger should have a by-pass; see pages 100 to 102 for dimensions and description.
†Sizes 8-inch and larger can be equipped with gears; see pages 100 to 102 for dimensions and description.



Flanged
Outside Screw and Yoke
Without By-Pass



Outside Screw and Yoke
No. 343 E, Flanged

For additional description, see pages 88 and 89.

These unusually rugged valves are especially suitable for use in oil refineries, in pump houses, in pipe lines, in high pressure water lines, or for similar service requiring heavy, massive iron body valves.

Materials: The body and bonnet are made of Crane Ferrosteel, a high grade iron approximately 35 per cent stronger than cast iron. The body seat rings, screwed into the body, are made of Crane Special Bronze, a hard, leaded tin bronze.

The discs in sizes 2 to 4-inch are Crane Special Bronze; in larger sizes, they are cast iron faced with Crane Special Bronze. The stem is brass (Cast Manganese Bronze in non-rising stem valves). In non-rising stem valves, the portion of the discs that engages the stem threads is brass or brass-bushed.

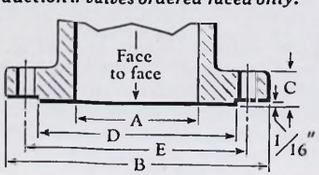
Stuffing box and gland: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure. The gland is the two-piece type, consisting of an Ihrigized steel gland and a malleable iron gland flange.

Standards: Flanged valves without by-pass conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949.

Flanged valves without by-pass also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 250-Lb. Cast Iron Flanged Double Disc Gate Valves.

Flange dimensions and facing: End flanges conform to the American Cast Iron Flange Standard, Class 250 (B16b-1944). End flanges are regularly furnished with a 1/16-inch raised face. The raised face is finished with concentric grooves, approximately 16 per inch, known as a "serrated" finish.

Prices of flanged valves include facing, drilling, and spot facing (F.D. & S.F.) to the American Cast Iron Flange Standard, Class 250; no deduction if valves ordered faced only.

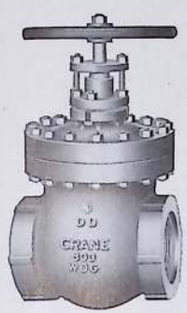


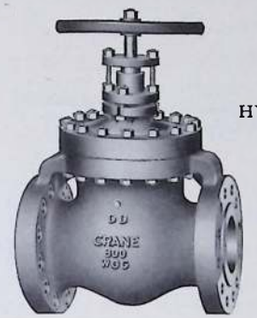
Dimensions, in Inches

Size	A	B	C	D	E	F	G	H	J	K	Turns to open	No. of Bolts	Dia. of Bolts
2	2	6½	⅞	4 3/16	5	8	8½	12½	17	9	15	8	⅝
2½	2½	7½	1	4 15/16	5⅞	8⅞	9½	14½	18¾	9	18	8	¾
3	3	8¼	1⅛	5 11/16	6⅝	9⅝	11⅛	15½	21	10	15	8	¾
4	4	10	1¼	6 15/16	7⅞	10½	12	17⅞	25¼	12	19	8	¾
6	6	12½	1 7/16	9 11/16	10⅝		15⅞	22¾	34	16	28	12	¾
8	8	15	1⅝	11 15/16	13		16½	28¾	42¾	20	36	12	⅞
10	10	17½	1⅞	14 1/16	15¼		18	36	53¼	22	44	16	1
12	12	20½	2	16 7/16	17¾		19¾	40	61	24	52	16	1⅛

Templates for drilling . . . page 460 *Thread engagement . . . page 494*
Motor or cylinder operation . . . . pages 124 to 129 *600-Pound Steel Pipe Line Gate Valves . . . . pages 232 and 233*

800-Pound W.O.G.
Ferrosteel Double Disc Gate Valves
Brass Trimmed





Non-Rising Stem Valves
No. 214 H, Screwed No. 215 H, Flanged

WORKING PRESSURE
800 pounds cold water, oil, or gas, non-shock

HYDROSTATIC TEST PRESSURES
1600-pound shell test
850-pound seat test

Air tested

List Prices, Each

Size	Screwed	Flanged F. D. & S. F.	
Inches	No. 214 H N-R.S.	No. 215 H N-R.S.	No. 217 H OS & Y
2	89.00		
2½	107.00		
3	137.00	160.00	170.00
4	217.00	245.00	258.00
* 6	330.00	415.00	458.00
* 8		610.00	700.00
*†10		1015.00	1300.00
*†12		1520.00	1940.00

*Sizes 6 to 12-inch should have a by-pass; see pages 100 to 102 for dimensions and description.
†Sizes 10 and 12-inch should be geared; see pages 100 to 102 for dimensions and description.



Outside Screw and Yoke Valve
No. 217 H
Flanged

Prices of flanged valves include facing, drilling, and spot facing (F.D. & S.F.) to the 800-Pound Hydraulic American Cast Iron Flange Standard; no deduction for valves ordered faced only.

These valves are ideal for use in oil or gas fields, in pump houses, on pipe lines, on high pressure water lines, and for other heavy duty service.

Materials: The body and bonnet are Crane Ferrosteel. Threaded ends of screwed valves are recessed for lead. The screwed-in body seat rings and the discs (2 to 4-inch) are Crane Special Bronze, a hard, leaded tin bronze. In larger sizes, discs are iron, faced with Crane Special Bronze.

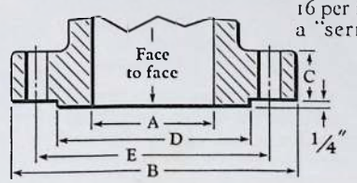
Outside screw and yoke valves have a brass stem. In non-rising stem valves, the stem is Cast Manganese Bronze, and the portion of the discs engaging the stem threads is brass or brass bushed.

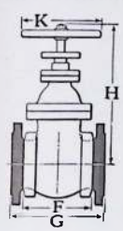
Stuffing box and gland: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure. The gland is two-piece and consists of an Ihrigized steel gland and a malleable iron gland flange.

Standards: Flanged valves conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949.

Flanged valves also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939), for 800-Lb. Hydraulic Cast Iron Flanged Double Disc Gate Valves.

Flange dimensions and facing: Dimensions and drilling of end flanges conform to the 800-Pound Hydraulic American Cast Iron Flange Standard (B16b1-1931). End flanges are regularly furnished with a ¼-inch male face (large male). The male face is finished with concentric grooves, approximately 16 per inch, known as a "serrated" finish.

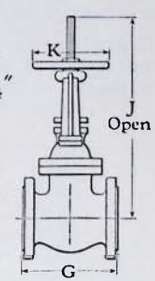




Screwed or Flanged
Non-Rising Stem

Dimensions, in Inches

Size	A	B	C	D	E	F	G	H	J	K	Turns to open	No. of Bolts	Dia. of Bolts
2						7½		13		9	15		
2½						8⅞		15		9	18		
3	3	8¼	1½	5	6⅝	9⅝	14	16¾	20¾	10	15	8	¾
4	4	10¾	1⅞	6 3/16	8½	10½	17	19	26½	12	19	8	⅞
6	6	14	2¼	8½	11½	14¾	22	23½	34	16	28	12	1
8	7⅞	16½	2½	10⅝	13¾		26	29¼	42¾	20	36	12	1⅛
10	9¾	20	2⅞	12¾	17		31	36½	53½	22	46	16	1¼
12	11¾	22	3	15	19¼		33	39¾	61¼	24	54	20	1¼



Flanged
Outside Screw and Yoke

Additional description . . . pages 88 and 89 *Templates for drilling . . . page 460* *Thread engagement . . . page 494*
Motor or cylinder operation . . . . pages 124 to 129 *600-Pound Steel Pipe Line Gate Valves . . . . pages 232 and 233*

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Iron Double Disc Gate Valves With Gearing or By-pass

For dimensions, see the following page.

With the exception of the A.W.W.A. Valves, the dimensions of Crane Iron Body and Ferrosteel Double Disc Gate Valves equipped with gearing or by-pass are shown on the opposite page.

For dimensions of the A.W.W.A. Valves and for dimensions of the other valves without gearing or by-pass, refer to the following pages:

25-Pound Valves.....see page 91
100-Pound W.O.G. Valves.....see page 93
A.W.W.A. Valves.....see page 95
200-Pound W.O.G. Valves.....see page 97
500-Pound W.O.G. Valves.....see page 98
800-Pound W.O.G. Valves.....see page 99

Gearing: Equipping the larger size Double Disc Gate Valves with gears will greatly facilitate their operation. Gears, both bevel and spur, are available for a wide range of sizes in each pressure class.

Face to face or end to end dimensions of valves with gears are the same as those of valves without gears; see pages referred to above.

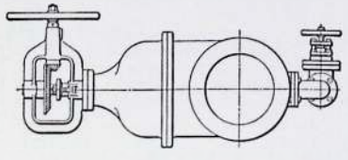
By-passes: Larger size flanged and hub end valves in all pressure classes can be furnished with a by-pass.

Center to top and wheel diameter dimensions of valves with by-pass are the same as those of valves without by-pass; face to face or end to end dimensions are explained below.

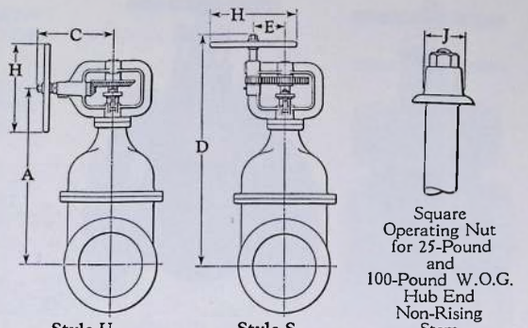
Face to face or end to end with by-pass: Crane 25-Pound, 100-Pound W.O.G., 200-Pound W.O.G., and 500-Pound W.O.G. Valves when furnished with a by-pass have a longer face to face or end to end dimension than the same valves without by-pass.

800-Pound W.O.G. Valves with by-pass have the same face to face dimension as the valves without by-pass. These dimensions are repeated on the opposite page for convenience.

Geared valves with by-pass: Spur-geared valves with by-pass have the by-pass connected at the side of the valve body.

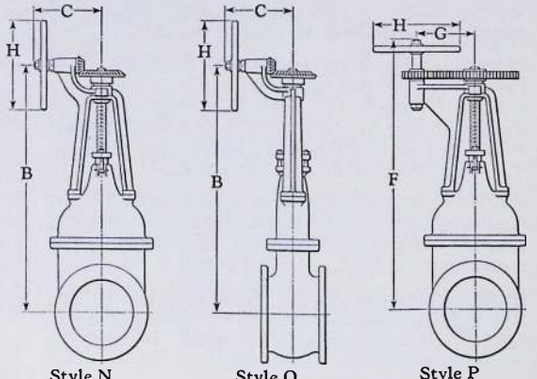


Bevel-geared valves with by-pass have the by-pass on the bottom, with the stem of the by-pass valve parallel to the pinion shaft; see illustration above.



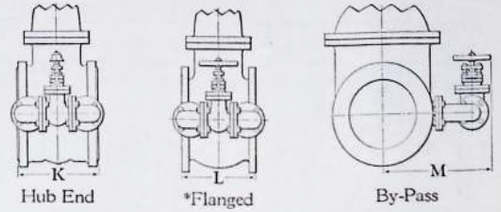
Style U Bevel Gearing — Style S Spur Gearing — Square Operating Nut for 25-Pound and 100-Pound W.O.G. Hub End Non-Rising Stem Geared Valves

Non-Rising Stem Valves With Bevel or Spur Gears



Style N Bevel Gearing — Style O Bevel Gearing — Style P Spur Gearing

Outside Screw and Yoke Valves With Bevel or Spur Gears



Hub End — *Flanged — By-Pass

Flanged and Hub End Valves with By-Pass

*Dimension "L" includes the 1/16-inch raised faces on 500-Pound W.O.G. Flanged Valves and the 1/4-inch male faces on 800-Pound W.O.G. Flanged Valves.

Iron Double Disc Gate Valves With Gearing or By-Pass

Dimensions, in Inches

For list prices, description, and dimensions of valves without gearing or by-pass, see pages 91 to 99.

Size of Main Valve	Valves with Gears: Bevel Geared A	B	C	Spur Geared D	E	F	G	H	J	No. of turns to open	Valves with By-Pass: K	*L	M	Size of by-pass
25-Pound Double Disc Gate Valves														
14	31¼	51⅛	12⅝	41½	6	54¾	10	14	2	58	18	16	23¼	2
16	34⅛	56⅛	12⅝	44½	6	59¾	10	14	2	66	21	18	27¼	3
18	39	62⅞	13	50¼	6	67¼	12	18	2	76	21	18½	28¼	3
20	42⅛	66⅜	13	53¼	6	70¾	12	18	2	84	21½	18½	29¼	3
24	49⅞	80¼	13	61	6	84¼	12	18	2	98	22½	20	32¾	4
30	58⅞	98⅞	13	70	6	103	12	18	2	248	23½	20½	34¾	4
36	70	113⅞	16⅞	84	8	119¾	14¾	22	2	441	27½	24	41¼	6
42		133¾	20½			139½	17	27		460		25½	44¾	6
48		139	23			157	19	30		600		29½	52	8
100-Pound W.O.G. Double Disc Gate Valves														
12											19¼	19¼	22	2
14	32½	49⅛	12⅝	42¾	6	52⅝	10	14	2	60	20	20	23¼	2
16	37¾	59⅜	13	48¾	6	59¾	12	18	2	68	23	23	26¼	3
18	40¾	60¾	13	51¾	6	65	12	18	2	76	23½	23½	27½	3
20	44¼	66⅜	13	55¼	6	70¾	12	18	2	84	24	24	28¾	3
24	52¾	78¾	17	66¾	8	84¾	14 11/16	22	2	152	26	26	31¼	4
30	65¼	100¼	20½	81¼	10 13/16	105¾	17	27		223		26½	35¼	4
36	77½	116¾	23	94	12	122½	19	30		456		27½	43	6
200-Pound W.O.G. Double Disc Gate Valves														
12	31⅛	44¾	13	42¼	6	49	12	18		51		18	22¼	2
14	35⅜	52⅝	13	46½	6	57	12	18		60		18½	23¼	2
16	41	59⅝	17	55	8	65¾	14 11/16	22		102		26½	26	3
18	44⅜	65¼	17	58½	8	71¼	14 11/16	22		114		27	27¼	3
20	47¼	72	17	61¼	8	78	14 11/16	22		128		28	28¾	3
24	56¼	85⅜	20½	72¼	10 13/16	91	17	27		182		32	32¾	4
500-Pound W.O.G. Double Disc Gate Valves														
6												16	12¾	1¼
8	24⅜	34½	13	35¼	6	38¾	12	18		72		18	14¾	1½
10	29⅝	43	15	42	7	47¾	14	20		110		20	16¾	1½
12	33½	48¼	15	45	7	53	14	20		130		22	24½	2
800-Pound W.O.G. Double Disc Gate Valves														
6	19⅝	28	12½	30	6	32	10	14		54		*22	14	1¼
8	25¼	34½	12⅞	36¼	6	38¾	12	18		72		*26	17	1½
10	30⅝	43½	15	43	7	48¼	14	20		112		*31	18½	1½
12	34¼	48⅞	15	46½	7	53⅝	14	20		133		*33	20¾	2

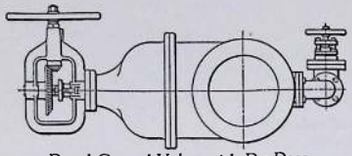
*Dimension "L", the face to face of flanged valves with by-pass, includes the 1/16-inch raised faces on 500-Pound W.O.G. Valves and the 1/4-inch male faces on 800-Pound W.O.G. Valves. Dimensions identified by an asterisk are the same as for valves without by-pass.

Description of gears...page 102 ***Description of by-passes...page 102*** ***Templates for drilling...pages 459 and 460***

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Accessories for Iron Double Disc Gate Valves

By-Passes



Bevel Geared Valve with By-Pass

When so ordered, larger size Flanged and Hub End Iron Body Double Disc Gate Valves can be furnished with a by-pass. This facilitates operation of the main valve by equalizing the pressure on both sides of the disc. The by-passes are large size, suitable for water (or oil or gas) service.

Non-rising stem valves are furnished with a non-rising stem by-pass; O.S.&Y. Valves, with an O.S.&Y. by-pass. Brass trimmed valves will have a brass trimmed by-pass; all-iron valves, an all-iron by-pass.

Unless otherwise ordered, on regular wheel operated and spur geared valves, the by-pass will be attached to the side of the main valve with the stem of the main valve and of the by-pass valve parallel, pointing vertically upward. Bevel geared valves with by-pass have the by-pass on the bottom of the main valve, as shown in the illustration at the upper left.

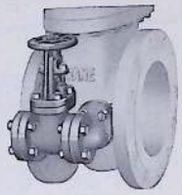
Dimensions . . . . pages 100 and 101

By-Passes
For Water Service on Flanged or Hub End Valves

Pressure Class of Main Valve	Size of Main Valve Inches	Size of By-Pass Inches	Price, Each: Non-Rising By-Pass	Price, Each: O. S. & Y. By-Pass
25-Lb. W.O.G. Page 91	14	2	*Prices on Application*	*Prices on Application*
	16 to 20	3		
	24 and 30	4		
	36 and 42	6		
	48	8	....	
100-Lb. W.O.G. Page 93	12 and 14	2	*Prices on Application*	
	16 to 20	3		
	24 and 30	4		
	36	6		
200-Lb. W.O.G. Page 97	12 and 14	2	*Prices on Application*	
	16 to 20	3		
	24	4		
500 and 800-Lb. W.O.G. Pages 98 and 99	6	1¼	*Prices on Application*	
	8 and 10	1½		
	12	2		



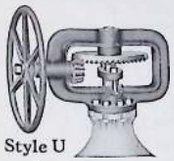
By-Pass for Water Service on Non-Rising Stem Gate Valve
Non-Rising Gate Valve Used in By-Pass



By-Pass for Water Service on Outside Screw & Yoke Gate Valves
Outside Screw & Yoke Gate Valve Used in By-Pass

Gearing

Non-Rising Stem



Style U Bevel Gearing



Style S Spur Gearing

Bevel or Spur Gearing For Non-Rising Stem Or O. S. & Y. Valves
25-Lb. Valves 14-inch and larger
100-Lb. W.O.G. Valves 14-inch and larger
200-Lb. W.O.G. Valves 12-inch and larger
500-Lb. W.O.G. Valves 8-inch and larger
800-Lb. W.O.G. Valves 6-inch and larger

The larger size Crane Iron Body Double Disc Gate Valves can be equipped with gears to facilitate operation.

Bevel gearing: Unless otherwise ordered, non-rising stem and outside screw and yoke bevel geared valves are furnished with the pinion shaft extending at right angles to the run of the valve. They can also be furnished with the shaft parallel to the run.

Outside Screw and Yoke



Style N Bevel Gearing



Style O Bevel Gearing



Style P Spur Gearing

Prices on Application
Dimensions of geared valves.... pages 100 and 101

Cleanouts

For 200-Pound W.O.G. Flanged Valves
Sizes 12-inch and smaller only

Cleanouts should be used where sediment will accumulate in a valve. They are installed on the side of the valve body.



Prices on Application Single Side Cleanout

Indicators

For 100 and 200-Pound W.O.G. Valves
Sizes 12-inch and smaller only

This "Universal" type indicator is easily applied to No. 776, 100-Pound W.O.G. and No. 480 or No. 481, 200-Pound W.O.G. Valves in stock or service. The parts are brass. Specify valve catalog number and size.



Indicator	List Price, Each	7.00

Iron Body Globe and Angle Valves

Union Bonnet Globe and Angle
150-Pound . . . . . pages 104 and 105
1000-Pound W.O.G., Malleable Iron . . . . . page 106
Heavy Duty All-Iron . . . . . page 111

Yoke-Type Bolted Bonnet Globe and Angle
General Description . . . . . page 107
Names of Parts . . . . . page 107
125-Pound . . . . . pages 108 and 109
250-Pound . . . . . page 110

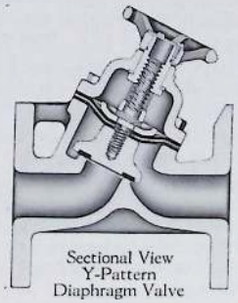
Heavy Duty All-Iron Globe and Angle . . . . . page 111

Butterfly Valves . . . . . page 111

Special attention is directed to the unusually complete line of 150-Pound Iron Body Union Bonnet Globe and Angle Valves shown on pages 104 and 105. These small size valves will find wide application in many industries. The wide variety of seating surfaces and trim materials available and the interchangeability of parts will appeal to users whose requirements warrant standardization and the stocking of replacement parts.

Tight Seating, "Packless" Type Crane Iron Body Y-Pattern Diaphragm Valves

Unexcelled for a Wide Variety of General and Corrosive Services



Sectional View Y-Pattern Diaphragm Valve

Crane Iron Body, Y-Pattern Diaphragm Valves, built for hard usage, are excellent for a wide variety of corrosive, as well as ordinary, piping systems. The flexible diaphragm mounted between the body and bonnet (eliminates the need for a stuffing box) and the tight-seating disc facing make the valves ideal for conveying liquids, compressed air, gases, volatile fluids, etc.

The valves, suitable for pressures ranging up to 150 pounds and a maximum temperature of 180° F., are made with screwed ends in sizes ½ to 2-inch and with flanged ends in sizes 1½ to 6-inch. They are available with the diaphragm and disc insert made of neoprene, Buna N, or natural rubber. The flanged valves are also available with the body lined, and the disc coated, with neoprene or natural rubber.

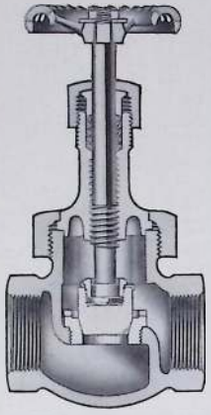
In addition to cast iron, the complete diaphragm line includes valves having the body and disc holder made of brass, aluminum, or 18-8 Mo.

For the complete Crane line of Diaphragm Valves, see pages 388 to 391.

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150-Pound Iron Body Globe and Angle Valves

Plug Type Disc



Cross Section
No. 314½ P, Globe

WORKING PRESSURES
150 pounds saturated steam
250 pounds cold water, oil, or gas, non-shock

FEATURES
Crane Nitri-Hard Seating Surfaces
Renewable Body Seat Ring
Plug Type Disc
Union Bonnet
2-inch and smaller
Bolted Bonnet
2½ and 3-inch



No. 314½ P, Globe
Screwed



No. 316½ P, Angle
Screwed

These valves are the same as the No. 350½ Globe and No. 352½ Angle shown on page 105 except that they have a plug type disc and seat instead of a 35° wide bearing seat.

List Prices, Each

Size — Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
No. 314½ P or No. 316½ P, Screwed	8.00	8.30	8.80	10.20	12.50	16.40	22.00	29.00	45.50	59.00

10

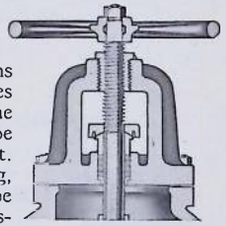
Service recommendations: Crane No. 314½ P Globe and No. 316½ P Angle Valves are ideally suited for installations where operating conditions are severe. Strong, compact, rugged, and durable, they are recommended for throttling and for soot blower, blow-off, boiler feed, drip, and drain lines.

Materials: Sizes 2-inch and smaller have a brass bonnet and a malleable iron union bonnet ring; 2½ and 3-inch sizes have a cast iron bonnet. All sizes have a cast iron body and a brass stem.

Disc and seat: The valves have a plug type disc and seat whose excellent design characteristics for rigorous service are well known. The wide seating surface is not easily ruined by foreign matter or by wiredrawing, and the tapered disc permits close regulation of flow when throttling.

Both the disc and seat are made of Crane Nitri-Hard, a stainless steel that withstands high temperatures and has an extremely hard surface. The design of the disc and seat combined with the excellent resistance offered by the high hardness to seizure, erosion, galling, and scoring, produce a truly superior seating combination. It will withstand severe operating condition unusually well.

Bonnet construction: Sizes 2-inch and smaller have a union bonnet as shown on the illustrations above; 2½ and 3-inch sizes have a bolted bonnet of the outside screw and yoke type as illustrated at the right. Both types provide a strong, tight joint, yet they can be easily dismantled and reassembled without danger of injuring the valve.



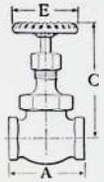
2½ and 3-inch sizes have a bolted bonnet.

Stuffing box: The stuffing box is unusually deep and is fitted with a gland. It is filled with high grade packing.

Repacking: The valves, when wide open, can be repacked while under pressure.

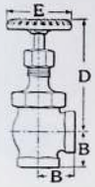
Interchangeability: Except for the plug type disc and seat and the materials used in these valves, the various parts of the Nos. 314½ P and 316½ P valves are completely interchangeable, size for size, with all of the 150-Pound Globe and Angle Valves shown on the opposite page.

A metal tag, secured under the wheel nut, shows the catalog number of the valve.



Dimensions, in Inches

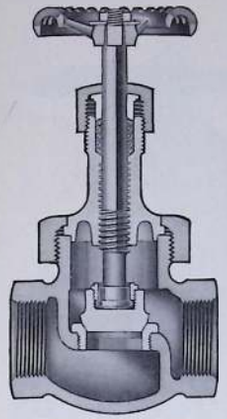
Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3
A	2⅜	2⅝	3	3½	4⅛	4⅝	5¼	6⅜	7	8
B	1⅛	1¼	1⅜	1 9/16	1⅞	2 3/16	2⅜	3	3½	4
C—open	4⅛	4⅜	5⅛	5½	6⅝	7¼	8¼	9½	11½	14
D—open	4	4¼	5	5⅜	6½	7¼	8⅛	9¼	11 3/4	13 3/4
E	1¾	2 1/16	2 9/16	2¾	3 1/16	3⅝	4 1/16	4¾	8	9



Thread engagement . . . page 494

150-Pound Iron Body Globe and Angle Valves

Brass Trimmed, All-Iron, or Composition Discs



Cross Section, Globe
Metal Disc

WORKING PRESSURES
150 pounds saturated steam
250 pounds cold water, oil, or gas, non-shock

FEATURES
Interchangeable Parts
Choice of Seating Materials
Renewable Body Seat Ring

A metal tag, secured under the wheel nut, shows the catalog number of the valve.

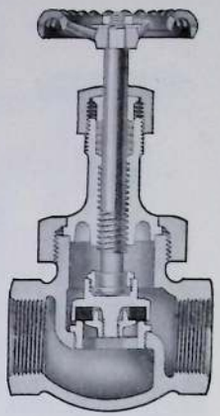


Globe, Screwed



Angle, Screwed

No. 350½ —Brass Trim, Nickel Alloy Disc & Seat—No. 352½
No. 354½ —All-Iron, Nickel Alloy Disc & Seat—No 356½
No. 355½ —All-Iron, Iron or Steel Disc & Seat—No. 357½
No. 350½ C—Brass Trim, No. 1 Cranite Disc—No. 352½ C
No. 355½ C— All-Iron, No. 1 Cranite Disc —No. 357½ C



Cross Section, Globe
Composition Disc

List Prices, Each

Size — Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	
No. 350½ or 352½	7.50	7.70	8.00	9.60	11.60	14.30	18.00	23.80	42.50	51.00	10
No. 354½, 355½, 356½, or 357½	9.00	9.20	9.60	11.50	12.70	15.70	19.80	26.00	Use 125-Pound Valves, pages 108 and 109.		
No. 350½ C or 352½ C	7.50	7.70	8.00	9.60	11.60	14.30	18.00	23.80			
No. 355½ C or 357½ C	10.80	11.00	11.50	13.70	15.30	18.80	23.80	31.50			

Service recommendations: Made with a sturdy cast iron body, these rugged, compact valves are ideal for steam, water, oil, gas, and similar services. They find wide application in many industries, including oil and gas fields, oil refineries, gas plants, mines, sugar refineries, chemical plants, etc.

Metal disc valves: The disc and seat are finished to a 35° taper and have wide contacting surfaces; they hold pressure easily and offer good resistance to wear. Seat rings are screwed into the body.

The Nos. 350½ and 352½ are suitable for general non-corrosive service. They have a brass stem and, except on 2½ and 3-inch sizes, a brass bonnet and gland; their disc and seat are Crane Nickel Alloy.

The Nos. 354½ and 356½ have a malleable iron bonnet, a steel stem and gland, and a Crane Nickel Alloy disc and seat; they are suitable for many corrosive fluids which attack brass but not Nickel Alloy.

The Nos. 355½ and 357½ are completely all-iron, having a malleable iron bonnet, a steel stem and gland, and a steel or cast iron disc and seat.

Composition disc valves: These regularly have a No. 1 Cranite Disc, suitable for saturated steam or for hot water up to 300° F. Valves ordered for cold water, air, gas, oil, or gasoline will have a No. 6 Disc. On hot water under 200° F., especially for easy seating, a No. 6 Disc is preferred to the No. 1.

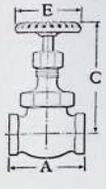
The Nos. 350½ C and 352½ C are brass trimmed, with a brass bonnet, stem, gland, disc holder, and disc nut, and a Nickel Alloy screwed-in seat ring.

The Nos. 355½ C and 357½ C are all-iron, with a malleable iron bonnet and disc holder, a steel stem and gland, and a steel or cast iron screwed-in seat ring.

Bonnet construction: Valves 2-inch and smaller have a union bonnet; their union bonnet ring and packing nut are tough malleable iron. Larger sizes have a cast iron yoke-type bolted bonnet with gasket, similar to the small illustration on page 104.

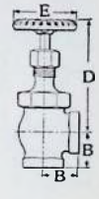
Stuffing box: The stuffing box is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Interchangeability: Except for materials and the design of the seat and disc, the parts of the valves shown here and on page 104 are completely interchangeable, size for size. This adds to their general utility and reduces stocks maintained for repairs.



Dimensions, in Inches

Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3
A	2⅜	2⅝	3	3½	4⅛	4⅝	5¼	6⅜	7	8
B	1⅛	1¼	1⅜	1 9/16	1⅞	2 3/16	2⅜	3	3½	4
C—open	4½	4 11/16	5 5/16	6 1/16	7	7 11/16	8 13/16	10¼	11½	13⅛
D—open	4⅜	4⅝	5 3/16	6	7	7⅝	8⅝	10	11½	12¾
E	1¾	2 1/16	2 9/16	2¾	3 1/16	3⅝	4 1/16	4¾	8	9



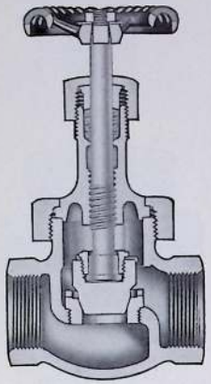
Composition Discs . . . page 133 *Thread engagement . . . page 494*

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1000-Pound W.O.G.
Malleable Iron Globe and Angle Valves
Plug Type Disc

WORKING PRESSURES
300 pounds steam or hot oil, 550° F.
1000 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
1200 pounds hydrostatic



Cross Section
No. 254 P, Globe
Exelloy Stem

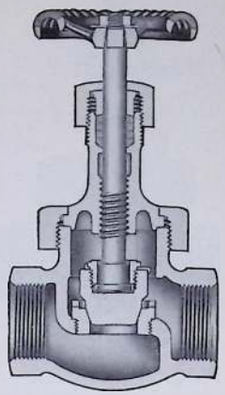


Globe, Screwed
No. 254 P, Exelloy Stem
No. 255 P, Steel Stem

Air Tested



Angle, Screwed
No. 256 P, Exelloy Stem
No. 257 P, Steel Stem



Cross Section
No. 255 P, Globe
Steel Stem

Crane Nitri-Hard Seating Surfaces

10

List Prices, Each

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 254 P or No. 256 P, Screwed		11.00	11.50	12.60	15.20	18.60	23.00	29.50	37.50
No. 255 P or No. 257 P, Screwed		10.20	10.50	11.30	13.60	16.60	20.00	26.00	33.50

Service recommendations: Crane 1000-Pound W.O.G. Malleable Iron Globe and Angle Valves are exceptionally strong, compact, and rugged. They are ideal for oil lines where fire hazard legislates against the use of cast iron and for services where a material stronger than cast iron is desired.

These valves hold pressure easily and when throttled, permit accurate regulation of flow. The wide and tapered plug type disc and seat is unusually resistant to wiredrawing and to damage from foreign matter.

Materials and construction: The body, bonnet, and union bonnet ring of the valves are made from high grade malleable iron. Because of the generous metal sections provided in their design and the durability of the materials used, these parts contribute unusual ruggedness to the valves. They have a very liberal factor of safety at their maximum recommended working pressure.

No. 254 P and No. 256 P Valves are equipped with an Exelloy stem; No. 255 P and No. 257 P Valves have a steel stem, nickel-plated.

Plug type disc and seat: The valves have a plug type disc and seat with a wide bearing surface which offers excellent resistance to wiredrawing and to damage caused by foreign particles.

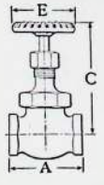
Both the disc and seat are Crane Nitri-Hard, a stainless steel having an extremely hard surface. The design of the disc and seat combined with the excellent resistance offered by the high hardness to erosion, galling, and scoring, produce a truly superior seating combination. It will withstand severe operating conditions unusually well.

Union bonnet: The union bonnet connection, joining the body and bonnet in a metal to metal contact, is made up with a heavy malleable iron union ring. The joint is strong, tight, simple, and practical, yet when occasion demands, it can be easily dismantled and reassembled quickly. Gaskets are not required.

Stuffing box: The stuffing box is unusually deep; it is fitted with a steel gland, a malleable iron packing nut, and is filled with high grade packing.

Repacking: These valves, when wide open, can be repacked while under pressure.

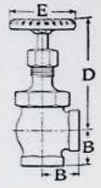
A metal tag, secured under the wheel nut, shows the catalog number of the valve.



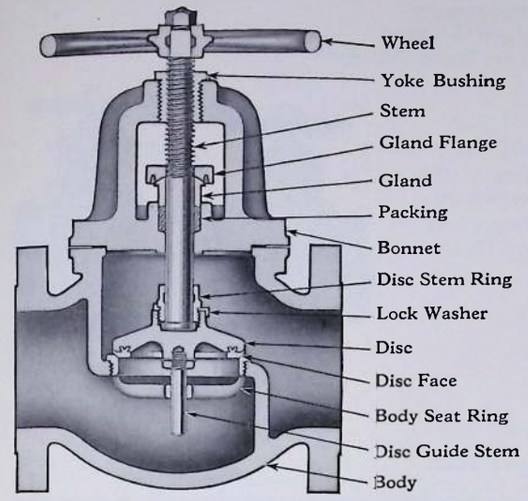
Dimensions, in Inches

Size	¼	⅜	½	¾	1	1¼	1½	2
A	2⅜	2⅝	3	3½	4⅛	4⅝	5¼	6⅜
B	1⅛	1¼	1⅜	1⁹⁄₁₆	1⅞	2³⁄₁₆	2⅜	3
C—open	4⁷⁄₁₆	4⁹⁄₁₆	5³⁄₁₆	5⁹⁄₁₆	7	7⅝	8¾	10
D—open	4⁵⁄₁₆	4⁹⁄₁₆	5⅛	5⅞	6⅞	7½	8½	9⅞
E	1¾	2¹⁄₁₆	2⁹⁄₁₆	2¾	3¹⁄₁₆	3⅝	4¹⁄₁₆	4¾

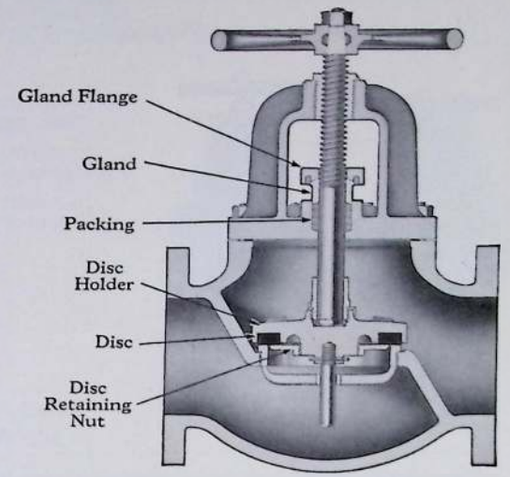
Thread engagement . . . . page 494



Iron Body Globe and Angle Valves
With Yoke Bonnet



Globe Valve—Brass Trimmed
(Illustration shows No. 21 E, 250-Pound, page 110)



Globe Valve—With Composition Disc
(Illustration shows No. 359, 125-Pound, page 109)

10

General Description

The Crane line of Iron Body Globe and Angle Valves with Yoke Bonnet includes the following types:

125-Pound Valves, Brass Trimmed. . . . . page 108
125-Pound Valves, All-Iron. . . . . page 108
125-Pound Valves, Composition Disc. . . . . page 109
250-Pound Valves, Brass Trimmed. . . . . page 110

All of these valves are similar in construction, differing principally in proportions and in materials. The illustrations appearing above show cross sections of typical valves. Variations in design are covered in detail on pages 108 to 110.

Rugged construction: The valves are well proportioned and are ruggedly constructed. They have amply thick metal sections, and the metal is properly distributed to assure maximum strength.

Bonnet: The bonnet is the yoke type. Stem threads are engaged in the yoke on the outside where they are not affected by the fluid in the line and where they can be easily lubricated, thereby minimizing wear. The yoke bushing is made of Cast Manganese Bronze.

Disc-stem connection: All of the valves have a swivel disc or disc holder securely fastened to the stem with a disc stem ring. The connection is locked with a special lock washer.

Guided disc: Except for the 2-inch 125-Pound All-Iron Valves, the disc or disc holder is closely guided throughout its travel by a guide stem operating in the bridge cast integral with the body seat ring. Vibration of the internal parts is thereby minimized, and true seating of the disc is assured.

The disc guide stem is integral with the disc in the smaller sizes; in larger sizes, the disc guide stem is screwed into the disc or disc holder and pinned.

Gland and gland flange: All Crane Iron Body Globe and Angle Valves have a two-piece gland and gland flange.

In 125-Pound Valves, the gland is Ihrigized steel and the gland flange is malleable iron. Gland studs and nuts for brass trimmed valves are bronze; for composition disc and all-iron valves, they are steel.

In 250-Pound Valves, the gland is Ihrigized steel or brass and the gland flange is steel or malleable iron. Gland studs and nuts are steel.

Stuffing box: Stuffing boxes are of liberal depth and are filled with high grade packing. A brass stem hole bushing, fitted in the bottom of the stuffing box, is furnished on all 125-Pound Brass Trimmed Valves.

Repacking: These valves, when wide open, can be repacked while under pressure.

Wheel: The wheel, having a tapered square hole, fits snugly on the square stem end and is held in place with a steel nut. It can be easily removed. Wheels are made of malleable iron.

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125-Pound Iron Body Globe and Angle Valves

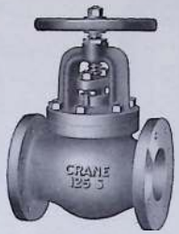
Brass Trimmed or All-Iron

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

TEST PRESSURES
Shell Test
350 pounds hydrostatic
Seat Test
225 pounds hydrostatic


Globe, Screwed
No. 350
Brass Trimmed
No. 350¼
All-Iron


Angle, Screwed
No. 352
Brass Trimmed
No. 352¼
All-Iron


Globe, Flanged
No. 351
Brass Trimmed
No. 351¼
All-Iron


Angle, Flanged
No. 353
Brass Trimmed
No. 353¼
All-Iron

List Prices, Each

Size		Inches	2	2½	3	3½	4	5	6	8	10
Brass Trimmed	No. 350 or No. 352, Screwed		36.00	38.00	44.50	52.00	65.00	84.50	114.00		
	No. 351 or No. 353, Flanged, F. & D.		40.00	43.00	51.00	62.50	76.50	96.00	126.00	210.00	335.00
All-Iron	No. 350¼ or No. 352¼, Screwed		36.00	38.00	44.50						
	No. 351¼ or No. 353¼, Flanged, F. & D.		40.00	43.00	51.00		76.50		126.00	210.00	

10

Rugged proportions: These are high quality valves designed to withstand severe service. They are ruggedly proportioned to provide liberal strength.

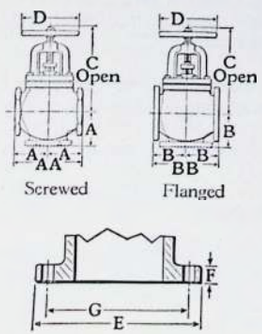
Brass trimmed valves: Brass trimmed valves are ideal for steam or water lines, or for fluids that do not corrode brass or iron. They have an iron body and bonnet, a brass screwed-in body seat ring, a brass stem hole bushing, and a Cast Manganese Bronze stem. A solid brass disc is furnished on sizes 6-inch and smaller; larger sizes have an iron disc with a heavy brass seating face.

All-iron valves: For fluids that corrode brass but not iron, the all-iron valves are recommended. The body, bonnet, seat, and disc are iron; the stem is made of steel and is nickel plated.

Flange dimensions and facing: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

Face to face and center to face: The face to face and center to face dimensions of Flanged Globe and Angle Valves in sizes 8-inch and smaller conform to the American Ferrous Flanged Valve Standard (B16.10-1939) for 125-Pound Cast Iron Globe and Angle Valves. This Standard does not include the 10-inch size.

Drilling: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.



Dimensions, in Inches

Size			2	2½	3	3½	4	5	6	8	10
AA			6½	7	8	9	10	11¼	13		
A			3¼	3½	4	4½	5	5⅝	6½		
BB			8	8½	9½	10½	11½	13	14	19½	24½
B			4	4¼	4¾	5¼	5¾	6½	7	9¾	12¼
C	Globe		11⅛	11½	13⅛	13⅜	15½	17⅜	19½	24¾	30¼
	Angle		11	11½	12¾	13¾	14⅞	17⅜	19⅜	22¾	24
D			8	8	9	9	10	10	12	16	18
Flange Dimensions		E	6	7	7½	8½	9	10	11	13½	16
		F	⅝	11/16	¾	13/16	15/16	15/16	1	1⅛	1⅜16
		G	4¾	5½	6	7	7½	8½	9½	11¾	14¼
		No. of bolts	4	4	4	8	8	8	8	8	12
		Dia. of bolts	⅝	⅝	⅝	⅝	⅝	¾	¾	¾	⅞

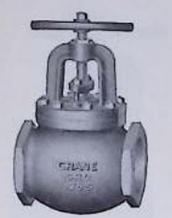
Valves for Marine Service....pages 400 and 406
Additional description....page 107
Templates for drilling....page 459

125-Pound Iron Body Globe and Angle Valves

No. 1 Cranite Composition Disc

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

TEST PRESSURES
Shell Test
350 pounds hydrostatic
Seat Test
225 pounds hydrostatic


Globe, Screwed
No. 358


Angle, Screwed
No. 360½


Globe, Flanged
No. 359


Angle, Flanged
No. 361½

List Prices, Each

Size		Inches	2½	3	3½	4	5	6
With No. 1 Cranite Disc	No. 358, Globe, Screwed		46.00	53.50		79.00		
	No. 359, Globe, Flanged, F. & D.		51.00	60.00	72.50	90.00	115.00	146.00
	No. 360½, Angle, Screwed		46.00	53.50		79.00		
	No. 361½, Angle, Flanged, F. & D.		51.00	60.00	72.50	90.00	115.00	146.00

10

Service recommendations: These valves are sturdy and well proportioned. They are similar in construction to the valves shown on the opposite page. Being equipped with a composition disc, they are suitable for a wide range of service.

Materials: The valves have an iron body and bonnet. The stem is made of Cast Manganese Bronze and the body seat ring is made of brass. The disc holder is made of iron.

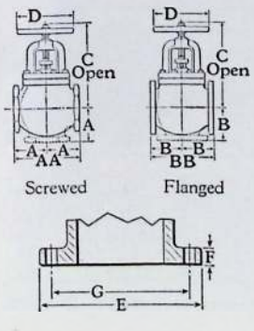
Discs: All of the valves are regularly equipped with a No. 1 Cranite Disc, suitable for saturated steam or for hot water up to 300° F.

Valves ordered for cold water, air, gas, oil, or gasoline are furnished with a No. 6 Disc. On hot water under 200° F., especially for frequent operation or easy seating, a No. 6 Disc is preferred to the No. 1. For description, service recommendations, and dimensions of composition discs, see page 133.

Flange dimensions and facing: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

Face to face and center to face: The face to face and center to face dimensions of Flanged Globe and Angle Valves conform to the American Ferrous Flanged Valve Standard (B16.10-1939) for 125-Pound Cast Iron Globe and Angle Valves.

Drilling: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.



Dimensions, in Inches

Size			2½	3	3½	4	5	6
AA			8	8¼		10½		
A			4	4⅛		5¼		
BB			8½	9½	10½	11½	13	14
B			4¼	4¾	5¼	5¾	6½	7
C			10¼	12¼	12½	14½	16¼	18⅝
D			8	9	9	10	10	12
Flange Dimensions		E	7	7½	8½	9	10	11
		F	11/16	¾	13/16	15/16	15/16	1
		G	5½	6	7	7½	8½	9½
		No. of bolts	4	4	8	8	8	8
		Dia. of bolts	⅝	⅝	⅝	⅝	¾	¾

Composition discs....page 133
Additional description....page 107
Templates for drilling....page 459

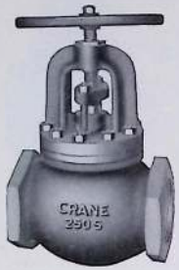
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250-Pound Ferrosteel Globe and Angle Valves

Bronze Trimmed

WORKING PRESSURES
250 pounds steam, 450° F.
500 pounds cold water, oil, or gas, non-shock

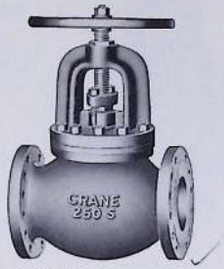
HYDROSTATIC TEST PRESSURES
Shell test — 1000 pounds Seat test — 550 pounds



Globe, Screwed
No. 20 E



Angle, Screwed
No. 22 E



Globe, Flanged
No. 21 E



Angle, Flanged
No. 23 E

10

List Prices, Each

Size, Inches	2	2½	3	3½	4	5	6	8
No. 20 E or No. 22 E, Screwed	63.50	78.00	89.00		123.00			
No. 21 E or No. 23 E, Flanged, F. & D.	68.00	86.00	102.00	117.00	139.00	182.00	230.00	376.00

Service recommendations: Crane 250-Pound Ferrosteel Globe and Angle Valves have very heavy metal sections and are unusually rugged. They are recommended for high pressure and severe service on steam, water, oil, or gas lines.

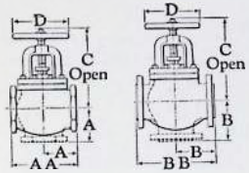
Materials: The body and bonnet are Ferrosteel. The disc is solid Crane Special Bronze in sizes 3½-inch and smaller, and iron with a large Crane Special Bronze seating face rolled in on larger sizes. The body seat ring, too, is Crane Special Bronze, a strong, wear-resisting leaded tin bronze. The stem is Cast Manganese Bronze.

Seat: Sizes 6-inch and smaller have a 45° seat; the 8-inch size has a flat seat.

Face to face and center to face: The face to face and center to face dimensions of the flanged globe and angle valves conform to the American Ferrous Flanged Valve Standard (B 16.10-1939).

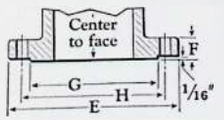
Flange dimensions and facing: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 250 (B16b-1944). Flanges have a 1/16-inch raised face; the raised face is finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

Drilling: List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 250. No deduction is made when valves are ordered faced only.



Screwed

Flanged



Dimensions, in Inches

Size		2	2½	3	3½	4	5	6	8
AA		9½	10¾	11¾		13			
A		4¾	5⅜	5⅞		6½			
BB		10½	11½	12½	13¼	14	15¾	17½	21
B		5¼	5¾	6¼	6⅝	7	7⅞	8¾	10½
C	Globe	13¾	14⅝	16¼	16⅞	18⅝	20⅞	23¼	28½
	Angle	13	13⅝	15⅜	16⅞	17¼	19⅜	21⅝	26
D		9	10	10	10	12	14	16	20
Flange Dimensions	E	6½	7½	8¼	9	10	11	12½	15
	F	⅞	1	1⅛	1 3/16	1¼	1⅜	1 7/16	1⅝
	G	4 3/16	4 15/16	5 11/16	6 5/16	6 15/16	8 5/16	9 11/16	11 15/16
	H	5	5⅞	6⅝	7¼	7⅞	9¼	10⅝	13
	No. of bolts	8	8	8	8	8	8	12	12
	Dia. of bolts	⅝	¾	¾	¾	¾	¾	¾	⅞

Additional description . . . . page 107 *Templates for drilling . . . . page 460*

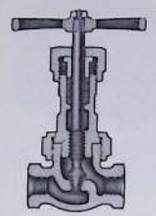
Heavy Duty All-Iron Globe and Angle Valves

For list prices and dimensions, see pages 411 and 412.

WORKING PRESSURES
500 pounds oil (non-shock), gas, or air, 100° F.
300 pounds oil (non-shock), gas, or air, 300° F.

Tested 300 pounds air-under-water.

Union Bonnet


Globe
No. 1504½
Screwed
1/4 to 1-inch

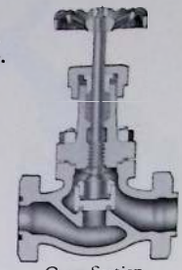

Angle
No. 1505½
Screwed
1/4 to 1-inch

Bolted Bonnet


Globe
No. 1501, Flanged
Tongue and Groove
1/2 to 4-inch


Globe
No. 1504
Screwed
1/4 to 3-inch


Angle
No. 1505
Screwed
1/4 to 3-inch


Cross Section
No. 1504, Globe
With Lead Faced Disc


Section of Steel Disc and Seat in Bolted Bonnet Valves

10

Service recommendations: These valves are ideally suited for use on air, gas, or oil service, and for corrosive fluids in special process work and in chemical plants where heavy, all-iron construction is needed. They are unusually massive and rugged, providing a high margin of safety against accidents.

Union bonnet valves: Union bonnet valves have a plug type disc that is integral with the stem. The valves can be reground without removing the body from the line. The stuffing box is unusually deep, is filled with high grade packing, and is equipped with a threaded packing nut.

Bolted bonnet valves: The bolted bonnet valves are regularly furnished with a Special Lead Face rolled into a machined dovetail in the disc. The face seats upon a crowned face in the body, assuring tightness in service. Where high temperatures or corrosive action prohibit the use of lead, the valves can be furnished with a case-hardened steel disc and steel seat ring, as illustrated at the right. Be sure to order valves "with Steel Disc and Seat" when this type construction is needed.

The bonnet joint is male and female, with a Cranite gasket retained by a long lip on the bonnet. The stuffing box is extra deep to assure a good seal around the stem; sizes 1½-inch and smaller have a heavy, threaded packing nut, while the larger sizes have a one-piece bolted gland. ¼, ⅜, and ½-inch valves have a one-piece stem and disc or disc holder.

Materials: All of these valves have a Ferrosteel body and bonnet. They are all-iron (except for the lead faced disc described above), and have a steel stem; no copper or brass is used in their construction.

Iron Body Butterfly Valves

Butterfly Valves provide easy operation in about one-quarter turn from the wide open to the closed position. They are not intended to close pressure tight and should be used only to control or regulate flow. The valves have an iron body, a steel stem, and a brass disc.

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas

On flanged valves, the dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced with a smooth finish. List prices of flanged valves include facing and drilling to this Standard; no deduction is made when valves are ordered faced only.



No. 380, Screwed
No. 381, Flanged

10 and 12-inch sizes have a bolted gland, (not illustrated)

For Brass Butterfly Valves, see page 57.

List Prices and Dimensions

Size, Inches		2	2½	3	4	5	6	8	10	12
No. 380, Screwed	Each	15.00	19.00	26.00	35.00					
No. 381, Flanged, F. & D.	Each			40.00	56.00	75.00	97.00	164.00	268.00	403.00
End to end or face to face	Inches	4¼	4¾	5¼	6	6¾	7½	9¼	10¾	12½
Diameter of stem	Inches	½	½	9/16	⅝	⅝	¾	15/16	1¼	1⅜
Center to top of stem	Inches	6⅛	7	7⅞	9⅛	10¼	11½	12½	12¾	15

A drilled hole through the upper part of the valve stem permits attaching an operating mechanism.

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Crane Iron Body Valves

A Variety of Types For Every Service



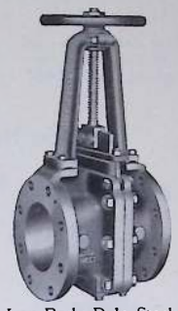
250-Pound Ferrosteel Stop-Check No. 28 E *(Page 303)*

Commonly used types of Crane Iron Body Valves are illustrated and described in Sections 8 to 11 of this catalog, as follows:

Wedge Gate.....Section 8
Double Disc Gate.....Section 9
Globe and Angle.....Section 10
Check and Foot.....Section 11



Iron Body Back Pressure No. 385 *(Page 310)*



Iron Body Pulp Stock No. 1427 *(Page 300)*

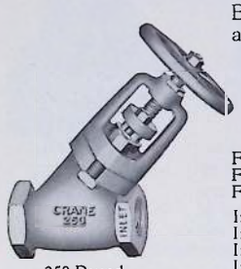
In addition to the foregoing, Crane supplies a wide assortment of Iron Body Valves for special services and in designs that will automatically perform a specified duty in piping installations.

For greater convenience, such valves are shown in other sections of this catalog, along with related products. Refer to the following pages:

Ferrosteel Stop-Check Valves.....page 303
Ferrosteel Blow-Off Valves.....page 308
Ferrosteel Valves for Ammonia.....pages 410 to 413

Iron Body Pulp Stock Valves.....page 300
Iron Body Back Pressure Valves.....pages 310 and 311
Iron Body Float Valves.....pages 314 and 316
Iron Body Safety Valves.....pages 322 to 325
Iron Body Relief Valves.....pages 331, 332, and 334
Iron Body Diaphragm Valves.....pages 388 to 391
Iron Body Valves for Marine Service.....pages 400, 405, and 406

Alloy and Ni-Resist Iron Gate Valves.....pages 384 and 385



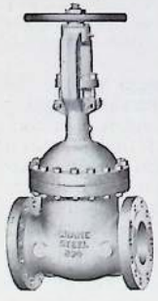
250-Pound Ferrosteel Blow-Off No. 393 *(Page 308)*



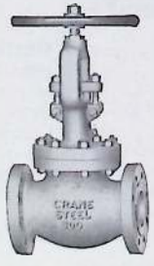
Iron Body Relief No. 1113 *(Page 332)*

Crane Steel Valves

For High Pressures — For High Temperatures



300-Pound Cast Steel Wedge Gate No. 33 X *(Page 229)*



300-Pound Cast Steel Globe No. 151 X *(Page 246)*



300-Pound Cast Steel Swing Check No. 159 X *(Page 255)*

Steel Pressure-Seal and Lip-Seal Bonnet Valves..pages 205 to 219
Steel Gate Valves.....pages 221 to 234
Steel Globe and Angle Valves.....pages 235 to 248
Steel Check Valves.....pages 249 to 256

Leaky Valve Stuffing Boxes Are Easily Remedied!



A slight stuffing box leak, if left unattended, gets bigger and bigger and can cause serious damage to valve parts. More important, the waste of fuel, power, or fluid is surprisingly great—often many times the cost of the entire valve in a few months of leakage.

The remedy is simple. Since packing wears gradually as it is subjected to service, it is only necessary to slightly tighten the packing nut or gland to stop a leak when it starts. And when new packing is necessary, Crane Valves can be repacked when wide open and under pressure.

Iron Body Check and Foot Valves

Lift Check Valves

125-Pound.....page 115
150-Pound.....page 114
Heavy Duty All-Iron.....page 115

Swing Check Valves

125-Pound.....pages 116 to 118
Clearway Type, Underwriters' Pattern.....page 120
250-Pound.....page 121
1000-Pound W.O.G., Malleable Iron.....page 114
With Outside Lever and Weight.....page 118

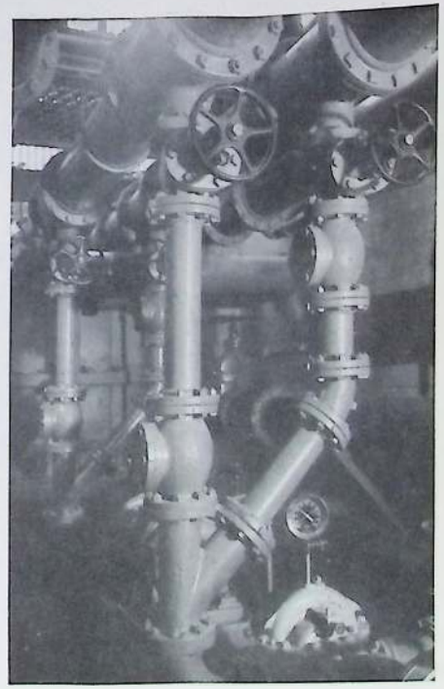
Foot Valves.....page 119

The liberal variety of sizes and types of Crane Iron Body Check and Foot Valves assures an adequate selection for all ordinary service requirements.

In addition, the Stop-Check Valves shown on pages 301 to 303 are frequently used to excellent advantage for regular check valve service in boiler feed lines, in the discharge lines from high pressure pumps, and in the discharge lines from air compressors.

The Ferrosteel Check Valves for ammonia, shown on page 115 and page 412, also are frequently used on water and air lines under pulsating service.

Crane-Line Backflow Preventers....page 318



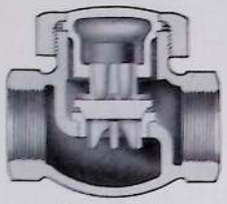
Crane iron body check and gate valves, and iron flanged fittings in an electric light and power plant.

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150-Pound Iron Body Lift Check Valves

Nickel Alloy or No. 1 Cranite Composition Disc

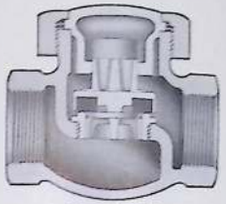
WORKING PRESSURES
150 pounds saturated steam
250 pounds cold water, oil, or gas, non-shock



Cross Section
No. 366½
Crane Nickel Alloy Disc
Crane Nickel Alloy Seat



Horizontal Lift, Screwed
No. 366½, Nickel Alloy Disc
No. 366½ C, Composition Disc



Cross Section
No. 366½ C
Composition Disc
Crane Nickel Alloy Seat

List Prices and Dimensions

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 366½, with Crane Nickel Alloy Disc	Each	7.80	8.00	8.60	9.40	10.50	12.00	14.50	19.00
No. 366½ C, with No. 1 Cranite Composition Disc	Each	7.80	8.00	8.60	9.40	10.50	12.00	14.50	19.00
End to end	Inches	2⅜	2⅝	3	3½	4⅛	4⅝	5¼	6⅜
Center to top	Inches	1 7/16	1 9/16	1¾	2 1/16	2 5/16	2 11/16	3 3/16	3 5/8

For list prices of Composition Discs for No. 366½ C Valves, see page 133.

Service recommendations: Crane 150-Pound Iron Body Lift Check Valves are recommended for small lines carrying steam, hot water, cold water, oil, gas, and similar fluids. They are compact and are ruggedly constructed.

Construction: The valves have a union cap, providing a strong, tight joint. The disc or disc holder is guided both at the top and at the bottom, assuring square seating.

Materials: The body is cast iron, the cap is brass, and the cap ring is malleable iron.

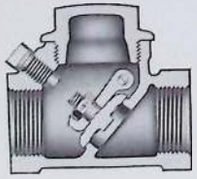
The No. 366½ Valves have a Nickel Alloy disc and body seat ring. Crane Nickel Alloy is hard and offers excellent resistance to wear.

The No. 366½ C Valves have a brass disc holder and a Nickel Alloy body seat ring.

Unless otherwise ordered, the No. 366½ C Valves are furnished with a No. 1 Cranite Disc, suitable for steam, or hot water from 200° to 300° F. When ordered for hot water up to 200° F., cold water, air, gas, oil, or gasoline, they are furnished with a No. 6 Disc. For discs, see page 133.

1000-Pound W.O.G.

Malleable Iron Swing Check Valves



Cross Section

WORKING PRESSURES
300 pounds oil, 550° F.
1000 pounds cold water, oil, or gas, non-shock

TEST PRESSURE
1200 pounds hydrostatic



No. 346½, Screwed

List Prices and Dimensions

Size	Inches	⅜	½	¾	1	1¼	1½	2
No. 346½, Screwed	Each	12.50	13.00	13.70	14.70	16.00	18.00	21.00
End to end	Inches	2¾	2¾	3 1/16	3⅝	4⅛	4 13/16	5 13/16
Center to top of cap	Inches	1⅞	1⅞	2⅛	2½	2⅞	3⅜	3⅞

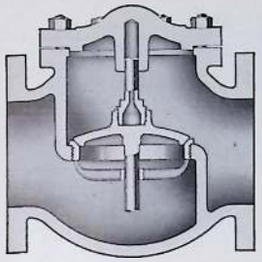
Service recommendations: These valves are especially suitable for oil lines where fire hazard legislates against the use of cast iron, and for corrosive services where all-iron valves are satisfactory but where a material stronger than cast iron is desired. The valves are compact and rugged.

Materials: The body, cap, disc, and hinge are made of tough, durable malleable iron. The hinge pin is made of Exelloy.

Regrinding: The valves can be reground without taking the body from the line. By removing the stop plug, a screw driver can be engaged with the slot in the disc spud, making it easy to rotate the disc when regrinding.

125-Pound Iron Body Lift Check Valves

Brass Trimmed

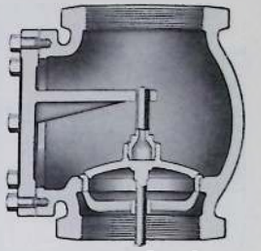


Cross Section
No. 367, Horizontal

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock

TEST PRESSURES
Shell test — 350 pounds hydrostatic
Seat test — 225 pounds hydrostatic

List prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.



Cross Section
No. 368, Vertical

List Prices, Each, and Dimensions

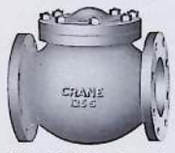
Size	Inches	2	2½	3	4	5	6
No. 366, Horizontal, Screwed		13.50	19.00	25.00	43.00		
No. 367, Hor., Flanged, F.&D.				29.50	49.50	74.00	101.00
No. 368, Vertical, Screwed			24.00	32.00	51.00		
Dimensions in Inches	A	6½	7	8	10		
	B			9½	11½	13	14
	C	3½	4¼	5	6¼	7	8¼
	D		7	8	10		
	E		4¼	5	6		



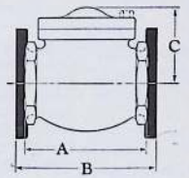
No. 366, Horizontal Screwed

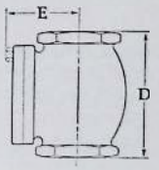


No. 368, Vertical Screwed



No. 367, Horizontal Flanged





Templates for drilling *. . . . page 459*
Thread engagement *. . . . . page 494*

Materials and construction: These are rugged, well proportioned horizontal and vertical lift check valves. Their solid brass disc is accurately guided both at the top and bottom, assuring square seating. The body seat ring is brass and is screwed into the body.

No. 366 Valves, 3-inch and smaller, have a brass screwed-in cap; the 4-inch size has an iron bolted cap. No. 367 and No. 368 Valves have an iron bolted cap on all sizes.

Flange dimensions and facing: End flanges conform to the American Cast Iron Flange Standard, Class 125, (B16.1-1948). The flanges are plain faced with a smooth finish.

Heavy Duty All-Iron Lift Check Valves



Cross Section

WORKING PRESSURES
500 pounds oil (non-shock), gas, or air, 100° F.
300 pounds oil (non-shock), gas, or air, 300° F.
Tested 300 pounds air-under-water

Sizes	Inches	½	¾	1	1¼	1½	2

For prices and dimensions, see page 412.



No. 1507½ Screwed

Service recommendations: The No. 1507½ All-Iron Lift Check Valve is ideally fitted for use on air, gas, or oil service, and for corrosive fluids in chemical plants and in special process work where heavy, all-iron construction is desired. They are especially designed for handling deadly or hazardous fluids; their rugged, unusually massive construction provides a high margin of safety against accidents.

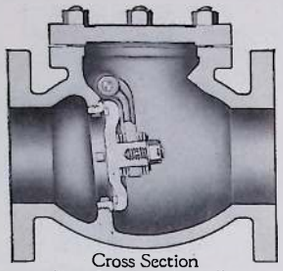
Construction: The body has heavy metal sections, liberally reinforced at points of greatest stress. The cap is bolted on, using four steel stud-bolts. The cap joint is tongue and groove, assuring positive retention of the gasket, which is made from 1/16-inch thick Cranite sheet packing. The disc is piston shaped at the upper end to permit a snug fit in the body. The cushioning effect secured by this dashpot construction makes the valve well suited for lines subject to pulsation, such as on air compressors or reciprocating type pumps. The disc is guided at both ends in valves 1¼-inch and larger, and in 1½ and 2-inch valves, is equipped with a piston ring.

Materials: The body and cap are made of Ferrosteel. The disc in sizes 1-inch and smaller is steel; in larger sizes it is Ferrosteel. Crane Ferrosteel is a high grade iron approximately 35 per cent stronger than cast iron.

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125-Pound Iron Body Swing Check Valves

Brass Trimmed or All-Iron



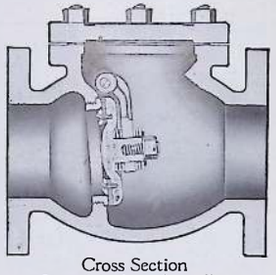
Cross Section
Sizes 8-inch and smaller
No. 373, Flanged
Brass Trimmed

Size of Valve	Working Pressures			Hydrostatic Test Pressures	
	Screwed or Flanged Valves		Hub End Valves	Screwed, Flanged, or Hub End Valves	
	Saturated steam	Cold water, oil, or gas, non-shock	Cold water or gas, non-shock	Shell test	Seat test
2 to 12-inch	125 pounds	200 pounds	200 pounds	350 pounds	225 pounds
14 and 16-inch	125 pounds	150 pounds	—	250 pounds	175 pounds
18 to 24-inch	—	150 pounds	—	250 pounds	175 pounds

DISC-HINGE CONNECTION

Sizes 8-inch and smaller (patented) feature a flexible disc-hinge connection. Two springs are used in the disc-hinge assembly, one on each side of the hinge. When the disc nut is tightened upon assembly, these springs are compressed sufficiently to provide a flexible but semi-rigid connection which eliminates lost motion between the parts, reduces wear, and yet, permits the disc to make true, full contact with the seat. See the cross sections illustrated on this page.

Sizes 10-inch and larger (not illustrated) have the conventional swing check valve disc-hinge connection in which the spud on the disc fits into a hole in the hinge, the parts being held together by a large washer and a nut.



Cross Section
Sizes 8-inch and smaller
With Leather Faced Disc

When so ordered, any of the brass trimmed valves can be furnished with a leather faced disc. Such valves are recommended only for cold water. Extra charges for the leather faced discs are shown on the opposite page.

Brass trimmed valves: Brass trimmed valves are recommended for steam or water, or for fluids that do not corrode brass.

The body seat ring is brass and is screwed into the body. The hinge pin, also brass, rides in brass bushings, one on each side of the valve body, thus assuring a non-corrosive, wear-resistant bearing. Unless otherwise ordered, the disc is brass in sizes 3-inch and smaller, and cast iron faced with brass in larger sizes.

All-iron valves: All-iron valves are recommended for gas, or for fluids that corrode brass but not iron.

The seating surfaces are cast integral with the body and disc. Valves with screwed-in body seat rings can be supplied when ordered; prices on application.

The hinge pin is Exelloy, supported at each end by iron bushings in the valve body.

Construction: These are well proportioned and sturdily constructed valves. The body, oval or globular in shape, provides ample flow area around the disc when the valve is wide open. The valves are designed so that the disc cannot stick in the open position.

All sizes have the hinge suspended in the body. Easy access to both ends of the hinge pin is provided by the tapped and plugged opening in each of the two bosses on the body. This feature simplifies change-over to outside lever and weight construction.

By-passes: A by-pass (2-inch on 12 and 14-inch valves, 3-inch on 16, 18, and 20-inch valves, and 4-inch on 24-inch valves) can be furnished; prices and dimensions on application. The valve in the by-pass is a non-rising stem wedge gate valve.

Hub end valves: The hubs on hub end valves accommodate Class "A", "B", "C", or "D" cast iron pipe.

In the sizes indicated below, hub end valves are suitable for use with Transite pipe. When ordering valves for such use, specify the pipe size and class.

For machined end or rough end Transite pipe:
4 to 8-inch valves.....for Class 50, 100, or 150 pipe

For machined end Transite pipe only:
4-inch valves.....for Class 200 pipe

Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

Face to face: The face to face dimensions of flanged valves 6-inch and smaller conform to the American Ferrous Flanged Valve Standard (B16.10-1939), for 125-Pound Cast Iron Swing Check Valves. Sizes 8-inch and larger are not included in this Standard.

API Standard: Flanged valves in 2, 2½, 3, 4 and 6-inch sizes conform except for marking to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. Sizes 3½, 5, and 8-inch and larger are not included in this Standard.

Swing Check Valves with Outside Lever and Weight are described and illustrated on page 118.

125-Pound Iron Body Swing Check Valves

Brass Trimmed or All-Iron



Screwed
No. 372, Brass Trimmed
No. 372½, All-Iron



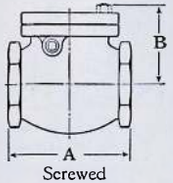
Flanged
No. 373, Brass Trimmed
No. 373½, All-Iron



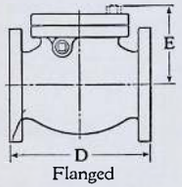
Hub Ends
No. 374¼, Brass Trimmed

For working pressures and description, see the preceding page.

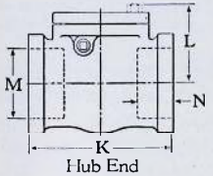
These valves may be used either in a horizontal position, or in a vertical position for upward flow.



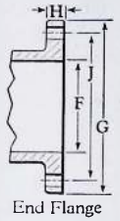
Screwed



Flanged



Hub End



End Flange

Templates for drilling, see page 459.

Normal thread engagement, see page 494.

List Prices

Size	Brass Trimmed Valves				All-Iron Valves	
	No. 372 Screwed	No. 373 Flanged F. & D.	No. 374¼ Hub Ends	Extra for Leather Faced Disc	No. 372½ Screwed	No. 373½ Flanged F. & D.
Inches	Each	Each	Each	Per Valve	Each	Each
2	18.00	21.00		2.60	18.00	21.00
2½	19.50	24.00		3.70	19.50	24.00
3	24.00	30.00		4.10	24.00	30.00
3½	32.50	39.50		4.80		
4	41.00	48.50	48.50	5.80	41.00	48.50
5	53.50	62.00		8.00		62.00
6	67.50	76.50	76.50	10.70		76.50
8		162.00	162.00	14.70		162.00
10		260.00		20.00		260.00
12		357.00		32.00		357.00
14		638.00				
16		890.00				
18		1185.00		No Extra Charge		
20		1380.00				
24		1975.00				

Drilling: The list prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.

Dimensions, in Inches

Size	Screwed Valves		Flanged Valves								Hub End Valves			
									Bolts					
	A	B	D	E	F	G	H	J	No.	Dia.	K	L	M	N
2	6½	4¼	8	4¼	2	6	5/8	4¾	4	5/8				
2½	7	4 3/16	8½	4 3/16	2½	7	1 1/16	5½	4	5/8				
3	8	5 1/16	9½	5 1/16	3	7½	¾	6	4	5/8				
3½	9	5 13/16	10½	5 13/16	3½	8½	1 3/16	7	8	5/8	12	6 3/16	5 5/8	3
4	10	6 3/16	11½	6 3/16	4¼	9	1 5/16	7½	8	5/8				
5	11¼	7 3/16	13	7 3/16	5¼	10	1 5/16	8½	8	¾	14	7½	7 7/8	3
6	12½	7½	14	7½	6 5/16	11	1	9½	8	¾	19½	10 3/16	10	3½
8			19½	10 3/16	8	13½	1 1/8	11 3/4	8	¾				
10			24½	12 1/8	10	16	1 3/16	14¼	12	7/8				
12			27½	13¾	12	19	1¼	17	12	7/8				
14			31	16 1/8	14	21	1 3/8	18¾	12	1				
16			36	17 7/8	16	23½	17/16	21¼	16	1				
18			36	17½	18	25	1 9/16	22¾	16	1 1/8				
20			40	20	20	27½	1 11/16	25	20	1 1/8				
24			48	21	24	32	1 7/8	29½	20	1¼				

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125-Pound Iron Body Swing Check Valves

With Outside Lever and Weight



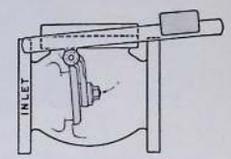
No. 383, Flanged
Brass Trimmed

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non shock

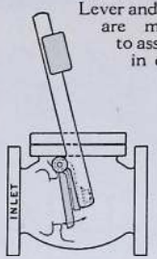
TEST PRESSURES
Shell test—350 pounds hydrostatic
Seat test—225 pounds hydrostatic

These are swing check valves, similar, except for the lever and weight, to the No. 373 valves shown on page 117; they are not to be used as back pressure valves, unloading valves, etc.

For Use in Horizontal Lines

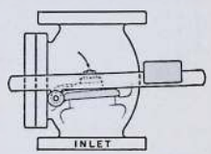


Above: Lever and weight are mounted to assist disc in closing.



Lever and weight mounted to balance the disc.

For Use in Vertical Lines for Upward Flow



Lever and weight mounted to assist the disc in closing.

Recommendations: Lever and Weight Swing Check Valves with the lever and weight positioned to assist the disc in closing are recommended for use in pipe lines where quick action is necessary to avoid a sudden reversal of flow.

Valves with the weight balancing the disc are used in installations requiring swing check valves that will open under a minimum of pressure.

Construction and materials: The hinge and outside lever are made of malleable iron and are keyed to a long Exelloy hinge pin which extends out of one side of the body through a special stuffing box. The stuffing box ensures a pressure-tight connection. The lever is also locked to the end of the hinge pin and the weight is locked to the lever with setscrews. All moving parts operate together.

Other parts are the same as the No. 373 Brass Trimmed Swing Check Valves shown on page 117.

Leather disc available: These valves are regularly furnished with a brass or brass faced disc. When orders so specify, they can be furnished with a leather faced disc; such valves are recommended only for cold water service. Extra charges for the leather faced discs are listed in the table below.

Position of lever and weight: Commonly accepted positions of the lever and weight are illustrated at the right.

Valves can also be furnished for vertical lines with downward flow, or for lines on an angle, provided sound engineering practices are not violated.

Standards: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced, with a smooth finish.

The face to face dimensions of valves 6-inch and smaller conform to the American Ferrous Flanged Valve Standard (B16.10-1939), for 125-Pound Cast Iron Swing Check Valves. Sizes 8-inch and larger are not included in this Standard.

These valves in sizes 2, 2½, 3, 4, and 6-inch conform, except for marking, to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949. Sizes 3½, 5, and 8-inch and larger are not included in this Standard.

Drilling: List prices include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made for valves ordered faced only.

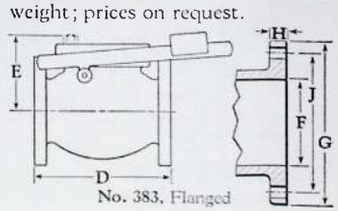
Ordering: State whether for horizontal or vertical installation and, if the latter, the direction of flow; also, whether lever and weight are to assist the disc in closing or to balance it. When not specified, the lever and weight are mounted on the right side of the valve when facing the inlet.

Other valves: Larger sizes, as well as any other iron body, Ferrosteel, or cast steel swing check valve, can be made to order with lever and weight; prices on request.

List Prices and Dimensions

Size	No. 383 Flanged F.&D.	Extra for leather faced disc	Dimensions, in Inches (Over-all dimensions furnished on request)							
									Bolts	
Inches	Each	Per Valve	D	E	F	G	H	J	No.	Dia.
2	38.00	2.60	8	4¼	2	6	⅝	4¾	4	⅝
2½	45.00	3.70	8½	4 3/16	2½	7	1 1/16	5½	4	⅝
3	55.00	4.10	9½	5 1/16	3	7½	¾	6	4	⅝
3½	70.00	4.80	10½	5 13/16	3½	8½	13/16	7	8	⅝
4	85.00	5.80	11½	6 3/16	4¼	9	15/16	7½	8	⅝
5	110.00	8.00	13	7 3/16	5¼	10	15/16	8½	8	¾
6	120.00	10.70	14	7½	6 5/16	11	1	9½	8	¾
8	200.00	14.70	19½	10 3/16	8	13½	1⅛	11¾	8	¾
10	320.00	20.00	24½	12⅛	10	16	1 3/16	14¼	12	⅞
12	450.00	32.00	27½	13¾	12	19	1¼	17	12	⅞

Templates for drilling . . . page 459



No. 383, Flanged

Iron Body Foot Valves

Leather or Brass Disc



Screwed
No. 394, Leather Disc
No. 394½, Brass Disc

Service recommendations: Crane Iron Body Foot Valves are recommended for suction lines on shallow well pumps where the pressure does not exceed 34-foot head (approximately 15 pounds). The valves, however, will safely withstand 25 pounds pressure on priming pump service, when not subjected to the pulsations of the pump.

The leather disc valves are especially suitable for cold water; the brass disc valves, for hot water.

Shape of strainer: Sizes 6-inch and smaller have a semi-spherical strainer as illustrated on the screwed valve at the left; larger sizes have a flat bottom strainer as illustrated on the flanged valve at the right.



Flanged
No. 395, Leather Disc
No. 395½, Brass Disc

Materials and construction: Leather disc valves have a cast iron body, strainer, and seat. Sizes 6-inch and smaller have one disc; larger sizes have two discs.

Brass disc valves have a cast iron body and strainer and a brass seat. Sizes 6-inch and smaller have one disc; larger sizes have four discs.

Flanged valves: The dimensions and drilling of the end flange on valves 4-inch and larger conform to the 25-Pound American Tentative Cast Iron Flange Standard (B16b2-1931). On smaller sizes, the diameter and drilling conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flange is plain faced, with a smooth finish.

List prices of flanged valves include facing and drilling to the American Standard applying, as indicated in the preceding paragraph. No deduction is made if flanged valves are ordered faced only.

When so ordered, the flange on sizes 5-inch and larger can be drilled to the American Standard, Class 125. Full face gaskets should then be used to avoid distorting the flange.

Brass Foot Valves, see page 45.

Templates for drilling, see page 459.

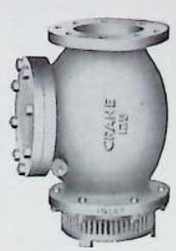
Screwed Valves

Size	List Prices, Each			Dimensions, in Inches	
	No. 394 Leather Disc		No. 394½ Brass Disc	Over-all width	Over-all height
Inches	Black	Galv.	Black		
¾	2.30	2.50		3¾	3⅝
1	2.40	2.70		3¾	3⅝
1¼	2.70	3.00	14.00	4⅛	4⅛
1½	3.40	3.80	15.00	4¾	4¾
2	4.60	5.10	16.00	5½	5¾
2½	6.00	6.50	19.00	6¼	6⅜
3	8.00	8.80	22.00	7	7⅛
3½	10.70	11.80		8⅞	9¼
4	13.50	15.00	28.00	8⅞	9¼
5	19.00	21.00	36.00	10½	11
6	24.00	27.50	48.50	11¾	12¼
8	55.00		124.00	15⅛	12½

Flanged Valves, F. & D.

Size	List Prices, Each		Dimensions, in Inches							
	No. 395 Leather Disc	No. 395½ Brass Disc	Over-all width		Over-all height		End Flanges			
			No. 395	No. 395½	No. 395	No. 395½	Diameter	Thickness	Bolt circle dia.	No. & dia. of bolts
Inches	Black	Black								
2	9.40		6		5¾		6	½	4¾	4-⅝
2½	10.80		7		6⅝		7	9/16	5½	4-⅝
3	14.00	28.00	7½	7½	7⅜	7⅜	7½	⅝	6	4-⅝
4	19.60	36.50	9	9	9⅝	9⅝	9	¾	7½	8-⅝
5	26.00	47.00	10½	10½	11¾	11¾	10	¾	8½	8-⅝
6	32.00	62.00	11¾	11¾	13¼	13¼	11	¾	9½	8-⅝
8	65.00	142.00	15⅛	15⅛	13½	13½	13½	¾	11¾	8-⅝
10	103.00	228.00	18	20¼	15⅝	16¼	16	⅞	14¼	12-⅝
12	152.00	322.00	20¼	24⅛	18¼	18¼	19	1	17	12-⅝

High Pressure
Iron Body Foot Valves

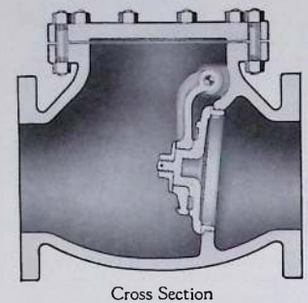


When foot valves are wanted for high pressures or for severe service, Crane No. 373 Flanged 125-Pound Iron Body Swing Check Valves having a strainer bolted on the inlet end, as illustrated at the right, are recommended. These valves are furnished with either a leather faced or a solid brass or brass faced disc. Prices will be furnished on application.

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Iron Body Clearway Swing Check Valves

Underwriters' Pattern



Cross Section
No. 375

WORKING PRESSURE
175 pounds cold water,
non-shock

TEST PRESSURES
Shell Test
350 pounds hydrostatic
Seat Test
200 pounds hydrostatic



No. 374½
Screwed



No. 375
Flanged

For use in a horizontal position, or in a vertical position for upward flow.

List Prices

Size	Inches	2½	3	4	5	6	8	10	12
No. 374½, Screwed	Each	48.50	56.50	75.00					
No. 375, Flanged, F. & D.	Each	53.00	63.00	83.00	108.00	140.00	209.00	376.00	590.00
Extra for Leather Faced Disc	Each	3.70	4.10	5.80	8.00	10.70	14.70	20.00	32.00

Underwriters' approved: Designed for fire protection service, these valves have been approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories. They are marked "CU" and "FM".

Construction: The body is large, providing liberal clearance around the disc. When opening, the disc swings entirely clear of the waterway; it is so constructed that it will not stick in the open position. Through bolt-studs with a nut on each end are used in the cap joint. The hinge pin is accessible from both sides of the body, being retained by brass plugs.

Materials: The body seat ring is brass and is screwed into the body. Sizes 6-inch and smaller have a brass disc and a brass hinge. In larger sizes, the disc is iron with a brass seating face and has a brass collar where it engages the hinge; the hinge is malleable iron, having a brass hinge-pin bushing and a brass disc-hub bushing.

All sizes have a brass hinge pin.

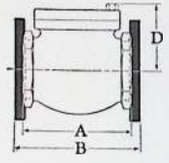
Leather disc: An extra charge is made for leather faced disc valves. See the list prices shown in the table above.

Bosses on body: Each valve is equipped with four bosses for a by-pass, two on each side of the body. An extra charge is made for drilling and tapping the bosses and for furnishing a by-pass.

Flange dimensions and facings: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

Drilling: The list prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.

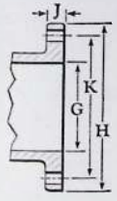
Interconnection service: The valves shown on this page are not recommended for "interconnection service". For such service, Crane-Line Reduced Pressure Backflow Preventers are recommended; see page 318 for illustration and description.



Screwed or Flanged

Dimensions, in Inches

Size		2½	3	4	5	6	8	10	12
A		10	11	13					
B		10	11	13	15	16	18	22	26
D		6¼	6¾	7½	8½	9¼	11¼	13½	15¼
Flange Dimensions	G	2½	3	4	5	6	8	10	12
	H	7	7½	9	10	11	13½	16	19
	J	11/16	¾	15/16	15/16	1	1⅛	1 3/16	1¼
	K	5½	6	7½	8½	9½	11¾	14¼	17
	No. of bolts	4	4	8	8	8	8	12	12
	Dia. of bolts	⅝	⅝	⅝	¾	¾	¾	⅞	⅞



Templates for drilling . . . . page 459

Thread engagement . . . . page 494

250-Pound Ferrosteel Swing Check Valves

Bronze Trimmed

WORKING PRESSURES
250 pounds steam, **450°** F.
500 pounds cold water, oil, or gas, non-shock

HYDROSTATIC TEST PRESSURES
Shell test—**1000** pounds Seat test—**550** pounds

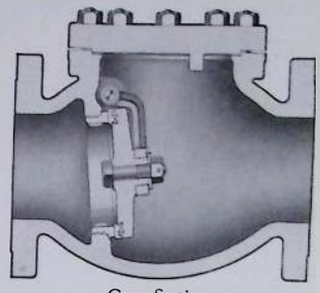


No. 38 E, Screwed



No. 39 E, Flanged

These valves also may be used in a vertical position for upward flow.



Cross Section
No. 39 E

List Prices

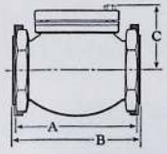
Size	Inches	2	2½	3	3½	4	5	6	8	10	12
No. 38 E, Screwed	Each	48.50	61.50	76.50		100.00					
No. 39 E, Flanged, F. & D.	Each	53.50	69.00	86.00	102.00	112.00	145.00	192.00	334.00	572.00	785.00

Service recommendations: Crane 250-Pound Ferrosteel Swing Check valves are well suited for a wide variety of services requiring the use of rugged, sturdily constructed valves.

The valves will give excellent results on steam lines where the pressure and temperature do not require the use of steel valves, on high pressure water, oil, or gas lines, and on similar service.

Construction: The valves are heavily proportioned and are unusually rugged. The body is oval in shape, providing ample flow area when the valve is open. The valves have a disc stop which keeps the disc from sticking in the open position.

Materials: The body and cap are Crane Ferrosteel. The body seat ring, screwed into the body, is made of Crane Special Bronze, a hard, leaded tin bronze. Sizes 3½-inch and smaller have a solid Crane Special Bronze disc; larger sizes have an iron disc with a Crane Special Bronze seating face.



Screwed or Flanged

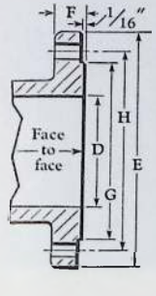
Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 250 (B16b-1944). Flanges have a 1/16-inch raised face. The raised face is finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

Drilling: The list prices of flanged valves include facing and drilling to the American Cast Iron Flange Standard, Class 250. No deduction in price is made when valves are ordered faced only.

Face to face dimensions: The face to face dimensions of the flanged valves conform to the American Ferrous Flanged Valve Standard (B16.10-1939), for 250-Pound Cast Iron Flanged Swing Check Valves.

API Standard: The flanged valves conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949.

This Standard includes sizes 2, 2½, 3, 4, 6, 8, 10, and 12-inch.



Dimensions, in Inches

Size		2	2½	3	3½	4	5	6	8	10	12
A		9½	10¾	11¾		13					
*B		10½	11½	12½	13¼	14	15¾	17½	21	24½	28
C		5¼	5⅞	6¼	6¾	7¼	8¼	9	11	13	14¾
Flange Dimensions	D	2	2½	3	3½	4	5	6	8	10	12
	E	6½	7½	8¼	9	10	11	12½	15	17½	20½
	*F	⅞	1	1⅛	1 3/16	1¼	1⅜	1 7/16	1⅝	1⅞	2
	G	4 3/16	4 15/16	5 11/16	6 5/16	6 15/16	8 5/16	9 11/16	11 5/16	14 1/16	16 7/16
	H	5	5⅞	6⅝	7¼	7⅞	9¼	10⅝	13	15¼	17¾
	No. of bolts	8	8	8	8	8	8	12	12	16	16
	Dia. of bolts	⅝	¾	¾	¾	¾	¾	¾	⅞	1	1⅛

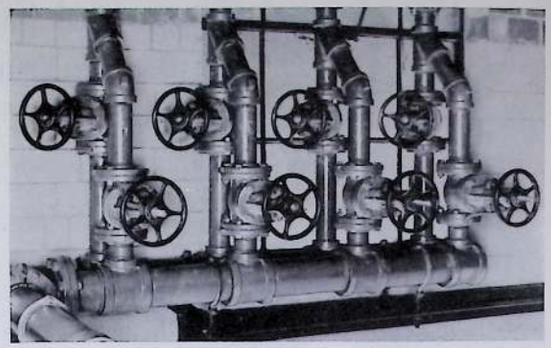
*Face to face (B) and thickness of flange (F) dimensions include the 1/16-inch raised face.

Templates for drilling . . . page 460

Thread engagement . . . page 494

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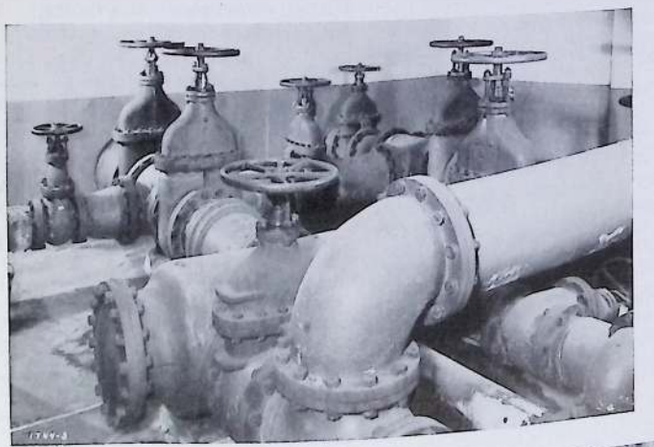
Industry Supplies the Service
Crane Supplies the Equipment



Crane valves in cooler lines of a brewery.



Crane iron body gate valves installed in a cooling tower manifold in a refinery.



In a sewage disposal plant equipped with Crane valves and fittings.



Gasoline treating plants are large users of Crane iron body gate valves.

Valve Accessories and Parts

Cylinder Operated Valves.....pages 124 and 125
Motor Operated Valves.....pages 126 to 129

Floor Stands.....pages 130 and 131
Extension Stems.....page 131
Indicator Posts.....page 132

Composition Discs.....page 133
Wheels for Valves.....page 134
Handles for Valves.....page 135
Size of Hole in Wheels and Handles.....page 135

Chain Wheels.....page 136
Adjustable Sprocket Rim with Chain Guide.....page 137
Keys for Lock Shield Valves.....page 137
Tee Wrenches.....page 137
Wrenches for Body Seat Rings.....page 137

For greater convenience, various valve accessories and parts, many of which are used with nearly all Crane Valves, have been grouped together on pages 124 to 137, as indexed above.

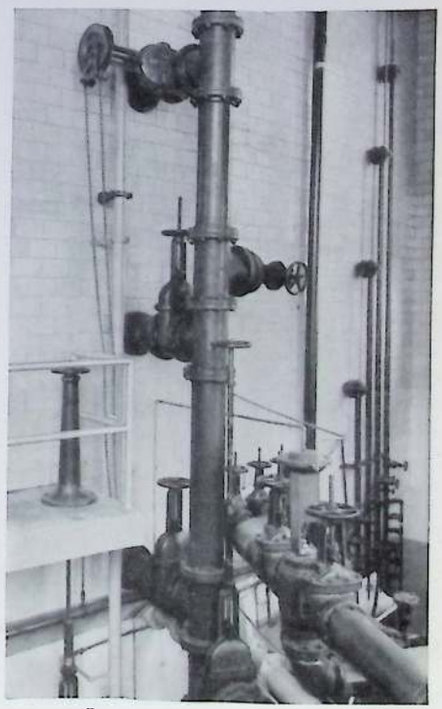
Crane regularly supplies other accessories in addition to those listed above. For complete data on these accessories, refer to the following pages:

By-Passes, Gearing, Cleanouts, and Indicators
For Iron Body Wedge Gate Valves.....pages 84 and 85
For Iron Body Double Disc Gate Valves.....page 102

By-Passes for Steel Gate Valves.....page 231
Gearing for Steel Gate Valves.....page 234
Gearing for Steel Globe and Angle Valves.....page 248
Valve Parts for AAR Valves.....page 40

Replacement Parts for Valves

Replacement parts, such as stems, bonnets, discs, packing nuts, etc., for any Crane Valve can be furnished upon receipt of an order. When ordering parts, specify the catalog number and the size of the valve, and give the name of the part required. In addition, since the valve must be clearly identified before a part that will fit correctly can be furnished, indicate how the valve is marked and where the marking appears.



Crane accessories simplify the operation of valves in a central station.

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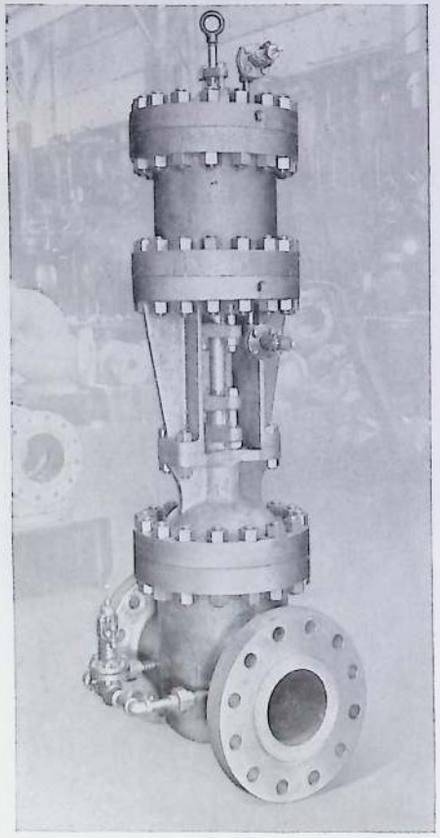
Cylinder Operated Gate, Globe, and Angle Valves

For All Pressures and Purposes

With the ever-increasing tempo of modern industry, power operation of valves is becoming a necessity in many plants. To speed the opening and closing of valves, or for use when valves are in inaccessible locations, cylinder operation is often ideal.

Crane Cylinder Operated Gate, Globe, and Angle Valves are well suited for many installations, giving highly satisfactory service with low operating and maintenance costs. Under normal conditions and with proper care, the cylinders will last as long as the valves.

As the name implies, these valves are actuated by means of a double acting piston and cylinder, using water, air, or oil as the operating medium. Control is obtained by operating a four-way valve located in any convenient place within reasonable distance from the valve.



Shown in the above photograph is a 10-inch 900-Pound Cast Steel Flanged Gate Valve with a Cast Steel Hydraulic Cylinder. The main valve by-pass and the valved emergency booster connections on the cylinder are special equipment on this particular assembly.

Remote control: When remote control is required, the piping connecting the cylinder and the four-way control valve must be large enough to compensate for pressure drop and back pressure resulting from the actuating and exhausting operations of the cylinder. Proper size pipe eliminates the possibility of faulty operation of the cylinder due to the choking of the supply lines.

Maintaining disc position: In order to keep the valve disc in either the open or closed position, the actuating pressure must be retained in the cylinder at all times, except in the following cases:

1. On globe and angle valves when closed, if installed with the cylinder above the valve and the line pressure is on top of the disc.
2. On gate valves when fully open, if installed with the stem horizontal, or if the valve is in an inverted position with the stem pointed down.

Cylinders: The cylinders are made of cast iron, or steel, with or without brass liners, or of brass pipe, dependent upon the size, the operating medium, and the pressure used. The rugged construction of the heads and bases and the addition of full length tie-bolts on the brass pipe design make an integral unit having an ample safety factor.

Piston: Piston construction is of the double cup or piston ring type, mounted on a shouldered stem and rigidly held in position.

Cups: Leather cups, synthetic rubber cups, or piston rings will be furnished to meet service requirements.

Expanders: Finger type cup expanders are furnished on air operated cylinders as a precaution against blow-by past the piston cups.

Stuffing boxes: Stuffing boxes with self-sealing packing and non-adjustable glands are furnished on each end of the cylinders to prevent the braking effect on the stem obtained by tightening a conventional, adjustable, gland-type, stuffing box too tightly.

Continued on next page

Cylinder Operated Gate, Globe, and Angle Valves

For All Pressures and Purposes (Cont.)

Speed control: When orders specify water or oil as the operating medium, orifice fittings are furnished in the cylinder ports. These orifices are drilled with the proper size openings to permit the disc to travel at its required speed.

When air is specified as the operating medium, the cylinders are equipped with speed control valves in the lines to the cylinder ports. By regulating the rate of discharge through these valves, the required disc travel speed is obtained.

Indicating rod: Unless otherwise specified, all valves will be furnished with a "tail-rod" extending through the top cylinder head. This feature provides a visible indication of the position of the valve disc at all times; i.e. whether the valve is operating, is fully open, or closed.

Control valves: Four-way valves are not furnished with cylinder operated valves unless specified. Manual, solenoid operated, pilot controlled, hydraulic, or air operated four-way valves for adjacent or remote control can be furnished at an extra charge.

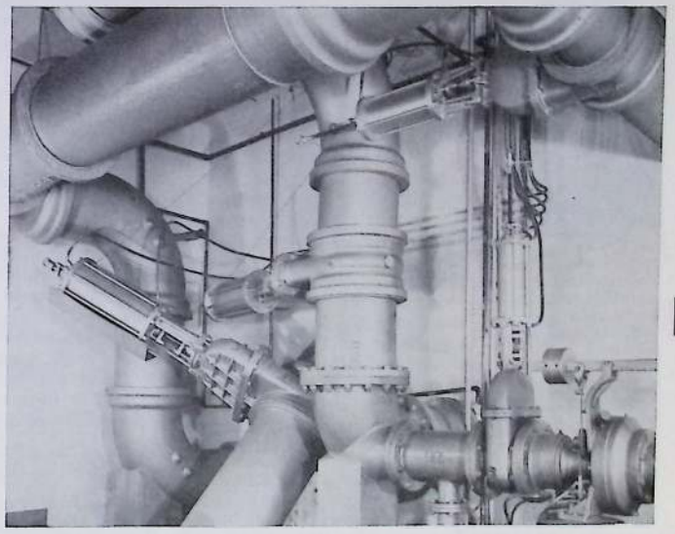
Accessories: Clean air, water, or oil, are requisites for proper cylinder operation.

Installation of a sediment separator is recommended in the line between the source of supply and the four-way valve. The separator will eliminate the possibility of dirt, grit, scale, or foreign matter entering the cylinder and scoring the walls, damaging the cups, or clogging the orifice openings.

If the air used is unusually dry, the piston cups will dry out and become brittle. To overcome that action, a drop oiler or other suitable device installed in the supply line is suggested; otherwise periodic oiling of the cups through the cylinder head should be maintained. A light motor oil about S.A.E. 10 is satisfactory for this purpose.

Special equipment: When so ordered, cylinder operated valves can be furnished with special equipment, depending upon the requirements.

Inquiries and orders must be accompanied by complete specifications and description of the proposed installation.



Remote-controlled Crane Cylinder Operated Gate Valves on pipe lines to filter tanks of modern Water Works.

Information Required on Inquiries and Orders

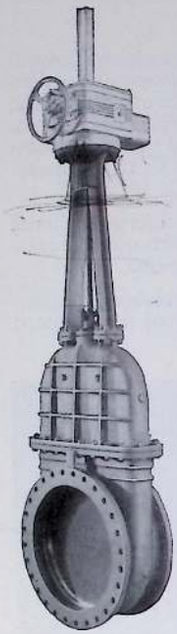
1. Catalog number and size of valves wanted.
2. With or without by-pass. If by-pass is wanted, state the location of the by-pass in relation to the valve.
3. Are the valves to be installed with the stems horizontal or vertical?
4. Designate the service on which valve is to be used: steam, water, oil, gas, etc.
5. What is the maximum working pressure and maximum differential pressure to open against?
6. Designate the fluid to be used for operating the cylinder: air, hot or cold water, oil, etc.
7. What pressure is available for operating the cylinder? It is recommended that the operating pressure be as high as possible, thus allowing the use of a minimum diameter cylinder.
8. Maximum temperature, working or ambient, to which cylinder will be subjected.
9. Specify desired speed of operation. Unless otherwise specified, cylinders are factory regulated for disc travel of approximately 1-inch per second.

Prices and complete description furnished on application.

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Motor Operated Valves

Electric Motor Units—Air or Gas Motor Units



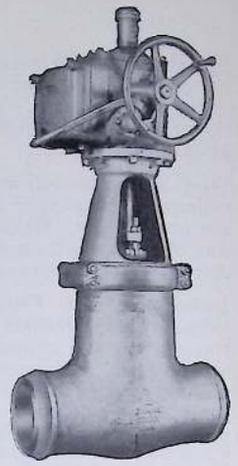
30-inch Crane Low Pressure Iron Body Gate Valve with Cutler-Hammer Electrically Operated Valve Control

Valves that are to be mechanically operated by electricity, air, or gas, require a specially designed motor operator to control the valve performance.

Motor controlled valves have a wide range of application in piping systems. Their use provides a high degree of safety in emergencies, saves labor, and makes possible extreme flexibility in the operation of piping systems.

Emergency operation: As a matter of insurance against destruction due to mechanical failure of pipe lines or apparatus, the motor controlled valve has no equal; it can be operated instantly from remote positions, positions out of the danger zones. The valve closes rapidly and completely, and can be reopened at will. Inspection and periodical operation, however, are essential to its proper performance.

Labor saving: On valves operated frequently, and on especially large valves requiring considerable power and time to open or close, the motor operator is indispensable. It provides a perfect means of reducing the effort necessary to control the valves and the flow in the pipe lines.

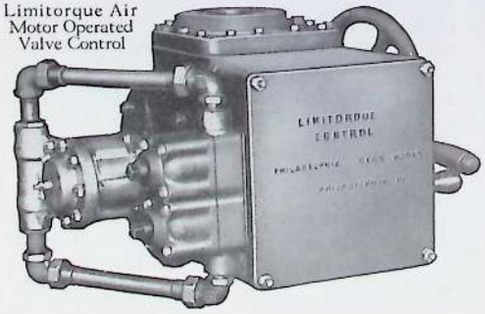


12-inch Crane 1500-Pound Steel Pressure-Seal Bonnet Gate Valve with Limitorque Electrically Operated Valve Control.

Flexibility: To provide flexibility of plant operation, motor controlled valves are a necessity. Rapid operation of individual valves, and simultaneous operation of groups of valves by remote control from any number of convenient points is possible. The automatic operation through the use of pressure switches and other electrical devices provides almost unlimited means of controlling the flow in complicated and interconnected piping arrangements. Motor operated valves are the only means of securing these desirable advantages. The cost is amply justified when these elements of piping design are given full consideration.

Motor operator assemblies: Motor operator units consist of a special high starting torque motor, a reduction gear, limit switches (if operated by electric motors), or valves (if operated by air motors), and handwheel engaging mechanism, all contained in one weather-proof assembly with all gears running in oil. A hammer-blow device allows the motor to reach full speed before the full load is engaged.

Limitorque Air Motor Operated Valve Control



The ball bearing motor is totally enclosed. The handwheel, provided for manual operation, does not revolve during motor operation.

In closing the valve, the motor is stopped by a predetermined thrust exerted on the valve stem, acting on the limit switch, or limit valve. This also affords protection should any foreign matter obstruct the closing of the valve. In opening the valve, the motor is stopped by the mechanical limit switch, or limit valve, which stops the movement of the stem before the valve can back-seat. Limit switches and limit valves for both opening and closing are adjusted independent of each other.

Motor operators are available for unusual conditions and speeds of closing.

Electric Motors: Electric motor operators require a specially built high starting torque reversing motor. It is designed for intermittent duty, is capable of exerting its maximum power by the time the yoke sleeve in the operator completes one-eighth of a turn, and absorbs the shock of the built-in hammer-blow mechanism—all without danger of injury or overheating.

Air or Gas Motors: Air motors are of the rotary vane, or reciprocating piston reversible types. These are high speed, high starting torque motors, equipped with special air limit valves. Maximum air pressure is 125 pounds per square inch. Gas may be used instead of air to operate the motors, provided it is free of grit, or dirt, or chemicals, which may affect the motor.

Air motor units are of particular advantage in refineries, on oil and gas lines, and in various process industries, where sparks from electric motors and wires will ignite an explosive-laden atmosphere. They will operate even when totally submerged in water.

Continued on next page

Electrical Equipment

Control of the electric power applied to motors is accomplished through reversing contactor panels set in operation by either push button stations or special electrical equipment.

All motor operators, panels, and control stations are especially built for this service, and conform to the standards established by the National Electrical Manufacturers' Association. Those standards are commonly known as "NEMA".

Careful consideration should be given to the electrical requirements when submitting inquiries, and placing orders, for motor operated valves. Unless otherwise specified, all motors will be furnished in NEMA III Weather-proof Enclosures—all panels and control stations in NEMA I General Purpose Enclosures.

Standard Electrical Enclosures For Motors, Contactor Panels, and Control Stations

NEMA I—General Purpose Enclosure—serves as protection against dust and indirect splashing, but is not dust-tight or splash-proof.

NEMA II—Drip-proof Enclosure—meets the requirements of drip-proof or drip-tight apparatus.

NEMA III—Weather Resisting Enclosure—suitable for outdoor installation. It meets the requirements for splash-proof, weather-proof, sleet-proof, and moisture-resisting apparatus.

NEMA IV—Water-tight Enclosure. This is a cast or fabricated steel case and gasketed. It is water-tight and dust-tight, and meets the requirements for water-tight apparatus, but is not submersible.

NEMA V—Dust-tight Enclosure—suitable for use in cement mills, and other locations, where dust must be excluded.

NEMA VI—Submersible Enclosure—meets the specifications for submersible apparatus.

NEMA VII—This case is designed for hazardous locations and is generally accepted as explosion-proof.

Reversing Contactor Panels

A reversing contactor panel is required for each electric motor operator unit.

Contactor panels have been developed and designed especially for valve operation. They consist of two mechanically interlocked three-pole contactors. Panels are furnished wired, provided with terminals, and mounted in an enclosure.

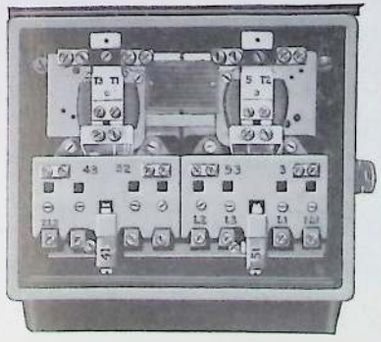
The arc quenchers used on these panels speedily extinguish the arc and provide for long contact life.

A mechanical interlock prevents damage when two opposite buttons are pushed at one time.

Any number of push button stations may be used with each reversing contactor panel.

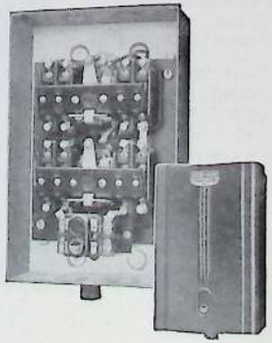
Single line break contactor panels are available. It is recommended, however, that double line break contactor panels be used for valve operation to prevent accidental operation of the valve in case of a ground or short circuit in the wiring.

Continued on next page



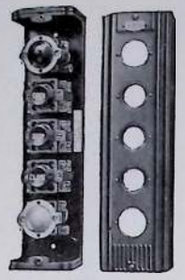
Limitorque Contactor Panels are regularly made in three sizes: No. 0, No. 1, and No. 2

Cutler-Hammer Contactor Panels are regularly made in two sizes and types: Size No. 1, Type "AAA", Size No. 2, Type "CCC"



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Push Button Control Stations



Any of the following push button stations can be used to control electric motor operated valves. Unless otherwise specified, all stations will be furnished with three buttons (open-stop-close), and two lights (red and green). Provision can also be made for the use of additional automatic devices, as desired.



← Type HD-3
Cutler-Hammer
Push Button Control Station
in NEMA I Enclosure

Type AL →
Limitorque
Push Button Control Station
in NEMA V Enclosure

Types of Control Stations Available

Manufacturer	Type of Control Station: One Button	Two Button	Three Button	Drum Type	Lights	Enclosures Furnished	Mounting
Cutler-Hammer	KA and KB			—	2	NEMA IV	Surface
	HD-1	HD-2	HD-3	—	2	NEMA I, IV, or VII	
	FHD-1	FHD-2	FHD-3	DSLF	2	NEMA I	Flush
	—	—	—	DSL	2	NEMA I	Surface
	—	—	—	DS	None	NEMA I	
Limitorque Philadelphia Gear Works	—	—	AS	—	2	NEMA I	Surface or flush, as ordered
	ALEW	—	ALW	—	2	NEMA IV	
	ALEC	—	AL	—	2	NEMA V	
	—	—	ALEX	—	2	NEMA VII	
	W	—	—	—	2	Pistol Grip Switch	
	—	—	ALW-3	—	3	NEMA IV	
	—	—	AL-3	—	3	NEMA V	

Drum Stations DS and DL have three positions; DSLF has two positions and a stop button.

Enclosures
NEMA I is sheet steel.
NEMA IV is cast aluminum.
NEMA V is cast aluminum.
NEMA VII is cast steel.

Break-Glass Doors; Locks
Cutler-Hammer Stations KA and KB have a break-glass door. KA has a Yale lock; KB will take a padlock.

Limitorque Stations, with the exception of types AS, ALEX, and W, have a break-glass door and a Yale lock.

Step-Down Transformers and Fusible Plugs

When push button stations and other electrical control apparatus, such as pressure and float switches, are to operate at a lower AC current voltage than the main motor, it is necessary to install a step-down transformer in the contactor panel. This requires a special over-size case.

Fusible plugs or disconnect switches can also be installed.

Accessories

Position indicators: It is frequently desirable to have an indicator showing the exact position of the disc at all times, especially on globe valves, which are used for throttling purposes. Motor operators are furnished with protectors for the valve stem extension above the motor unit, to prevent mechanical damage to the stem and the accumulation of dust and dirt which might be carried into the yoke sleeve or yoke bushing by the stem. The valve stem, therefore, cannot act as an indicator.

All valve motor operators can be equipped with position indicators, of either the integral or remote type. The integral type is placed on the operator case, with a pointer indicating the disc position. The remote type is connected to a transmitter attached to the integral type indicator. Remote indicators may be in multiple.

A rod position indicator attached to the top of the stem of the valve, operating through a hole in the cap of the stem protector, is frequently furnished.

Floor stands: Motor operators may be mounted on floor stands for operating valves below a floor, when it is impractical to mount the operator directly on the valve. The floor stands may be of the plain type with the contactor panel and push button station mounted elsewhere, or of the combined type having the panel and station mounted on the side of the floor stand.

When a floor stand is used and the distance from the valve to the floor is within practical limits, a one-piece stem for the valve will be provided, extending through the floor stand. If the distance is too great for a one-piece stem, or the valve itself is in a line, which will impart movement to the valve through expansion or contraction, universal joints and spline couplings must be used in the stem.

Placing the floor stand at a location other than directly above the valve is not practical, due to the power absorbed by the required bevel gears, and the lost motion involved.

Continued on next page

Recommendations

Rising or non-rising stem valves: The use of non-rising stem valves with motor operators is not generally recommended. The stems in such valves rotate with considerable speed and without interruption, and all of the wear takes place between the stem and the threaded bushing in the disc. Sediment or scale in the line greatly accelerates this wear, and the life of the valve is materially shortened.

In a rising stem valve, the wear is between the stem and the yoke sleeve or yoke bushing, which (being enclosed in the motor operator housing) is protected from all foreign matter. However, when clearance becomes the determining factor, non-rising stem valves can be furnished.

Electrical insulation: The insulation of the electric motor is important. For power plant operation, Class "B" Insulation should always be used, whereas for large water valves, or valves in a low temperature situation, Class "A" Insulation may be used.

Class "A" Insulation consists of cotton, silk, paper or other similar organic material immersed in oil or enamel as applied to conductors.

Class "B" Insulation consists of inorganic materials such as mica, or asbestos, in built-up form with binding substances.

Electric current: When alternating current motors are specified, 3 phase motors are regularly furnished. Single phase motors can be supplied for small valves only, requiring not over four-tenths horse power motors.

Closing speeds: Unless otherwise specified, the closing speed of the disc on gate valves will be figured on the basis of approximately 12 inches per minute, and on globe valves, approximately 6 inches per minute. Motor units are available for closing valves at higher speeds, and if required, all details of the installation should be provided.

Information Required on Inquiries and Orders

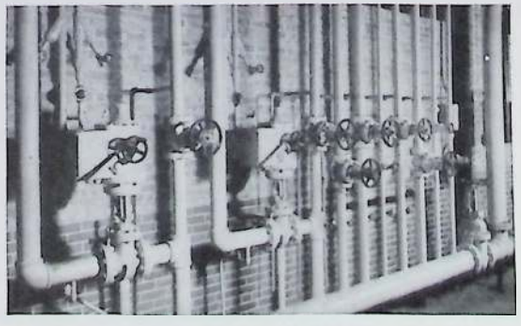
1. Quantity, size, and end connections of valves (flanged, screwed, or welding ends).
2. Catalog number of regular valve preferred.
3. Rising or non-rising stem. See "Recommendations" above.
4. With or without by-pass. If by-pass is wanted, state its location in relation to the valve.
5. Service—steam, water, oil, air, gas, etc.
6. Working pressure, maximum differential pressure to open against, and operating temperature.
7. Valves used for: main steam, equalizing, boiler feed, circulating water, etc.
8. Information on any special conditions, such as: whether valve must close against full flow, open against full pressure, or if coking is present.
9. Maximum velocity through valve, if obtainable.
10. Position of valve run—horizontal or vertical.
11. On valves with horizontal run, give position of valve stem: vertical up, vertical down, horizontal, or other position.
12. Position of motor operator handwheel: parallel with or across the run of the valve.
13. Approximate maximum temperature at point where valve yoke will be located.
14. Desired closing speed of disc, in inches per minute, or all conditions if high speed closing is required.

When Electric Motor Operator is Wanted:

15. Electrical characteristics—voltage, type of current (AC or DC) and phase and cycle if AC. See "Recommendations" above.
16. State whether open-stop-close, close-only, or open-only stations are wanted; type of enclosure, and whether lock-up or non-lock-up; number of stations per valve. See page 128.

When Air or Gas Motor Operator is Wanted:

17. Available air or gas pressure for operating motor. (The minimum requirement is 70 pounds and the maximum 125 pounds. The normal working pressure of the motor is 100 p.s.i. Working pressures above this are not recommended due to increased vane friction at the higher speed.)



Type "S" Air Operated Limitorque Valve Controls on 4-inch Crane Gate Valves in the fire-water pump house of a refinery.

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Floor Stands

Without Indicator



With Indicator



When equipped with the proper extension stem, these Floor Stands are suitable for operating either rising or non-rising stem valves. The list prices shown below are for the Floor Stand with wheel and wheel stem coupling, and, in addition, on the Floor Stand with Indicator, the complete indicator parts. They do not include extension stems, valve stem couplings, or yoke sleeve couplings.

Extension stems are illustrated on the opposite page. Prices are on application.

The 20-inch high Floor Stand is for valves with 8-inch and smaller diameter handwheels; the 32-inch for valves with larger diameter handwheels.

Regular Floor Stands without indicator are furnished for use with stem 2⅞-inch diameter or less. Regular Floor Stands with indicator are furnished for use with stems 2⅛-inch diameter or less.

List Prices
Including wheel and wheel stem coupling only.

Height of Floor Stand		Inches	20	32
Without Indicator	Painted column, japanned wheel	Each	75.00	100.00
	Finished column, japanned wheel	Each	145.00	180.00
	Finished column; rim and hub of wheel finished, spokes japanned	Each	205.00	250.00
With Indicator	Painted column, japanned wheel	Each	115.00	140.00
	Finished column, japanned wheel	Each	185.00	220.00
	Finished column; rim and hub of wheel finished, spokes japanned	Each	245.00	290.00

Directions for Ordering

Floor Stand Only

For Crane Valves, specify:

1. Style (with or without indicator) and finish of Floor Stand, and height
2. Size and catalog number of valve, and whether valve opens by turning to the right or left
3. Date valve was purchased, and complete markings.

For other than Crane Valves, specify:

4. Style (with or without indicator) and finish of Floor Stand
5. Size, style, and catalog number of valve
6. Manufacturer's name
7. Diameter of handwheel on valve
8. Number of turns to open
9. Dimension from center-line of valve to top of present handwheel—both open and closed positions, when wanted for globe and angle valves.
10. Whether valve opens by turning to the right or the left

Floor Stand with Extension Stem

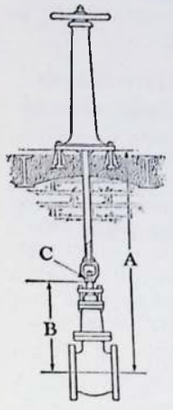
For Crane Valves, specify:

11. Information requested when ordering Floor Stand only (1 to 3, above)
12. Dimension A, center of valve port to floor level
13. Details, description, and proximity of structural members or walls available for support of long extension stems

For other than Crane Valves, specify:

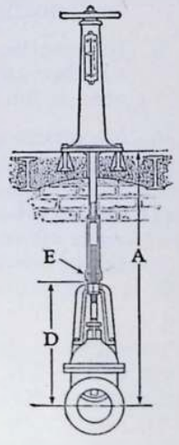
14. Information requested in above items 4 to 10, inclusive, and 12 and 13
15. If non-rising stem gate valve, or globe or angle valve, include:
    (a) Dimension B, center of valve to bottom of square on stem
    (b) Dimension C, dimensions of square on stem—in detail
16. If outside screw and yoke gate valve include:
    (a) Dimension D, center of valve to bottom of hub on handwheel
    (b) Dimension E, detail dimensions of the part of the yoke sleeve on which the handwheel fits

Floor Stands with Extension Stems are priced on application.



Non-Rising Stem Gate Valve

Unless otherwise ordered, extension stems are made of Extra Strong Pipe.

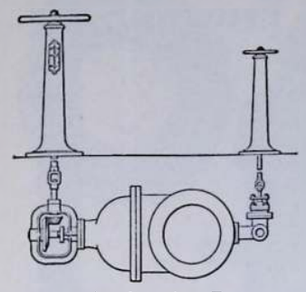


Outside Screw and Yoke Gate Valve

Unusually long extension stems must be properly supported.

Floor Stands

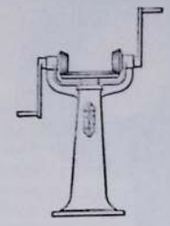
Typical Application and Special Designs



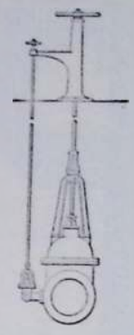
Application E
Floor Stands Applied to Gate Valve with By-Pass in Horizontal Position



Application F
Floor Stand with Single Bevel Gearing and Handwheel



Application G
Floor Stand with Double Bevel Gearing and Crank Handles



Application K
Floor Stand with Arm for Operating By-Pass

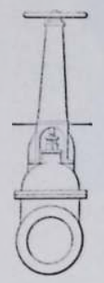


Application L
Bell Bottom Floor Stand Used on Non-Rising Stem Gate Valve Projecting Above Floor Line

The Floor Stands shown on the opposite page can be used to operate globe or angle valves or rising or non-rising stem gate valves, either with or without gearing. These meet the requirements of ordinary installations.

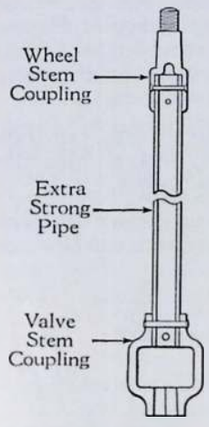
In addition, Floor Stands of special designs and for special installations, such as illustrated on this page, can be made to order. Prices on the special designs, equipped with gears, ball bearings, cranks, motors, arms, or with bell or wide bottom, are furnished on application.

Inquiries and orders should indicate clearly what is wanted and be accompanied with a sketch including all known dimensions.



Application J
Wide Bottom Floor Stand Used on Rising Stem Gate Valve Projecting Above Floor Line

Extension Stems



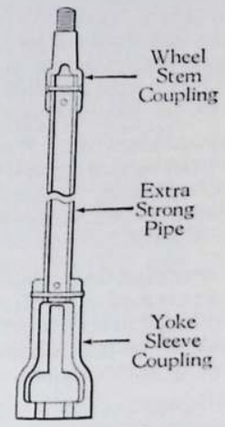
Extension Stem For Non-Rising Stem Gate Valves, Globe or Angle Valves

Extension stems are frequently required for valves that are to be operated from a distance. Ordinarily, a Floor Stand is used to support the stem and handwheel, but in many installations the extension stem only is used.

Extension stems for non-rising stem gate valves and for all globe and angle valves are furnished with a wheel stem coupling suitable for a square hole handwheel and a valve stem coupling to fit the square on the valve stem. Those for outside screw and yoke gate valves have the same wheel stem coupling as for non-rising stem gate valves and globe and angle valves, but have a hexagon hole yoke sleeve coupling, designed to absorb the rise of the valve stem, thus effecting non-rising operation of the extension stem.

Wheels are not furnished with extension stems unless ordered.

Unless otherwise ordered, extension stems are made of Extra Strong Pipe.



Extension Stem For Rising Stem Outside Screw and Yoke Gate Valves

Inquiries and orders should specify the length of the extension stem measured from the center of the valve port to the bottom of the square on the wheel stem coupling. For use on Crane valves, include the size and catalog number of the valve, the year of purchase and the complete valve markings. For use on valves not of Crane manufacture, include the information requested in lines 5 to 7, 9, 15 and 16 on page 130.

Extension stems that are long, must be rigidly and properly guided with supporting brackets. When requesting prices, furnish complete information.

Prices on application

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asbestosclaims.law/library/21276/85

Indicator Posts



No. 520
Applied to
No. 462
Gate Valve

Standard Pattern

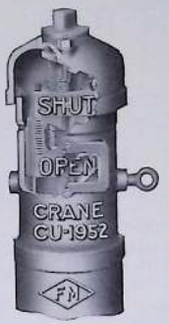


Enlarged
Sectional View
of Head
No. 520 Post

When ordering an indicator post for a Crane valve, specify the catalog number of the post, the size and catalog number of the valve with which it will be used, and the depth of the trench (distance from ground level to bottom of pipe line).

When ordering indicator posts for valves other than Crane, refer to the paragraph below on "Special indicator posts."

Underwriters' Pattern



Enlarged
Sectional View
of Head
No. 510 Post



No. 510
Applied to
No. 462½
Gate Valve

List Prices, Each, and Dimensions

Depth of trench		Feet	2 to 6
No. 510, with wrench			168.00
No. 520, with wrench			138.00
Extra for each 6″ over 6-foot trench for No. 510			8.40
Extra for each 6″ over 6-foot trench for No. 520			7.00
Distance from ground level to top of post	No. 510	Inches	38
	No. 520	Inches	33¼

Service recommendations: Crane Indicator Posts provide an ideal means for operating iron body nonrising stem gate valves buried underground. They are used principally in factory and mill yards, on valves for fire protection service.

The Standard Pattern, recommended when the Underwriters' Pattern is not required, is suitable for valves 2 to 14-inch inclusive. It is generally used with the No. 462 Gate Valves shown on page 79.

The Underwriters' Pattern, approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories, is used with No. 462½ Underwriters' Pattern Gate Valves shown on page 80. The post is marked "CU" and "FM".

Construction: Crane Indicator Posts are sturdily constructed of cast iron. Each post is furnished with an angle wrench which can be locked or sealed at the side of the post when not in use. The operating nut is 1¼ inches square.

The word "OPEN" or "SHUT", in large, easily read letters, appears behind the indicator glass when the valve is open or closed, respectively. The lower plate, marked "OPEN", is adjustable, and its position is changed to suit the size of the valve. The indicator opening is fitted with a heavy plate glass ½-inch thick; small openings under the cap ventilate the entire post and prevent accumulation of moisture on the glass in cold weather.

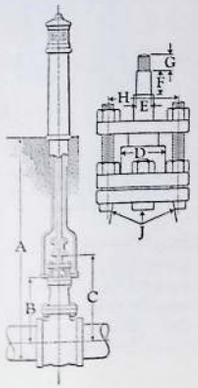
Attaching post to valve: These posts have the standard N.F.P.A. (National Fire Protection Association) flange for attachment to the valve; the operating rod has a socket for the valve stem.

When No. 462 Gate Valves are ordered for use with an indicator post, they are furnished with an indicator post flange bolted on the bonnet at no extra charge. When the No. 520 Indicator Post is required for valves already installed and not equipped with a flange, a separate adaptor plate for the valve is furnished with the post at no extra charge.

No. 462½ Gate Valves used with the No. 510 Indicator Post are furnished regularly with an indicator post flange cast integral with the bonnet.

Special indicator posts: Indicator posts for nonrising stem gate valves other than Crane can be made to order at a special price. When ordering, specify the name of the valve manufacturer, the valve size, whether it opens by turning to the right or left, the number of turns to open, and the following dimensions:

A — Depth of trench
B — Center of pipe to top of stuffing box flange
C — Center of pipe to bottom of valve stem square
D — Diameter of stuffing box
E — Size of stem square
F — Height of stem square
G — Length of stem thread
H — Stuffing box bolt circle
J — Number and diameter of stuffing box studs and/or bolts.



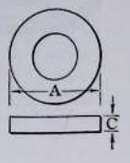
Composition Discs



No. 1 Granite Disc
⅛ to 3-inch



No. 1 Cranite Disc
3½ to 6-inch
No. 6 Composition Disc
⅛ to 6-inch





No. 4 Granite Disc
⅛ to 3-inch



No. 10 and No. 12
Composition Discs
⅛ to 2-inch

Size	List Prices per 100 Pieces					Approximate Dimensions in Inches			
						No. 1, No. 4, No. 6		No. 10 or No. 12	
Inches	No. 1 Cranite Discs	No. 4 Cranite Discs	No. 6 Discs	No. 10 Discs	No. 12 Discs	A	C	A	C
⅛	17.50	50.00	17.50	7.00	7.00	21/32	7/32	1/2	1/8
¼	17.50	50.00	17.50	7.00	7.00	21/32	7/32	1/2	1/8
⅜	17.70	57.00	17.70	8.00	8.00	3/4	7/32	19/32	1/8
½	18.00	57.00	18.00	8.00	8.00	13/16	1/4	21/32	3/16
¾	22.00	65.00	22.00	10.50	10.50	1 1/16	1/4	29/32	7/32
1	23.00	82.00	23.00	13.50	13.50	1 3/8	1/4	1 1/4	1/4
1¼	31.50	119.00	31.50	19.00	19.00	1 5/8	11/32	1 1/2	1/4
1½	39.50	165.00	39.50	24.50	24.50	2	11/32	1 13/16	9/32
2	56.50	254.00	56.50	38.00	38.00	2 9/16	11/32	2 9/32	5/16
2½	74.00	334.00	74.00			3 3/16	15/32		
3	179.00	471.00	179.00			3 15/16	1/2		
3½	236.00		236.00			4 3/8	9/16		
4	243.00		243.00			4 7/8	19/32		
5	326.00		326.00			6 1/16	19/32		
6	370.00		370.00			7 1/16	19/32		

Crane Composition Discs are made from high quality materials—compounded, cured, and tested for the recommended services. All are molded and vulcanized. Constant study, research, and control assure uniformity in composition and serviceability.

No. 1 Granite Discs: No. 1 Granite Discs are made of a specially formulated composition consisting of a synthetic base, with asbestos and other ingredients. Sizes ⅛ to 3-inch have serrated faces on both sides; one side is marked "No. 1 Granite", and includes the size marking. Sizes 3½-inch and larger are plain on both sides, without markings.

For 150 pounds steam, 366° F. maximum
*150 pounds hot water, 366° F. maximum
*300 pounds hot water, 300° F. maximum

No. 4 Granite Discs: No. 4 Granite Discs are laminated, and consist of a synthetic base with spirally wound long fibre asbestos and other ingredients. They are suitably cured to provide a hard disc for high temperature, yet they seat with a minimum of effort. All sizes have serrated faces on both sides; one side is marked "No. 4 Granite", and includes the size.

For 300 pounds steam, 450° F. maximum
*600 pounds hot water, 420° F. maximum

*The No. 1 and No. 4 Discs are suitable for hot water under 200° F. only when used in globe and angle valves; however, when such valves are to be operated frequently or must seat easily, and the temperature does not exceed 200° F., the No. 6 Discs are recommended.

No. 5 Cranoil Discs: Cranoil Discs (not illustrated above), are compounded from phenol formaldehyde resinoid. They are cemented into the disc holders of the valves, and have specially machined faces to fit specially machined seats. They are not interchangeable with other Crane Discs. See page 31.

For oil, gasoline, air, or gas, 250° F. maximum

No. 6 Discs: No. 6 Discs are made of a specially formulated composition consisting of a synthetic base, with other ingredients. They are soft enough to make a tight seat on air or gas, yet sufficiently stiff and resistant to withstand hot water, and the wear and tear of repeated operation.

All sizes are plain on both sides, without markings.

For 400 pounds hot water, 200° F. maximum
600 pounds water, air, gas, oil, or gasoline, 150° F. maximum.
(Also suitable for propane and butane when used in Underwriters' approved valves.)

Nos. 10 and 12 Discs: Nos. 10 and 12 Discs are not interchangeable with Nos. 1, 4, and 6 Discs; they are slightly smaller in size. Made from homogeneous compounds with synthetic bases, they are highly suitable for their respective recommended services.

All sizes are plain on both sides, without markings.

No. 10 . . For 100 pounds steam, 338° F. maximum
No. 12 . . For 150 pounds water, air, gas, oil, or gasoline, 200° F. maximum, and for domestic gas service.

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asbestosclaims.law/library/21276/86

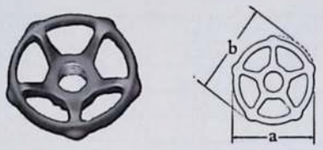
Wheels for Valves



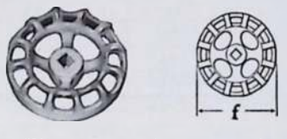
Style A Wheels, of a dished design with oval rim and either a square or threaded hole, are made of malleable iron. Orders must specify "square" or "threaded" hole.

Square hole wheels are used on the small size Steel Globe and Angle Valves shown on pages 237 to 239, 386, and 387.

Threaded hole wheels are used on the O.S. & Y. Steel Gate Valves shown on pages 223, 225, and 387, and on 2-inch Diaphragm Valves.



Style B Wheels, of malleable iron and similar to the Style A above, are made with a threaded hole only. They are used on Diaphragm Valves 1½-inch and smaller.



Style F Wheels, non-heat, round pattern with a square hole, are die cast in diameters 4½-inch and smaller and malleable iron in the larger diameters. They are widely used on smaller size Brass, Bronze, Iron, and Steel Globe, Angle, and Gate Valves (but not on O.S. & Y. Gate Valves).



10-inch diameter and smaller — 12-inch diameter and larger

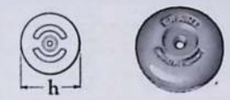
Style D Wheels have an oval rim, square hole, and are malleable iron. They are used on the larger size Diaphragm Valves, Brass, Bronze, Iron, and Steel Globe, Angle, and Gate Valves (but not on O.S. & Y. Gate Valves); they are also used on No. 453 Hose Gate Valves.



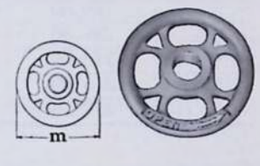
10-inch diameter and smaller — 12-inch diameter and larger

Style E Wheels, made of malleable iron and similar to the Style D above, have a hexagon hole. They are used on O.S. & Y. Iron and Steel Gate Valves. 6 and 7-inch diameter wheels are also available with a threaded hole for use with the Steel Gate Valves shown on pages 223, 225, and 387.

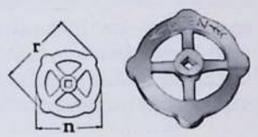
Style L Wheels, of a black, moulded composition material with a square socket, are used on Brass and Bronze Radiator Valves and on special polished valves.



Style M Wheels are a round pattern design. They have a round rim, a threaded hole, and are made of malleable iron. These wheels are used only on the No. 459 Bronze Gate Valves shown on page 19.



Style N Wheels are the "Navy" Four-Ball Pattern. They have a square hole, are made of polished brass, and are used on special polished valves.



Sizes (Diameters) in Inches, and List Prices

Style A				Style B		
Size		Price, Each		Size		Price, Each
a	b	Sq. Hole	Thd. Hole	a	b	Thd. Hole
2½	2 11/16	.20	.40	2	2 3/16	.30
*3	3¼	.30	.46	2¼	2 7/16	.35
3½	3⅞	.38	.68	2½	2 11/16	.40
4	4 7/16	.56	.95	3	3¼	.46
5	5½	1.05	1.60	4	4 7/16	.95

Style D		Style E			
Size	Price Each	Size	Price, Each		
d		e	Hex. Hole	Thd. Hole	
3½	.45				
4½	.75				
5½	1.35				
6	1.60	6	1.60	1.85	
7	2.00	7	2.00	2.50	
8	2.50	8	2.50		
9	3.15	9	3.15		
*10	3.35	*10	3.35		
12	4.40	12	4.40		
14	6.30	14	6.30		
16	12.75	16	12.75		
18	14.00	18	14.00		
20	19.00	20	19.00		
22	23.00	22	23.00		
24	39.00	24	39.00		
27	42.00	27	42.00		
30	58.00	30	58.00		
36	160.00	36	160.00		
42	200.00	*42	200.00		

Style F		Style L		Style M	
Size	Price Each	Size	Price Each	Size	Price Each
f		h		m	
1½	.13	1⅝	.20	3 5/16	.80
1¾	.13	2	.22	3⅝	1.00
2 1/16	.16	2¼	.24	3⅞	1.20
2 9/16	.20	2½	.28	4⅜	1.60
2¾	.24	2¾	.32	4 13/16	1.90
3 1/16	.30	3	.40	5¾	2.20
3⅝	.36			6 11/16	4.30
4 1/16	.44				
4¾	.56				
5⅜	.75				

Style N		
Size		Price Each
n	r	
1½	1¾	Prices on application
1¾	2	
2	2⅜	
*2½	3	
3	3½	
3½	4⅛	
4	4⅝	
5	5⅝	
6	6⅝	

Prices of wheels for AAR Valves are shown on page 40.

Ordering wheels or handles: Specify the size and catalog number of the valve, or the size and style of the wheel or handle.

Valve dimension tables in the catalog include the wheel or handle size. The style can be determined from valve illustrations and the size, or from data shown on this and page 135.

*The asterisk indicates wheels made with two sizes of squares or hexagons; for these sizes, always include the size and catalog number of the valve on which the wheel will be used.

Handles for Valves



Style J Tee Handles are made of cast iron. They are used only on No. 50 Brass Hose Valves.



Style K Lever Handles are made of malleable iron. They are used on the smaller size Hydraulic Bronze and Steel Globe and Angle Valves.

Ordering.....page 134
Tee Wrenches.....page 137
Keys for Lock Shields.....page 137

Sizes, in Inches, and List Prices

	Size j	Price Each
Style J	5⅛	.45
	5¾	.75
	6½	.85
	8¼	1.00

	Size k	Price Each
Style K	3⅛	.32
	3 5/16	.38
	3½	.40
	3⅞	.42
	4¼	.46
	4⅝	.50
	5	.60
	5¾	.70

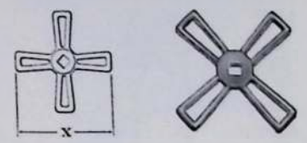
	Size s	Price Each
Style S	†2 9/16	.15
	3 9/16	.20
	4⅛	.38
	†4½	.43
	4¾	.46
	6	.62

	Size x	Price Each
Style X	†3	.40
	†3¾	.50
	†4¾	.62
	6	1.00
	7	1.10

†Two sizes of squares; specify size wanted.

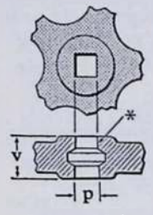


Style S Tee Handles are made of malleable iron. They are used on Bar Stock Valves and on some Corrosion-Resistant Globe Valves, Lip-Seal Bonnet Valves, and Ammonia Valves.



Style X Cross Handles are made of malleable iron. They are used on some Corrosion-Resistant Valves.

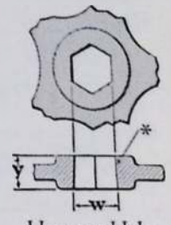
Size of Hole in Wheels and Handles



Square Hole Wheel or Handle

The tables below show the size of hole in square hole and hexagon hole wheels and handles. Wheels and handles with the same size and type of hole, and the same hub length, are interchangeable.

Caution: When substitution of wheels and handles involves the use of larger sizes than those with which the valves are regularly equipped, consideration must be given to the effect of increased power which will be obtained; recommendations furnished on request.



Hexagon Hole Wheel or Handle

*¾" total taper per foot

Dimensions, in Inches

Square Hole		Style A	Style F	Style N	Style J	Style K	Style S	Style X	Chain Wheel
p	v	Size a	Size f	Size n	Size j	Size k	Size s	Size x	Pitch Dia.
.20	.30		1½	1½					
.24	.35	2½	1¾	1¾				3	
.24	.37						2 9/16		
.29	.35		2 1/16	2		3⅛		3	
.29	.37						2 9/16		
.29	.44	3							
.32	.40		2 9/16	2½		3 5/16		3¾	
.32	.44						3 9/16		
.35	.44		2¾	2½		3½	4½	3¾	2⅜
.40	.44	3	3 1/16	3	5⅛	3⅞	4⅛, 4½	4¾	2⅜
.40	.56	3½					4¾		3
.42	.44		3⅝	3½		4¼		4¾	3
.42	.81				5¾				
.45	.56		4 1/16	4		4⅝	6	6	3
.45	.69				6½				
.53	.62	4, 5	4¾, 5⅜	5		5		7	4
.56	.75				8¼				
.56	.87			6		5¾			5

Square Hole		Style D	Chain	Square Hole		Style D	Chain
p	v	Size d	Wheel	p	v	Size d	Wheel
.35	.44	3½	2⅜	1.00	1.62	14	14
.37	.62	4½	4	1.13	1.75	16	14
.44	1.00	5½	4	1.25	1.87	18	18
.56	.87	6	5	1.31	2.12	20	18
.63	1.00	7	5	1.44	2.37	22	18
.69	1.06	8	7½	1.50	2.44	24	24
.75	1.19	9	7½	1.75	2.50	27	24
.81	1.25	10	10	1.87	2.75	30	30
.87	1.37	10	10	2.00	3.25	36	30
.94	1.50	12	10	2.50	3.50	42	

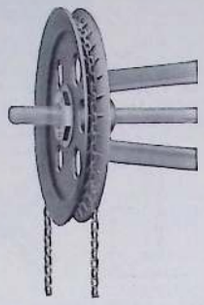
Hexagon Hole		Style E	Chain	Hexagon Hole		Style E	Chain
w	y	Size e	Wheel	w	y	Size e	Wheel
.99	.69	6		2.38	1.31	18	18
.99	.69	7	7½	2.75	1.31	20	18
1.16	.75	8	7½	3.27	1.50	22	18
1.35	.87	9	7½	3.46	1.62	24	24
1.54	.87	10	10	3.53	1.69	27	24
1.67	.87	10	10	4.03	1.75	30	30
1.86	1.00	12	10	4.56	2.19	36	30
2.05	1.06	14	14	5.16	2.75	42	
2.31	1.19	16	14	5.75	2.75	42	

Chain Wheels....page 136

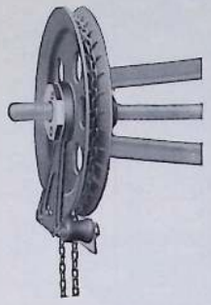
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Chain Wheels

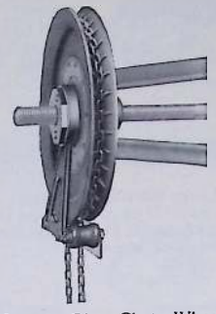
For Brass, Iron, and Steel Valves



Chain Wheel
With Chain



Chain Wheel
With Guide and Chain



Hammer Blow Chain Wheel
With Guide and Chain
(Prices on Application)

Illustrations show Chain Wheels applied to Rising Stem Gate Valves. Applications on Non-Rising Stem Gate Valves and on Globe and Angle Valves, while not illustrated, are similar.

Pitch Diameter of Chain Wheel	List Prices, Each For use with Rising or Non-Rising Stem Valves With Square or Hexagon Hole Wheel*		Chain Wheels are applicable to valves having the following style and size of Wheel or Handle with Square or Hexagon hole only					
			Style A Wheel	Style D Wheel	Style E Wheel	Style F Wheel	Style K Handle	Style S Handle
Inches	Chain Wheel Only	Chain Wheel and Guide	*Size Inches	Size Inches	*Size Inches	Size Inches	Size Inches	Size Inches
2⅜	3.75	17.50	3	3½		2¾, 3 1/16	3½, 3⅞	
3	4.00	17.75	3½			3⅝, 4 1/16	4¼, 4⅝	4¾, 6
4	4.25	18.00	4, 5	4½, 5½		4¾, 5⅜	5	
5	4.75	19.50		6, 7			5¾	
7½	8.50	23.50		8, 9	7, 8, 9			
10	12.50	28.50		10, 12	10, 12			
14	18.00	35.00		14, 16	14, 16			
18	26.00	44.00		18, 20, 22	18, 20, 22			
24	45.00	65.00		24, 27	24, 27			
30	95.00	125.00		30, 36	30, 36			

List price of Chain for Chain Wheels .45 per foot | List price for connecting ends of Chain .65 per Chain

Chain Wheels without guides will be furnished, unless ordered "With Guide".
****Chain wheels for valves with threaded hole wheels are made to order; prices on application.***

For convenience in operating valves located above a normal reach from floor levels, Crane Chain Wheels are ideal. They are made from high quality cast iron, of unusually rugged and serviceable construction, and are designed to provide a positive grip on the chain under the most severe operation.

Through a new improved hub design, these chain wheels are easily attached and locked to valves in service; an instruction tag is supplied with each wheel.

Guides: Guides for Crane Chain Wheels, for sizes of 7½-inch pitch diameter and larger, are regularly equipped with rollers, as illustrated; Guides for smaller wheels have plain loops. Crane Guides hold the chain in close contact with a large portion of the circumference of the wheel, preventing slipping or jumping of the chain.

Hammer Blow Chain Wheels: When Chain Wheels are desired for operating large size or high pressure valves, additional power is usually necessary for the first effort in unseating the disc, and in the final movement, to effect tight seating. For conditions such as these, the Crane Hammer Blow Chain Wheel is recommended. Its design embodies a "lost motion", wherein the wheel turns freely through a large angle, building up momentum until the heavy operating lugs engage. The resulting "hammer blow" acts upon the valve stem, facilitating opening and closing of the valve. The Hammer Blow Chain Wheels are available in 7½-inch pitch diameter and larger; prices are furnished on application.

Ordering: When ordering a Chain Wheel separately, specify the pitch diameter of the Chain Wheel and the size and catalog number of the valve for which it is intended. Also indicate if a Chain Guide is desired.

When ordering a Chain for a Chain Wheel separately, specify the pitch diameter of the Chain Wheel for which the Chain is intended.

When valves are ordered with a Chain Wheel or with a Chain Wheel and Guide, the equipment will be mounted on the valve at no extra charge; no allowance will be made for the regular valve wheel or handle.

For size of hole in Chain Wheels, Wheels, or Handles, see page 135.

Babbitt Adjustable Sprocket Rim

With Chain Guide

Size No.	Diameters, in Inches	
	Sprocket Wheels	Valve Wheels Rim Will Fit
0	4	2 to 4
1	5⅞	4⅛ to 5⅞
1½	7½	6 to 7½
2	9	7¾ to 9
2½	12½	9¼ to 12½
3	15½	12¾ to 15½
3½	19	15¾ to 19
4	22	19¼ to 22
4½	26	22¼ to 26
5	30	26¼ to 30

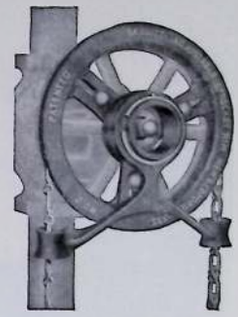
The Babbitt Rims may be easily attached to the wheels of valves in service. They do not in any way interfere with rising stems. Available in a wide range of sizes, each size can be adjusted to fit certain minimum and maximum diameters of valve wheels, as shown in the table at the left.

The new split guard ring of spring steel avoids the use of cotter pins.

The chain is rustproof.

When ordering, specify the number of feet of chain required, and indicate if the valve has a rising stem.

Prices on application.



Keys for Lock Shield

Keys Used With Lock Shield Valves

Size of Valve	Catalog Nos. of Valves				
	No. 67 G	No. 438	No. 440	No. 1240 No. 1241	No. 4270
Inches					
¼					
⅜				197	197
½	198	197	198		198
¾		198			
1	198 or 199			198	198 or 199
1¼		198 or 199	199		
1½	199				
2		199			

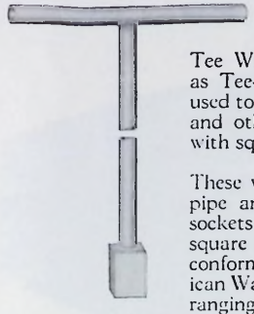
List Prices and Size of Square Hole

Key Nos.	List Prices Each	Size of Square Hole Inches
No. 197	1.00	.26 and .20
No. 198	1.20	.43 and .32
No. 199	1.60	.49 and .43



L-Shape Key
Malleable Iron
Cadmium Plated
Nos. 197, 198, and 199

Tee Wrenches



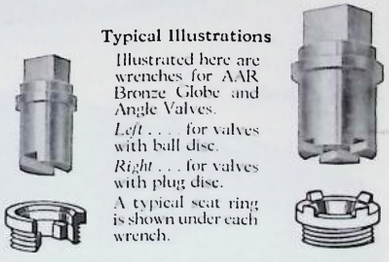
Tee Wrench
For Valves
With Square
Operating Nut

Tee Wrenches, frequently referred to as Tee-Handle Socket Wrenches, are used to operate all types of gate valves and other equipment regularly fitted with square operating nuts.

These welded wrenches, made of steel pipe and tubing, are furnished with sockets for either 2-inch or 3-inch square operating nuts. The nut sizes conform to the dimensions of the American Water Works Association. Lengths ranging from five to nine feet are regular; other lengths are made to order.

Prices and dimensions on application.

Seat Ring Wrenches



Typical Illustrations

Illustrated here are wrenches for AAR Bronze Globe and Angle Valves.

Left . . . for valves with ball disc.

Right . . . for valves with plug disc.

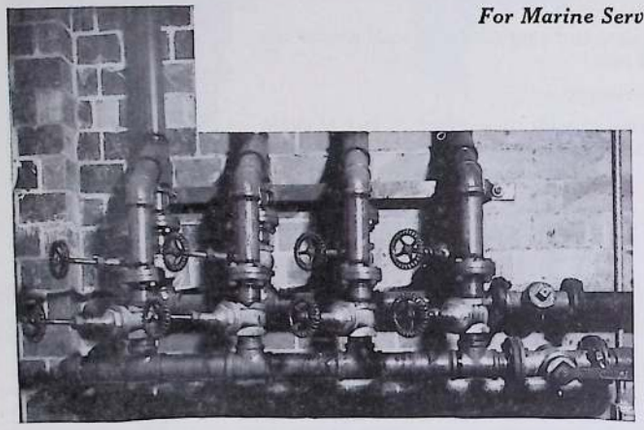
A typical seat ring is shown under each wrench.

Wrenches for removing and inserting flat, bevel, and plug type body seat rings in Crane Brass, Bronze, and small Iron Body Globe and Angle Valves are available. They are made of steel, ruggedly constructed, and correctly designed. Prices on application.

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Approved by Every Industry — Crane Valves and Fittings

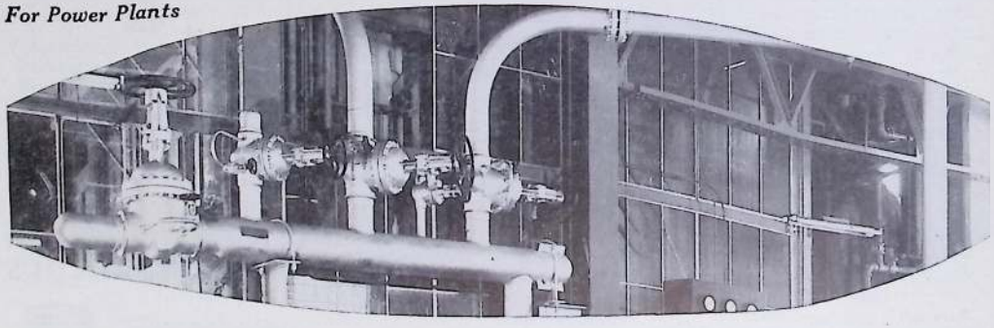
For General Use



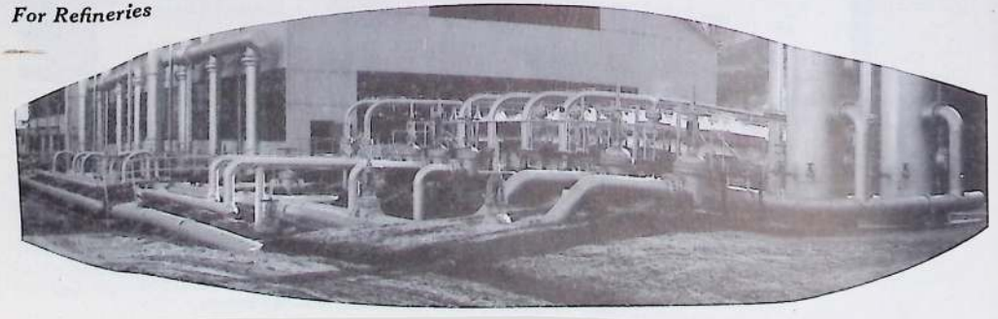
For Marine Service



For Power Plants



For Refineries



Malleable Iron Screwed Fittings

150-Pound Banded Fittings
List Prices and Description.....pages 140 and 141
Dimensions and List of Reducing Sizes....pages 142 and 143

Plain Pattern Fittings
List Prices and Description.....page 141
Dimensions and List of Reducing Sizes.....page 142

Air-Tested 150-Pound Fittings.....page 144
Circulating Boiler Fittings.....page 145

300-Pound Fittings.....pages 146 and 147
Heavy Fittings.....pages 146 and 147
AAR Fittings.....page 148

The Crane line of Malleable Iron Fittings includes fittings for steam working pressures up to 300 pounds and for water, oil, or gas working pressures up to 2000 pounds, depending upon size. The user is afforded a wide variety of types and an unusually liberal assortment of straight and reducing sizes.

Crane Malleable Iron is characterized by pressure tightness, stiffness, and toughness, the latter property being especially valuable in pipe fittings. It has a tensile strength of from 40,000 to 50,000 pounds per square inch. Uniformity and superior quality are assured through the application of improved methods in furnace practice, casting, and annealing.

Although differing in their weight and proportions, the various lines are alike in that no detail of manufacture is overlooked to provide fittings of exceptionally high quality. Except for Plain Pattern Fittings, the pipe ends are reinforced with bands. Tough, close-grained iron, threads accurately cut to gauge and in true alignment, openings chamfered to permit easy entrance of the pipe,—these and other features contribute to making Crane fittings uniformly satisfactory.

* * * * * * * * *

The list above does not include all the Malleable Iron Fittings manufactured by Crane. For greater convenience, the following fittings are shown in other sections of this catalog:

Plugs.....page 166
Bushings.....page 167
Single Strap and Double Strap Clamps.....page 171
Screwed Unions and Union Fittings.....pages 174 to 180
Flange Unions.....page 181
Railing Fittings.....pages 190 and 191
Floor Flanges.....page 203

How to read reducing fittings ... page 577

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150-Pound Malleable Iron Fittings



90° Elbow



45° Elbow

WORKING PRESSURES, BANDED FITTINGS
150 pounds saturated steam
300 pounds cold water, oil, or gas, non-shock

Prices of Reducing Fittings and Reducers apply only to the sizes listed on pages 142 and 143; the price is determined by the size of the largest opening.



Tee



Cross



90° Street Elbow



45° Street Elbow



Service Tee



Return Bend



45° Y-Bend



Cap



Coupling Right Hand



Coupling Right & Left



Reducer

List Prices, Each—Banded Fittings

Size	90° Elbows				45° Elbows		Tees				Crosses	
	Straight		Reducing				Straight		Reducing			
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
⅛	.16	.21			.19	.25	.22	.28			.43	.56
¼	.16	.21	.19	.25	.19	.25	.22	.28	.24	.31	.43	.56
⅜	.16	.21	.19	.25	.19	.25	.22	.28	.24	.31	.43	.56
½	.20	.26	.22	.29	.21	.28	.28	.36	.31	.40	.53	.71
¾	.25	.33	.27	.37	.29	.40	.37	.48	.41	.53	.65	.85
1	.32	.42	.35	.45	.35	.46	.47	.64	.53	.70	.80	1.05
1¼	.50	.66	.57	.76	.60	.80	.78	1.00	.85	1.10	1.10	1.45
1½	.68	.88	.72	.97	.75	.95	.96	1.25	1.00	1.35	1.40	1.80
2	.97	1.25	1.05	1.35	1.05	1.35	1.40	1.80	1.55	1.95	2.30	3.00
2½	1.85	2.40	2.00	2.60	2.05	2.65	2.45	3.20	2.70	3.50	3.70	4.80
3	2.95	3.85	3.25	4.25	3.30	4.30	3.30	4.15	3.60	4.75	5.50	7.10
3½	3.65	4.75			4.00	5.00	5.60	7.30			8.50	11.25
4	5.00	6.50	5.50	7.20	5.30	6.65	6.60	8.60	7.30	9.50	10.00	13.00
5	11.50	15.00			13.00	17.00	13.00	17.00			21.00	26.50
6	14.50	19.00			16.00	21.00	18.50	24.00	20.00	26.00	29.00	39.00

Size	90° Street Elbows				45° Street Elbows		Service Tees				45° Y-Bends	
	Straight		Reducing				Straight		Reducing			
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
⅛	.22	.29			.24	.31						
¼	.22	.29			.24	.31	.28	.36				
⅜	.22	.29			.24	.31	.28	.36			.33	.43
½	.26	.34	.28	.37	.28	.35	.36	.47			.39	.51
¾	.37	.48	.41	.53	.41	.51	.44	.59			.50	.65
1	.43	.54	.46	.62	.48	.64	.59	.79	.67	.90	.72	.94
1¼	.65	.84	.68	.91	.72	.96	.93	1.20	1.00	1.35	1.20	1.55
1½	.80	1.05	.86	1.10	.90	1.15	1.25	1.60	1.35	1.75	1.65	2.15
2	1.20	1.55	1.35	1.75	1.35	1.75	1.85	2.40	1.95	2.65	2.30	3.00
2½	2.10	2.75									4.45	6.00
3	3.25	4.25									7.50	9.50
4	5.30	7.00									13.00	16.25

Size	Return Bends						Caps		Couplings				Reducers	
	Close Pattern		Medium Pattern		Open Pattern				Right Hand		R. & L.			
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
⅛									.17	.22				
¼							.11	.15	.17	.22			.17	.22
⅜							.11	.15	.17	.22			.17	.22
½	.47	.60	.50	.65	.53	.69	.14	.18	.19	.24	.20	.27	.19	.24
¾	.56	.73	.60	.78	.65	.85	.19	.25	.22	.29	.25	.34	.22	.29
1	.68	.88	.73	.95	.80	1.05	.23	.30	.34	.44	.37	.48	.34	.44
1¼	1.00	1.30	1.10	1.45	1.30	1.70	.30	.40	.44	.58	.50	.67	.44	.58
1½	1.40	1.80	1.55	2.00	1.80	2.35	.41	.53	.55	.70	.64	.80	.55	.70
2	2.50	3.15	2.60	3.40	2.85	3.70	.53	.66	.80	1.00	.85	1.15	.80	1.00
2½					5.50	6.90	.94	1.20	1.45	1.85			1.45	1.85
3					8.30	10.80	1.30	1.75	2.00	2.50			2.00	2.50
3½							2.00	2.70					3.65	4.75
4					16.00	20.00	2.35	3.05	4.00	5.30			4.00	5.30
5							4.20	5.50					7.50	10.00
6							8.00	10.50					10.00	13.00

Dimensions and list of reducing sizes . . . pages 142 and 143 *Air-tested fittings . . . page 144*

150-Pound Malleable Iron Fittings

The Crane line of 150-Pound Malleable Iron Fittings, described and illustrated on pages 140 to 144, includes a wide variety of types and a large assortment of straight and reducing sizes. It affords the user an excellent selection, sufficient for every normal piping installation within its pressure and size range.

Banded Fittings: Banded fittings, so called because of the generous band which reinforces each female opening, are well proportioned and of good weight. Their strength is very high, providing a liberal factor of safety over the recommended working pressure. All openings are accurately threaded to gauge, are in true alignment, and are chamfered slightly, to permit easy entrance of the pipe.

Plain Fittings: Plain fittings are similar in quality to the Banded but do not have the strength producing reinforcing bands. They, too, have accurately cut threads with each opening in true alignment.

Male end fittings: A street elbow or a service tee, with the male thread on one end, eliminates one threaded joint when making up pipe lines. Their use, therefore, saves time and materials.

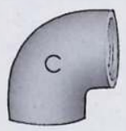
Air-tested fittings: Crane Air-Tested 150-Pound Malleable Iron Fittings are suitable for air brake and other compressed air lines; see page 144.

Reducing fittings: Reducing fittings are made in proportion with the straight sizes, thus harmonizing the fittings in any combination of piping.

Prices of reducing fittings and reducers are determined by the size of the largest opening and apply only to regularly listed sizes. All other sizes are special; prices on application. For list of sizes of Banded and Plain Reducers, see page 142; for list of sizes of Banded Reducing Elbows and Tees, see page 143.

Dimensions: The dimensions of straight and reducing fittings are shown on pages 142 and 143. Plain fittings have the same center to end dimensions as the corresponding size banded fitting.

Plain Pattern Fittings



90° Elbow


Side Outlet Elbow

Plain Pattern Fittings are satisfactory for low pressure gas and water lines, for plumbing in homes, or for railings.



Tee


Four-Way Tee



Coupling



Reducer



Locknut



Waste Nut



Cap



Extension Piece


Drop Elbow

List Prices, Each—Plain Fittings

Size	90° Elbows		Side Outlet Elbows		Tees		Four-Way Tees		Couplings Right Hand		Reducers		Locknuts Hexagonal		Waste Nuts	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
⅛	.16	.21			.22	.28			.17	.22			.07	.09	.15	.19
¼	.16	.21	.35	.47	.22	.28	.40	.52	.17	.22	.17	.22	.07	.09	.15	.19
⅜	.16	.21	.35	.47	.22	.28	.40	.52	.17	.22	.17	.22	.07	.09	.15	.19
½	.20	.26	.40	.52	.28	.36	.48	.64	.19	.24	.19	.24	.09	.11	.17	.22
¾	.25	.33	.45	.58	.37	.48	.62	.80	.22	.29	.22	.29	.11	.14	.19	.25
1	.32	.42	.66	.88	.47	.64	.80	1.05	.34	.44	.34	.44	.14	.18	.22	.29
1¼	.50	.66	.90	1.15	.78	1.00	1.10	1.45	.44	.58	.44	.58	.18	.23	.28	.36
1½	.68	.88	1.15	1.50	.96	1.25	1.50	1.95	.55	.70	.55	.70	.25	.32	.37	.48
2	.97	1.25	1.60	2.10	1.40	1.80	2.30	3.00	.80	1.00			.42	.55	.70	.88

Size	Caps		Extension Pieces		Drop Elbows Female	
Inches	Black	Galv.	Black	Galv.	Black	Galv.
⅛	.11*	.15*				
¼	.11*	.15*			.28	.37
⅜	.11*	.15*	.28	.36	.28	.37
½	.14	.18	.31	.40	.32	.42
¾	.19	.25	.40	.52		
1	.23	.30	.50	.65		

*Caps in sizes ⅛, ¼, and ⅜-inch are steel.

Plain Fittings are made to the same exacting standards as the Banded, having accurately cut threads with each opening in true alignment; the center to end dimensions are the same. The ends, however, are not reinforced with a band; and the fittings, therefore, are only suitable on non-pressure services such as railings, racks, etc., and for low pressure gas and water lines.

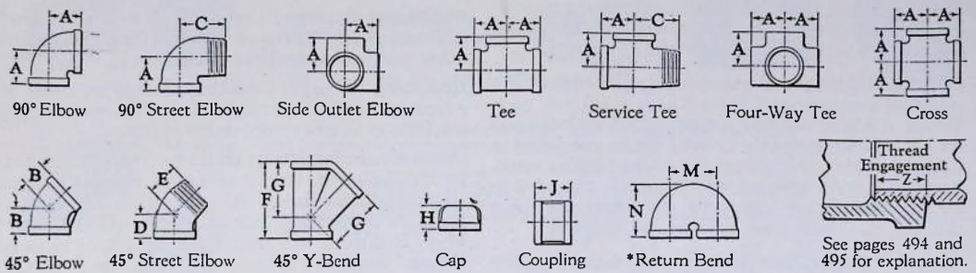
The prices of Reducers apply only to the sizes shown on page 142; the price is determined by the larger opening.

Dimensions (same as Banded) . . . . page 142 *List of sizes of Reducers . . . . page 142*

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150-Pound Malleable Iron Fittings

Dimensions of Straight Sizes, in Inches
Banded and Plain Pattern



These dimensions apply to both Banded and Plain Fittings; their center to end dimensions are alike.

*Close Pattern Return Bends can not be used to make up parallel coils. The center to center dimension is so close that the bands of adjacent bends will not clear each other.

Size	A	B	C	D	E	F	G	H	J	Return Bends Close M	Close N	Medium M	Medium N	Open M	Open N	Z
1/8	11/16	1/2	1	11/16	13/16			9/16	15/16							1/4
1/4	13/16	3/4	13/16	5/8	15/16			5/8	1 1/16							3/8
3/8	15/16	13/16	1 7/16	11/16	1 1/16	2 1/8	1 7/16	3/4	1 3/16							3/8
1/2	1 1/8	7/8	1 5/8	13/16	1 3/16	2 7/16	1 11/16	7/8	1 5/16	1	1 3/4	1 1/4	1 5/8	1 1/2	1 7/8	1/2
3/4	1 5/16	1	1 7/8	1 5/16	1 5/16	2 7/8	2	1 1/16	1 1/2	1 1/4	2 3/16	1 1/2	1 15/16	2	2 1/4	9/16
1	1 1/2	1 1/8	2 1/8	1 1/16	1 1/2	3 3/8	2 7/16	1 3/16	1 11/16	1 1/2	2 1/2	1 7/8	2 1/4	2 1/2	2 5/8	11/16
1 1/4	1 3/4	1 5/16	2 7/16	1 1/4	1 11/16	4 1/16	2 15/16	1 1/4	1 15/16	1 3/4	2 13/16	2 1/4	2 13/16	3	3 3/16	11/16
1 1/2	1 15/16	1 7/16	2 11/16	1 3/8	1 7/8	4 1/2	3 5/16	1 5/16	2 1/8	2 3/16	3 3/16	2 1/2	3 3/16	3 1/2	3 5/8	11/16
2	2 1/4	1 11/16	3 1/4	1 11/16	2 1/4	5 7/16	4	1 7/16	2 1/2	2 5/8	3 7/8	3	3 7/8	4	4 3/8	3/4
2 1/2	2 11/16	1 15/16	3 13/16			6 1/4	4 11/16	1 13/16	2 7/8					4 1/2	4 15/16	15/16
3	3 1/8	2 3/16	4 1/2			7 1/4	5 9/16	1 15/16	3 3/16					5	5 9/16	1
3 1/2	3 7/16	2 3/8						1 15/16								1 1/16
4	3 3/4	2 5/8	5 11/16			8 7/8	6 15/16	2 1/16	3 11/16					6	6 11/16	1 1/8
5	4 1/2	3 1/16						2 5/16								1 1/4
6	5 1/8	3 7/16						2 9/16								1 5/16

List of Sizes of Reducers and Dimensions, in Inches
Banded and Plain Pattern

Banded Reducers

Size	A	Size	A	Size	A
1/4 ×1/8	1	1 1/2×1 1/4	2 5/16	3 ×2 1/2	3 11/16
3/8 ×1/4	1 1/8	×1	2 5/16	×2	3 11/16
×1/8	1 1/8	×3/4	2 5/16	×1 1/2	3 11/16
1/2 ×3/8	1 1/4	×1/2	2 5/16	×1 1/4	3 11/16
×1/4	1 1/4	2 ×1 1/2	2 13/16	×1	3 11/16
×1/8	1 1/4	×1 1/4	2 13/16	3 1/2×3	4
3/4 ×1/2	1 7/16	×1	2 13/16	×2 1/2	4
×3/8	1 7/16	×3/4	2 13/16	×2	4
×1/4	1 7/16	×1/2	2 13/16	4 ×3 1/2	4 3/8
1 ×3/4	1 11/16	2 1/2×2	3 1/4	×3	4 3/8
×1/2	1 11/16	×1 1/2	3 1/4	×2 1/2	4 3/8
×3/8	1 11/16	×1 1/4	3 1/4	×2	4 3/8
×1/4	1 11/16	×1	3 1/4	×1 1/2	4 3/8
1 1/4×1	2 1/16			5 ×4	5 1/8
×3/4	2 1/16			6 ×4	4 3/8
×1/2	2 1/16				



The prices of Banded and Plain Pattern Reducers (pages 140 and 141) apply only to the sizes listed on this page; the size of the larger opening determines the price.

The engagement normally required between male and female pipe threads to make a tight joint is shown at the top of the page (dimension "Z"); this dimension applies to all 150-Pound Malleable Iron Fittings.

Plain Reducers

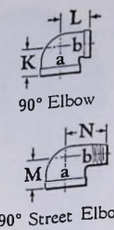
Size	B
1/4 ×1/8	1
3/8 ×1/4	1 1/8
×1/8	1 1/8
1/2 ×3/8	1 1/4
×1/4	1 1/4
×1/8	1 1/4
3/4 ×1/2	1 7/16
×3/8	1 7/16
×1/4	1 7/16
1 ×3/4	1 11/16
×1/2	1 11/16
×3/8	1 11/16
×1/4	1 11/16
1 1/4×1	2 1/16
×3/4	2 1/16
1 1/2×1 1/4	2 5/16

Prices of Banded Fittings....page 140

Prices of Plain Pattern Fittings....page 141

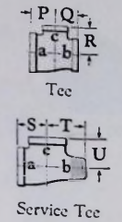
150-Pound Malleable Iron Fittings

List of Sizes of Banded Reducing Fittings and Dimensions, in Inches



The prices of banded reducing fittings (page 140) apply only to the sizes shown below; the size of the largest opening determines the price.

When specifying, always name the size of openings in the sequence of the lower case letters shown on the accompanying illustrations.



90° Elbows

Size a	Size b	K	L
1/4	×1/8	3/4	3/4
1/8	×1/4	3/4	3/4
3/8	×1/4	7/8	7/8
	×1/8	13/16	7/8
1/2	×3/8	1 1/16	1 1/16
	×1/4	1	1 1/16
3/4	×1/2	1 3/16	1 1/4
	×3/8	1 1/8	1 1/8
	×1/4	1 1/8	1 1/8
1	×3/4	1 5/16	1 3/8
	×1/2	1 1/4	1 5/16
	×3/8	1 1/4	1 5/16
1 1/4	×1	1 13/16	1 13/16
	×3/4	1 7/8	1 7/8
	×1/2	1 11/16	1 13/16
2	×1 1/2	2	2 1/8
	×1 1/4	1 15/16	2 1/16
	×1	1 15/16	2 1/16
	×3/4	1 5/8	2
2 1/2	×2	2 3/8	2 5/8
	×1 1/2	2 3/8	2 5/8
3	×2 1/2	2 13/16	3
	×2	2 1/2	2 7/8
4	×3	3 5/16	3 5/8

90° Street Elbows

Size a	Size b	M	N
1/2	×3/8	1 1/16	1 9/16
3/4	×1/2	1 3/16	1 3/4
1	×3/4	1 3/8	2
1 1/4	×1	1 9/16	2 5/16
	×3/4	1 9/16	2 1/4
1 1/2	×1 1/4	1 13/16	2 5/8
	×1	1 5/8	2 7/16
	×3/4	1 1/2	2 3/8
2	×1 1/2	2 1/16	3

Tees

Size a	Size b	Size c	P	Q	R
1/4	×1/4	×1/8	3/4	3/4	3/4
1/8	×1/8	×1/4	3/4	3/4	3/4
3/8	×3/8	×1/4	7/8	7/8	7/8
3/8	×1/4	×3/8	15/16	7/8	15/16
		×1/4	7/8	1 3/16	7/8
1/4	×1/4	×3/8	7/8	7/8	7/8
1/2	×1/2	×3/8	1 1/16	1 1/16	1 1/16
		×1/4	1	1	1 1/16
1/2	×3/8	×1/2	1 1/8	1 1/16	1 1/8
		×3/8	1 1/16	1 5/16	1 1/16
1/2	×1/4	×1/2	1 1/8	1 1/16	1 1/8
3/8	×3/8	×1/2	1 1/16	1 1/16	1 1/16
3/4	×3/4	×1/2	1 3/16	1 3/16	1 1/4
		×3/8	1 1/8	1 1/8	1 3/16
		×1/4	1 1/16	1 1/16	1 3/16
3/4	×1/2	×3/4	1 5/16	1 1/4	1 5/16
		×1/2	1 3/16	1 1/8	1 1/4
3/4	×3/8	×3/4	1 5/16	1 3/16	1 5/16
		×3/8	1 1/8	1 1/16	1 3/16
3/4	×1/4	×3/4	1 3/16	1 1/16	1 3/16
1/2	×1/2	×3/4	1 1/4	1 1/4	1 3/16
1	×1	×3/4	1 5/16	1 5/16	1 3/8
		×1/2	1 1/4	1 1/4	1 5/16
		×3/8	1 3/16	1 3/16	1 5/16
		×1/4	1 3/16	1 3/16	1 5/16
1	×3/4	×1	1 7/16	1 5/16	1 7/16
		×3/4	1 5/16	1 5/16	1 3/8
		×1/2	1 1/4	1 3/16	1 5/16
1	×1/2	×1	1 7/16	1 5/16	1 7/16
		×3/4	1 5/16	1 1/4	1 3/8
		×1/2	1 1/4	1 1/8	1 5/16
3/4	×3/4	×1	1 3/8	1 3/8	1 5/16
1/2	×1/2	×1	1 3/8	1 3/8	1 5/16
1 1/4	×1 1/4	×1	1 9/16	1 9/16	1 5/8
		×3/4	1 7/16	1 7/16	1 9/16
		×1/2	1 5/16	1 5/16	1 1/2
		×3/8	1 1/4	1 1/4	1 1/2
1 1/4	×1	×1 1/4	1 3/4	1 5/8	1 3/4
		×1	1 9/16	1 7/16	1 5/8
		×3/4	1 7/16	1 5/16	1 9/16
		×1/2	1 7/16	1 5/16	1 9/16
1 1/4	×3/4	×1 1/4	1 11/16	1 9/16	1 11/16
		×1	1 9/16	1 3/8	1 5/8
1 1/4	×1	×1 1/4	1 13/16	1 11/16	1 13/16
		×1	1 11/16	1 9/16	1 13/16
1 1/2	×1 1/4	×1 1/4	1 15/16	1 13/16	1 15/16
		×1	1 13/16	1 11/16	1 15/16
1 1/2	×1	×1 1/4	1 15/16	1 13/16	1 15/16
		×1	1 13/16	1 11/16	1 15/16
2	×1 1/2	×1 1/4	2 1/16	1 15/16	2 1/16
		×1 1/2	2	2	2 1/8
2	×1	×1 1/4	2 1/16	1 15/16	2 1/16
		×1	2	1 13/16	2 1/16
		×3/4	2	1 15/16	2 1/16
		×1/2	2	2	2 1/8
2	×1 1/2	×2	2 1/4	2 1/8	2 1/4
		×1 1/2	2 1/16	2 1/16	2 1/8
		×1 1/4	2 1/16	2	2 1/16
2	×1 1/4	×2	2 1/4	2 1/16	2 1/4
		×1 1/4	2 1/16	2	2 1/16
		×1	2	1 15/16	2 1/16
2	×1	×2	2 1/4	2 1/16	2 1/4
		×3/4	2 1/4	2 1/16	2 1/4
		×1/2	2 1/4	2 1/16	2 1/4
1 1/2	×1 1/2	×2	2 1/8	2 1/8	2
1 1/4	×1 1/4	×2	2 1/8	2 1/8	2
1	×1	×2	2 1/8	2 1/8	2
2 1/2	×2 1/2	×2	2 7/16	2 7/16	2 1/2
		×1 1/2	2 3/16	2 3/16	2 1/2
		×1 1/4	2 1/16	2 1/16	2 7/16
		×1	1 7/8	1 7/8	2 3/8
2 1/2	×2	×3/4	1 13/16	1 13/16	2 3/16
2 1/2	×2	×2 1/2	2 11/16	2 9/16	2 11/16
		×2	2 1/2	2 1/4	2 9/16
2 1/2	×1 1/2	×2 1/2	2 11/16	2 7/16	2 11/16
		×2	2 1/2	2 1/8	2 9/16
2	×2	×2 1/2	2 1/2	2 1/2	2 7/16
3	×3	×2 1/2	2 13/16	2 13/16	3 1/16
		×2	2 9/16	2 9/16	2 15/16
		×1 1/2	2 5/16	2 3/16	2 3/4
		×1 1/4	2 1/4	2 1/4	2 3/4
		×1	2 1/16	2 1/16	2 5/8
		×3/4	1 15/16	1 15/16	2 9/16
3	×2 1/2	×2 1/2	2 3/4	2 11/16	3
		×2	2 5/8	2 1/2	2 15/16
3	×2	×3	3 1/8	2 15/16	3 1/8
		×2	2 9/16	2 1/4	2 15/16
2 1/2	×2 1/2	×3	3	3	2 13/16
4	×4	×3	3 3/8	3 3/8	3 3/4
		×2 1/2	2 15/16	2 15/16	3 5/8
		×2	2 7/8	2 7/8	3 5/8
		×1 1/2	2 7/8	2 7/8	3 5/8
4	×3	×4	3 3/4	3 11/16	3 3/4
3	×3	×4	3 11/16	3 11/16	3 1/4
6	×6	×4	4 1/8	4 1/8	4 15/16
		×3	3 5/8	3 5/8	4 7/8
		×2	3 1/16	3 1/16	4 11/16

Service Tees

Size a	Size b	Size c	S	T	U
1	×1	×3/4	1 3/8	1 15/16	1 3/8
1 1/4	×1	×1/4	1 3/4	2 5/16	1 3/4
		×1	1 3/4	2 5/16	1 3/4
1 1/4	×3/4	×1 1/4	1 3/4	2 3/16	1 3/4
1	×1	×1 1/4	1 5/8	2 3/8	1 9/16
1 1/2	×1 1/4	×1 1/2	1 15/16	2 5/8	1 15/16
		×1	1 15/16	2 7/16	1 15/16
2	×2	×1	1 3/4	2 5/16	1 3/4
		×1 1/2	2	2	2

List prices....page 140

Normal thread engagement....page 142

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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150-Pound Malleable Iron Fittings

Air-Tested



90° Elbow



Tee



Cross



Return Bend

For air brake and other compressed air service



45° Elbow

Any of the 150-Pound Malleable Iron Fittings illustrated and priced on page 140 can be furnished air tested when so ordered.

The list prices of Air-Tested Fittings are the same as for untested, but the Air-Tested are sold at an advance in price. See the Crane Discount Sheet for prices.

Air-Tested Fittings are admirably suited for air brake and other compressed air lines. They are given an air-under-water test.

Banded 90° Elbows, 90° Street Elbows, and Tees, Black and Galvanized, sizes ¼ to 2-inch, are carried in stock air tested; other types and sizes are furnished to order on short notice.



Coupling

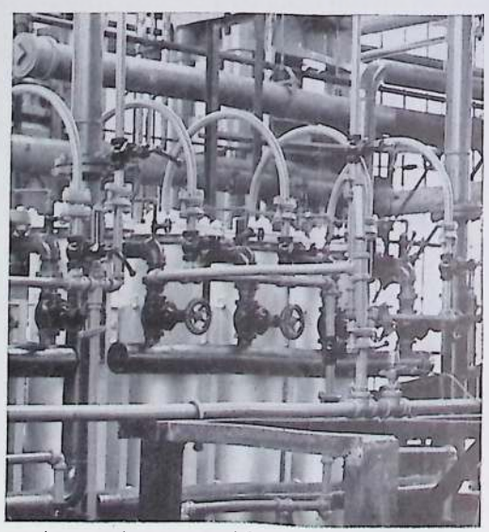


90° Street Elbow



Reducer

13

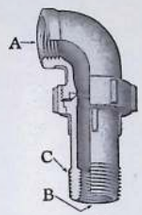

An unusual assortment of Crane Valves and Fittings


Gauging the threads of Screwed Fittings. This inspection is but one phase of the system that guards Crane Quality and assures the user satisfactory service.

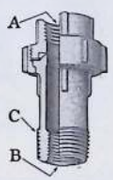
Circulating Boiler Fittings

Malleable Iron—Galvanized

Ground Joint

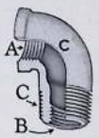


No. 586½ Elbow
Brass to Iron Seat Ground Joint Union

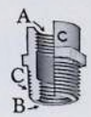


No. 589½ Coupling
Brass to Iron Seat Ground Joint Union

WORKING PRESSURE
150 pounds water, 200° F.



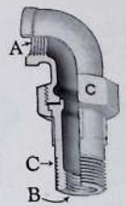
No. 587 Elbow



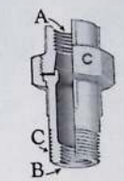
No. 588 Coupling

When ordering Circulating Boiler Fittings, be sure to specify the correct size; refer to illustrations.

Gasket Type



No. 586 Elbow
Gasket Type Union (With Rubber Gasket)



No. 589 Coupling
Gasket Type Union (With Rubber Gasket)

13

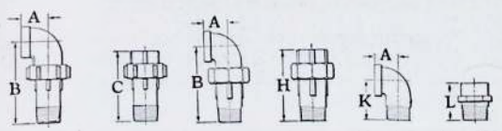
List Prices, Each, Galvanized

Size Inches A B C	Ground Joint Type Union		Gasket Type Union		Without Union	
	No. 586½ Elbow	No. 589½ Coupling	No. 586 Elbow	No. 589 Coupling	No. 587 Elbow	No. 588 Coupling
½×½×1	1.55	1.35	1.55	1.35	.85	.75
¾×½×1	1.70	1.50	1.70	1.50	.85	.75
¾×¾×1	1.70	1.50	1.70	1.50	.85	.75

Circulating Boiler Fittings are especially designed for tanks or receivers that utilize an internal pipe.

The connection for cold water into a range boiler or hot water tank is a common example. The internal pipe is screwed into the female opening at the male end of the fitting, and the male end is then screwed into the tank. The cold water supply is then connected to the female opening of the fitting on the outside of the tank.

The fittings with a ground joint union are exceptionally strong, rugged, and durable. The rings, threadpieces, and elbows are interchangeable with the corresponding parts of the 150-Pound Malleable Iron Unions shown on page 175.



No. 586½ No. 589½ No. 586 No. 589 No. 587 No. 588

Dimensions, in Inches

Size A B C	A	B	C	H	K	L
½×½×1	1⅛	3 13/16	3⅜	3⅜	1 13/16	1 13/16
¾×½×1	1 5/16	3 15/16	3⅜	3 7/16	2	1 13/16
¾×¾×1	1 5/16	3 15/16	3⅜	3 7/16	2	1 13/16

For extra gaskets for the No. 586 Elbow and No. 589 Coupling, see page 476.

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300-Pound Malleable Iron Fittings


No. 260 E
90° Elbow


No. 262 E
45° Elbow

WORKING PRESSURES
300 pounds steam or oil, 550° F.

Cold Water, Oil, or Gas, Non-Shock
¼ to 1-inch — *2000 pounds
1¼ to 2-inch — *1500 pounds
2½ to 4-inch — *1000 pounds
5 and 6-inch — 800 pounds

Sizes 3-inch and smaller are tested with 300 pounds air-under-water and are suitable for 300 pounds ammonia.

Heavy Malleable


Fittings 3½-inch and larger were formerly known as "Heavy Malleable Iron," and are marked "Heavy" as illustrated above.


No. 268 E
90° Street Elbow


No. 262½ E
45° Street Elbow


No. 264 E
Tee


No. 266 E
Cross


No. 267 E
Reducer


No. 278 E
Cap


No. 279 E
Coupling


No. 272 E
Return Bend

List Prices, Black, Each

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6
No. 260 E, 90° Elbows	Straight	.47	.47	.72	.82	1.05	1.40	1.80	2.50	3.85	5.50	9.60	11.00	21.00	27.50
	Reducing		.53	.83	.95	1.20	1.60	2.05	2.90	4.50	6.30				
No. 262 E, 45° Elbows		.66	.66	.88	1.00	1.10	1.55	2.00	3.00	4.50	6.20	10.50	12.00	22.00	30.00
No. 262½ E, 45° Street Elbows				1.00	1.10	1.30	1.75	2.30	3.50						
No. 264 E, Tees	Straight	.68	.68	.96	1.05	1.30	1.70	2.10	3.10	5.00	8.80	13.80	15.00	29.00	41.00
	Reducing		.78	1.10	1.20	1.50	1.95	2.40	3.55	5.75	10.50		17.00		
No. 266 E, Crosses		1.75	1.75	2.10	2.25	2.55	3.20	4.20	6.00	10.00	15.50	22.00	26.00		
No. 267 E, Reducers			.52	.64	.78	.94	1.05	1.45	2.10	3.35	5.10		10.50		
No. 268 E, 90° Street Elbows		.59	.59	.90	1.05	1.25	1.65	2.10	3.30	5.60	7.20				
No. 278 E, Caps		.40	.40	.46	.55	.70	.83	1.15	1.60	2.40	3.30				
No. 279 E, Couplings		.40	.40	.46	.55	.70	.83	1.15	1.60	2.40	3.30				
Pipe Size	Inches	1	1	1	1¼	1¼	1¼	1½	1½	1½	2	2	2		
Center to Center	Inches	1¾	2½	3	2¼	2½	3	3	3½	6	4	6	8		
No. 272 E, Return Bends		2.00	2.50	3.00	3.35	3.85	4.30	4.80	5.40	6.40	7.00	8.30	10.50		

Galvanized fittings are made to order; add 50% to list prices of black fittings shown above.

Service recommendations. These fittings are especially suitable for severe service. With ends reinforced with a heavy band, they are exceptionally tough, strong, and rugged, and are far superior to so-called heavy malleable iron fittings made from standard cast iron patterns. Their threads are long and are accurately cut to gauge. Sizes 3½-inch and larger were formerly listed as "Heavy Malleable Iron Fittings" and are marked "Heavy".

Ammonia service: Sizes 3-inch and smaller are suitable for 300 pounds ammonia service. They are air tested and each female opening has a machined chamfer to permit soldering when desired.

Reducing fittings: The prices of reducing fittings and of reducers apply to regularly listed sizes only, as shown on the opposite page; the size of the largest opening determines the price. All other sizes are special; prices on application.

***Working pressures:** The working pressures given above for cold service do not apply to Street Elbows; these are recommended for 600 pounds cold water, oil, or gas, non-shock.

Larger sizes: For sizes larger than those listed, 1000-Pound W.O.G. Cast Steel Fittings are recommended; see page 262 for complete description.

300-Pound Malleable Iron Fittings

Dimensions, in Inches

Straight Fittings


No. 260 E
90° Elbow

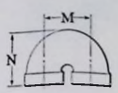

No. 262 E
45° Elbow


No. 268 E
90° Street Elbow


No. 262½ E
45° Street Elbow


No. 278 E
Cap


No. 279 E
Coupling


No. 272 E
Return Bend


No. 264 E
Tee


No. 266 E
Cross

Size	A	B	C	D	E	F	K	L
¼	15/16	13/16	13/16	17/16			25/32	13/8
⅜	1 1/16	⅞	15/16	1⅝			⅞	1⅝
½	1¼	1	1¼	2	1	1⅜	1 1/16	1⅞
¾	1 7/16	1⅛	1 7/16	2 3/16	1⅛	1 9/16	1¼	2⅛
1	1⅝	1 5/16	1⅝	2 9/16	1 5/16	1 13/16	1⅜	2⅜
1¼	1 15/16	1½	1 15/16	2⅞	1½	2⅛	1½	2⅞
1½	2⅛	1 11/16	2⅛	3⅛	1 11/16	2 5/16	1 11/16	2⅞
2	2½	2	2½	3 11/16	2	2 11/16	1 13/16	3⅝
2½	2 15/16	2¼	2 15/16	4½			2⅛	4⅛
3	3⅜	2½	3⅜	5⅛			2¼	4⅛
3½	4⅛	2⅝						
4	4½	2 13/16						
5	5½	3 3/16						
6	6¼	3½						

No. 272 E Return Bends

Size × M	N
1 ×1¾	2 9/16
1 ×2½	3¼
1 ×3	3½
1¼×2¼	3 9/16
1¼×2½	3 11/16
1¼×3	3 15/16
1½×3	4 3/16
1½×3½	3 15/16
1½×6	5 3/16
2 ×4	4¾
2 ×6	6⅛
2 ×8	6⅝

Reducing Fittings

No. 260 E Reducing 90° Elbows

Size a	b	G	H
⅜	×¼	1 1/16	1 1/16
½	×⅜	1 3/16	1 3/16
¾	×½	1 5/16	1⅜
	×⅜	1 5/16	1⅜
1	×¾	1½	1 9/16
	×½	1½	1 9/16
1¼	×1	1¾	1 13/16
	×¾	1¾	1 13/16
1½	×1¼	2	2 1/16
	×1	2	2 1/16
2	×1½	2¼	2⅜
	×1¼	2¼	2⅜
2½	×2	2 11/16	2¾
3	×2½	3 1/16	3 5/16

No. 267 E Reducers

Size	J	Size	J
⅜ ×¼	1 7/16	1½×¾	2 11/16
½ ×⅜	1 11/16	×½	2 11/16
×¼	1 11/16	2 ×1½	3 3/16
¾ ×½	1¾	×1¼	3 3/16
×⅜	1¾	×1	3 3/16
×¼	1¾	×¾	3 3/16
1 ×¾	2	×½	3 3/16
×½	2	2½×2	3 11/16
×⅜	2	×1½	3 11/16
×¼	2	3 ×2½	4 1/16
1¼×1	2⅜	×2	4 1/16
×¾	2⅜	×1½	4 1/16
×½	2⅜	4 ×3	4⅜
1½×1¼	2 11/16	×2½	4⅜
×1	2 11/16	×2	4⅜

No. 264 E, Reducing Tees

Size a	b	c	P	R	S
⅜	×⅜	×¼	1 1/16	1 1/16	1 1/16
½	×½	×⅜	1 3/16	1 3/16	1 3/16
		×¼	1 3/16	1 3/16	1 3/16
½	×⅜	×½	1¼	1¼	1¼
¾	×¾	×½	1 5/16	1 5/16	1⅜
		×⅜	1 5/16	1 5/16	1⅜
		×¼	1 5/16	1 5/16	1⅜
¾	×½	×¾	1 7/16	1⅜	1 7/16
		×½	1 5/16	1⅜	1 5/16
		×⅜	1⅜	1⅜	1⅜
½	×½	×¾	1⅜	1⅜	1 5/16
1	×1	×¾	1½	1½	1 9/16
		×½	1 7/16	1½	1½
		×⅜	1 5/16	1 5/16	1 7/16
		×¼	1 5/16	1 5/16	1 5/16
1	×¾	×1	1⅝	1 7/16	1⅝
		×¾	1½	1⅝	1 9/16
1	×½	×1	1⅝	1 9/16	1½
¾	×¾	×1	1⅝	1 9/16	1½
1¼	×1	×1	1¾	1⅝	1 11/16
		×¾	1¾	1⅝	1 11/16
		×½	1¾	1⅝	1 11/16
1¼	×1	×1¼	2	1¾	1 13/16
		×¾	1 13/16	1¾	1 13/16
		×½	1 13/16	1¾	1 13/16
1½	×1	×1¼	2	2	2 1/16
		×1	1 13/16	1 13/16	2
		×¾	1 11/16	1 11/16	1⅞
		×½	1⅝	1⅝	1 13/16
1½	×1¼	×1½	2⅛	2⅛	2⅛
2	×2	×1½	2¼	2¼	2⅜
		×1¼	2⅛	2⅛	2 5/16
		×1	2	2	2¼
		×¾	1 13/16	1 13/16	2⅛
		×½	1¾	1¾	2 1/16
2	×1½	×2	2½	2¼	2½
2½	×2½	×2	2 11/16	2 11/16	2¾
		×1½	2 7/16	2 7/16	2⅝
		×1¼	2 5/16	2¾	2 15/16
3	×3	×2½	3 1/16	3 1/16	3 5/16
		×2	2 13/16	2 13/16	3⅛
		×1½	2 13/16	2 13/16	3⅛
3	×2½	×3	3⅜	3 5/16	3⅜
4	×4	×3	4	4	4⅜
		×2½	3 11/16	3 11/16	4 5/16
		×2	3 7/16	3 7/16	4⅛

No. 260 E 90° Elbow


No. 264 E Tee


No. 267 E Reducer

When specifying reducing 90° elbows and reducing tees, always name the size of openings in the sequence of the lower case letters shown on the dimensional illustrations above.

Thread Engagement

Dimension "Z" applies to all 300-Pound Malleable Iron Fittings.

It is the engagement normally required between male and female pipe threads to make a tight joint.

See pages 494 and 495 for explanation.

Size	Z
¼	⅜
⅜	⅜
½	½
¾	9/16
1	11/16
1¼	11/16
1½	11/16
2	¾
2½	15/16
3	1
3½	1 1/16
4	1⅛
5	1¼
6	1 5/16

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AAR Malleable Iron Fittings


No. 260 E
90° Elbow


No. 262 E
45° Elbow

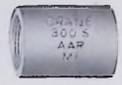

No. 262½ E
45° Street Elbow


No. 268 E
90° Street Elbow

WORKING PRESSURE
300 pounds steam
TEST PRESSURE
300 pounds air-under-water


No. 267 E
Reducer


No. 278 E
Cap


No. 279 E
Coupling


No. 264 E, Tee


No. 266 E, Cross

Galvanized fittings: Galvanized fittings are made to order only. Prices are 50% higher than the list prices shown below for black fittings.

List Prices, Black, Each

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
No. 260 E, 90° Elbows	Straight	.47	.47	.72	.82	1.05	1.40	1.80	2.50	3.85	5.50
	Reducing			.83	.95	1.20	1.60	2.05	2.90	4.50	6.30
No. 262 E, 45° Elbows		.66	.66	.88	1.00	1.10	1.55	2.00	3.00	4.50	6.20
No. 262½ E, 45° Street Elbows				1.00	1.10	1.30	1.75	2.30	3.50		
No. 264 E, Tees	Straight	.68	.68	.96	1.05	1.30	1.70	2.10	3.10	5.00	8.80
	Reducing			1.10	1.20	1.50	1.95	2.40	3.55	5.75	10.50
No. 266 E, Crosses		1.75	1.75	2.10	2.25	2.55	3.20	4.20	6.00	10.00	15.50
No. 267 E, Reducers			.52	.64	.78	.94	1.05	1.45	2.10	3.35	5.10
No. 268 E, 90° Street Elbows				.90	1.05	1.25	1.65	2.10	3.30	5.60	7.20
No. 278 E, Caps		.40	.40	.46	.55	.70	.83	1.15	1.60	2.40	3.30
No. 279 E, Couplings		.40	.40	.46	.55	.70	.83	1.15	1.60	2.40	3.30

Association of American Railroads: These fittings conform to the specifications and the recommended practice of the Association of American Railroads (AAR) for 300-Pound screwed pipe fittings. They are exactly the same as the fittings shown on pages 146 and 147, the types and sizes listed here being marked "AAR" because they are included in the AAR Specifications.

Rugged construction: These fittings are exceptionally strong, tough, and rugged. They are especially suitable for severe service and will withstand rough usage, piping strains, and vibration.

Reducing Fittings Carried in Stock

No. 260 E 90° Elbows	No. 264 E, Tees a	b	c	No. 267 E Reducers
½ ×⅜	½×½×⅜	1¼×1¼×1	2 ×2	×1½	⅜ ×¼	1½×¾
¾ ×½	×⅜×½	×¾		×1¼	½ ×⅜	×½
1 ×¾	¾×¾×½	×½		×1	¾ ×½	2 ×1½
1¼×1	×½×¾	1¼×1	×1¼	×¾	1 ×¾	×1¼
1½×1¼	1 ×1 ×¾	1½×1½×1¼		×½	×½	×1
2 ×1½	×½	×1	2 ×1½×2		1¼×1	×½
2½×2	×⅜	×¾	2½×2½×2	×1½	×¾	2½×2
3 ×2½	1 ×¾×1	×½			×½	3 ×2½
		1½×1¼×1½	2½×2	×2½	1½×1¼	×2
			3 ×3	×2½	×1	×1½
				×2		
			3 ×2½×3			

Reducing sizes: AAR Reducing 90° Elbows, Reducing Tees, and Reducers are carried in stock in the sizes shown in the table above. Prices of reducing fittings are determined by the size of the largest opening, and apply only to the sizes carried in stock.

13

Dimensions, in Inches


No. 260 E
90° Elbow


No. 262 E
45° Elbow


No. 262½ E
45° Street Elbow

Dimensions of straight sizes and of Reducers are shown in the table below. For dimensions of reducing sizes, see page 147.


No. 268 E
90° Street Elbow


No. 267 E
Reducer

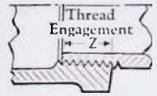

No. 278 E
Cap


No. 264 E, Tee


No. 279 E
Coupling


No. 266 E, Cross

Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3
A	15/16	1 1/16	1¼	1 7/16	1⅝	1 15/16	2⅛	2½	2 15/16	3⅜
B	13/16	⅞	1	1⅛	1 5/16	1½	1 11/16	2	2¼	2½
C			1¼	1 7/16	1⅝	1 15/16	2⅛	2 ½	2 15/16	3⅜
D			2	2 3/16	2 9/16	2⅞	3⅛	3 11/16	4½	5⅛
E			1	1⅛	1 5/16	1½	1 11/16	2		
F			1⅜	1 9/16	1 13/16	2⅛	2 5/16	2 11/16		
J		1 7/16	1 11/16	1¾	2	2⅜	2 11/16	3 3/16	3 11/16	4 1/16
K	25/32	⅞	1 1/16	1¼	1⅜	1½	1 11/16	1 13/16	2⅛	2¼
L	1⅜	1 5/8	1⅞	2⅛	2 3/8	2⅞	2⅞	3⅝	4⅛	4⅛
Z	⅜	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1



See page 494 for explanation.

AAR Valves . . . pages 38 to 40 *AAR Unions . . . pages 178 to 180*

Cast Iron Screwed Fittings
Sprinkler Fittings

125-Pound Fittings
List Prices and Description . . . . . pages 150 and 151
Dimensions and List of Reducing Sizes . . . . . pages 151 to 155

Sprinkler Type Fittings . . . . . page 156

250-Pound Short Pattern Fittings . . . . . page 157

The Crane line of Cast Iron Screwed Fittings includes fittings for steam working pressures up to 250 pounds and for water, oil, or gas working pressures up to 400 pounds. In addition, it includes Drainage Fittings; see pages 159 to 164.

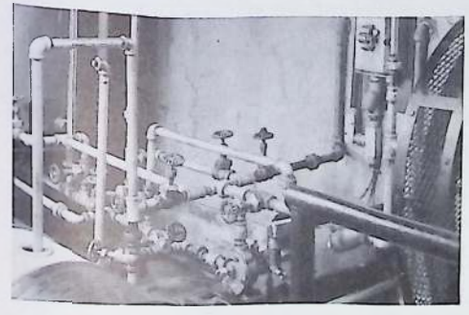
The list above does not include all the Cast Iron Screwed Fittings manufactured by Crane. For greater convenience, the following fittings are shown in other sections of this catalog:

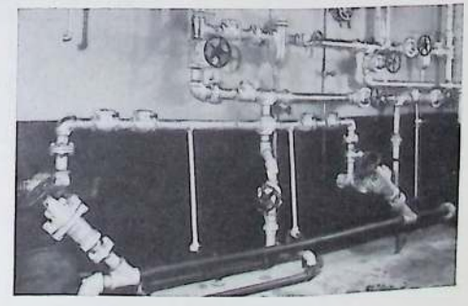
Plugs . . . . . page 166
Bushings . . . . . page 167
Flange Unions . . . . . page 181
Floor Flanges . . . . . page 203
Companion Flanges . . . . . pages 202 to 204

Drainage Fittings . . . . . pages 159 to 164
Steel Pipe Couplings . . . . . page 170
Wrought Steel Nipples . . . . . pages 168 and 169
Unions and Union Fittings . . . . . pages 173 to 182

Malleable Iron Screwed Fittings . . pages 139 to 148
Steel Screwed Fittings . . . . . pages 257 to 262
How to read reducing fittings . . . . . page 577

14





Typical of many Crane valve and fitting installations.
In an industrial plant, on solvent recovery. In a power plant, on boiler piping.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 94 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/94

125-Pound Cast Iron Fittings

WORKING PRESSURES
125 pounds saturated steam
175 pounds cold water, oil, or gas, non-shock



90° Elbow



45° Elbow



Tee

List Prices, Each

Size	90° Elbows										45° Elbows		Tees			
	Straight						*Reducing						Straight		*Reducing	
	Right Hand		Right & Left		Pitched		Right Hand		Pitched							
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
¼	.19	.38									.21	.42	.24	.48		
⅜	.19	.38									.21	.42	.24	.48		
½	.22	.44			.23	.46	.24	.48			.24	.48	.31	.62	.34	.68
¾	.28	.56	.31	.62	.31	.62	.31	.62	.35	.70	.31	.62	.39	.78	.43	.86
1	.34	.68	.38	.76	.36	.72	.38	.76	.43	.86	.38	.76	.44	.88	.51	1.02
1¼	.44	.88	.48	.96	.48	.96	.48	.96	.53	1.06	.48	.96	.66	1.32	.72	1.44
1½	.60	1.20	.66	1.32	.68	1.36	.69	1.38	.76	1.52	.68	1.36	.82	1.64	.94	1.88
2	.90	1.80	.98	1.96	1.00	2.00	.98	1.96	1.10	2.20	.96	1.92	1.20	2.40	1.30	2.60
2½	1.45	2.90					1.55	3.10			1.55	3.10	1.85	3.70	2.05	4.10
3	2.20	4.40					2.50	5.00			2.40	4.80	2.80	5.60	3.10	6.20
3½	3.10	6.20					3.30	6.60			3.30	6.60	4.35	8.70	4.80	9.60
4	4.00	8.00					4.30	8.60			4.50	9.00	5.40	10.80	6.20	12.40
5	6.85	13.70					7.50	15.00			7.50	15.00	9.40	18.80	10.50	21.00
6	9.00	18.00					10.30	20.60			10.00	20.00	12.00	24.00	14.00	28.00
8	18.50	37.00					20.00	40.00			20.00	40.00	25.00	50.00	27.00	54.00

Wide assortment: The Crane line of 125-Pound Cast Iron Fittings is illustrated on pages 150 to 156. It consists of a liberal variety of types of fittings, made in a large range of straight and reducing sizes. The line meets the requirements of nearly every piping installation using this class of material.

Special attention is called to the long list of reducing sizes of elbows, tees, crosses, and reducers. Many of these are used chiefly in sprinkler service; combined with straight sizes and with the combination screwed and flanged fittings shown on page 156, they fill the need for the large assortment of items normally used in fire protection piping.

125-Pound Cast Iron Fittings can be distinguished from 150-Pound Malleable Iron Fittings by the wide joining bands at the ends of the fitting in place of the narrower bands with open crotch used on the latter. Cast iron screwed fittings can be removed, if necessary, from a pipe line that is being dismantled by splitting or breaking the fitting with a hammer; fittings of materials more ductile, like malleable iron or brass, cannot be so broken.

Rugged construction: Crane 125-Pound Cast Iron Fittings are sturdy, rugged, and well proportioned. They have heavy metal sections and are amply reinforced at points subjected to greatest stress, assuring a high factor of safety over the recommended working pressures. Reducing fittings are made in proportion with the straight sizes, thus harmonizing the fittings in any combination of piping.

Threading: All openings are carefully and accurately threaded to gauge and are in true alignment. To permit easy entrance of the pipe, when starting a joint, each opening is slightly chamfered. Fittings are tapped right hand except where otherwise indicated.

Sprinkler service; Underwriters' approved: All of the fittings shown on pages 150 to 156 have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

***Pricing reducing fittings:** The prices of reducing fittings and of reducers apply only to the regularly listed sizes shown on pages 152 to 155. Any other size is special; prices will be furnished upon receipt of inquiry specifying quantity, size, and type.

The price of a reducing fitting or of a reducer is determined by the size of its largest opening.

Right & Left Elbows: Right & Left 90° Elbows have ribs cast on the end with the left hand thread or have the letter "L" cast on the band on that end.

Pitched Elbows: Pitched 90° Elbows are pitched ¼-inch per foot and have the letter "P" on the band at the pitched end.

Dimensions: The dimensions of both straight and reducing sizes are shown on pages 152 to 155.

Iron Plugs and Bushings . . . . pages 166 and 167
Cast Iron Flanged Fittings and Flanges . . . . pages 195 to 204
Cast Iron Flange Unions . . . . page 181

125-Pound Cast Iron Fittings

WORKING PRESSURES
125 pounds saturated steam
175 pounds cold water, oil, or gas, non-shock



Cross



45° Y-Bend

For description, see opposite page.



Reducer



Eccentric Reducer


Cap



Locknut

List Prices, Each

Size	Crosses				45° Y-Bends		*Reducers (Concentric)		*Eccentric Reducers		Caps		Locknuts	
	Straight		*Reducing											
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
¾	.47	.94			.84	1.68	.31	.62			For smaller sizes, use Malleable Iron. See page 140.		For smaller sizes, use Malleable Iron. See page 141.	
1	.66	1.32			1.00	2.00	.37	.74						
1¼	.88	1.76			1.30	2.60	.62	1.24	1.20	2.40				
1½	1.10	2.20	1.30	2.60	1.70	3.40	.87	1.74	1.50	3.00				
2	1.75	3.50	2.10	4.20	2.20	4.40	1.20	2.40	2.20	4.40				
2½	2.80	5.60	3.30	6.60	4.00	8.00	1.60	3.20	2.80	5.60			.63	1.26
3	4.50	9.00	5.20	10.40	5.60	11.20	2.00	4.00	3.45	6.90			.78	1.56
3½			7.25	14.50					4.35	8.70				
4	7.80	15.60	9.00	18.00	9.50	19.00	3.45	6.90	5.60	11.20	1.85	3.70	1.25	2.50
5	14.00	28.00	16.00	32.00			5.00	10.00	7.80	15.60	3.00	6.00		
6	18.00	36.00	22.00	44.00			6.60	13.20	10.50	21.00	3.75	7.50		
8			45.00	90.00			14.50	29.00	20.00	40.00	8.00	16.00		

Return Bends

Size	List Prices		Dimensions, In Inches	
	Black	Galv.	Center to Center	Face of openings to back
Inches	Each	Each		
Close Pattern, Right Hand				
½	.50	1.00	1¼	1 23/32
¾	.55	1.10	1½	2 1/32
1	.70	1.40	1¾	2 3/8
1¼	.90	1.80	2¼	2 29/32
1½	1.15	2.30	2½	3¼
2	1.90	3.80	3¼	3 31/32
Open Pattern, Right Hand				
¾	.62	1.24	1⅞	2 7/32
1	.78	1.56	2½	2 11/16
1¼	1.10	2.20	3	3 9/32
1½	1.40	2.80	3½	3¾
2	2.30	4.60	4½	4 19/32
2½	3.75	7.50	5½	5 7/16
3	6.00	12.00	6½	6 5/16
Open Pattern, Right and Left				
1	.82	1.64	2½	2 11/16
1¼	1.15	2.30	3	3 9/32
1½	1.50	3.00	3½	3¾
Special Wide Pattern, Right Hand				
1 ×3	1.20	2.40	3	3
1 ×4	1.25	2.50	4	3½
1¼×4	1.60	3.20	4	3¾
1¼×6	2.00	4.00	6	4¾
1½×6	2.25	4.50	6	5
2 ×6	3.25	6.50	6	5 5/16



Return Bend Close Pattern



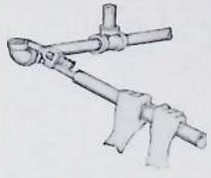
Return Bend Open Pattern

Close pattern return bends cannot be used to make up parallel coils. The center to center dimension is so close that the bands of adjacent bends will not clear each other.

For cast iron return bends with union ends and for other iron ammonia type return bends, see pages 414 and 415.

***Pricing reducing fittings:** The prices of reducing fittings and of reducers apply only to the regularly listed sizes shown on pages 152 to 155. Other sizes are special; prices on application.

Never use a "Hickey"!

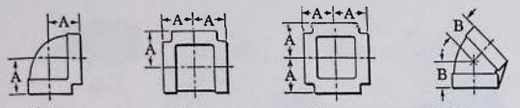


Never slip a piece of pipe over the wrench handle to get extra leverage when making up a joint. Sharp, clean threads, well lubricated, will only make up so far because of their taper, and the additional power secured with the extra length handle will result in distorted valves, stretched fittings, crushed pipe, or other damage. The only safe place to use a "hickey" is on a stubborn joint when taking down a line.

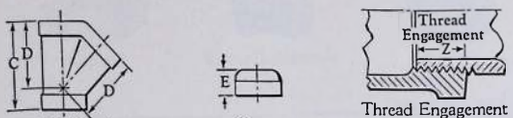
Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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125-Pound Cast Iron Fittings

Dimensions of Straight Sizes, in Inches



90° Elbow Tee Cross 45° Elbow

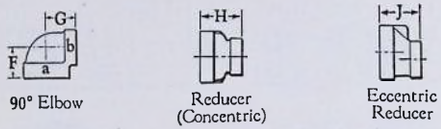


45° Y-Bend Cap Thread Engagement (See page 494.)

Size	A	B	C	D	E	Z
1/4	13/16	3/4				3/8
3/8	15/16	13/16				3/8
1/2	1 1/8	7/8				1/2
3/4	1 5/16	1	3	2 1/4		9/16
1	1 1/2	1 1/8	3 1/2	2 3/4		11/16
1 1/4	1 3/4	1 5/16	4 1/4	3 1/4		11/16
1 1/2	1 15/16	1 7/16	4 7/8	3 13/16		11/16
2	2 1/4	1 11/16	5 3/4	4 1/2		3/4
2 1/2	2 11/16	1 15/16	6 3/4	5 3/16		15/16
3	3 1/8	2 3/16	7 7/8	6 1/8		1
3 1/2	3 7/16	2 3/8				1 1/16
4	3 3/4	2 5/8	9 3/4	7 5/8	2 1/16	1 1/8
5	4 1/2	3 1/16			2 3/8	1 1/4
6	5 1/8	3 7/16			2 5/8	1 5/16
8	6 9/16	4 1/4			3 1/8	1 7/16

The engagement normally required to make a tight joint between male and female pipe threads is shown as dimension "Z" in the table; it applies to all 125-Pound Cast Iron Fittings.

List of Sizes of Reducing Elbows and Reducers and Dimensions, in Inches



90° Elbow Reducer (Concentric) Eccentric Reducer

The prices of Reducing 90° Elbows and of Reducers shown on pages 150 and 151 apply only to the sizes listed here; the size of the larger opening determines the price.

90° Elbows

Size a	Size b	F	G
1/2	3/8	1 1/16	1 1/16
3/4	1/2	1 3/16	1 1/4
1	3/4	1 5/16	1 3/8
	1/2	1 1/4	1 5/16
1 1/4	1	1 9/16	1 5/8
	3/4	1 7/16	1 9/16
	1/2	1 7/16	1 9/16
1 1/2	1 1/4	1 3/4	1 13/16
	1	1 5/8	1 3/4
	3/4	1 5/8	1 3/4
	1/2	1 3/4	1 3/4
2	1 1/2	2	2 1/8
	1 1/4	1 15/16	2 1/16
	1	1 3/4	2
	3/4	1 3/4	2
	1/2	1 3/4	2
2 1/2	2	2 1/2	2 9/16
	1 1/2	2 1/4	2 7/16
	1 1/4	2 1/4	2 7/16
	1	2 1/4	2 7/16
3	2 1/2	2 3/4	3
	2	2 9/16	2 15/16
	1 1/2	2 9/16	2 15/16
	1 1/4	2 9/16	2 15/16
3 1/2	3	3 7/16	3 7/16
4	3 1/2	3 3/4	3 3/4
	3	3 1/4	3 11/16
	2 1/2	3 1/4	3 11/16
	2	2 3/4	3 1/2
5	4	3 15/16	4 5/16
	3	3 7/16	4 1/4
	2 1/2	3 7/16	4 1/4
6	5	4 5/8	5 1/16
	4	4 1/8	4 15/16
	3	4 1/8	4 15/16
8	6	5 1/2	6 5/16

90° Elbows, Pitched

Size a	Size b	F	G
3/4	1/2	1 3/16	1 1/4
1	3/4	1 5/16	1 3/8
	1/2	1 3/16	1 5/8
1 1/4	1	1 3/4	1 13/16
1 1/2	1 1/4	2	2 1/8

Reducers (Concentric)

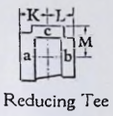
Size		H
3/4	1/2	1 1/2
1	3/4	1 7/8
	1/2	1 11/16
1 1/4	1	2 1/8
1 1/2	1 1/4	2 1/4
2	1 1/2	2 7/16
	1 1/4	2 7/16
	1	2 7/16
2 1/2	2	2 5/8
3	2 1/2	2 7/8
	2	2 7/8
4	3 1/2	3 3/8
	3	3 3/8
	2 1/2	3 3/8
	2	3 3/8
5	4	3 7/8
6	5	4 3/8
	4	4 3/8
8	6	5 1/4

Eccentric Reducers

Size	J	Size	J
1 1/4 x 1	2 1/8	3 1/2 x 1 1/4	3 1/8
x 3/4	2 1/8	x 1	3 1/8
1 1/2 x 1 1/4	2 1/4	4 x 3 1/2	3 1/4
x 1	2 1/4	x 3	3 3/8
x 3/4	2 1/4	x 2 1/2	3 3/8
2 x 1 1/2	2 7/16	x 2	3 3/8
x 1 1/4	2 7/16	x 1 1/2	3 3/8
x 1	2 7/16	x 1 1/4	3 3/8
x 3/4	2 7/16	x 1	3 3/8
2 1/2 x 2	2 11/16	5 x 4	3 3/8
x 1 1/2	2 11/16	x 3 1/2	3 7/8
x 1 1/4	2 11/16	x 3	3 7/8
x 1	2 11/16	x 2 1/2	3 7/8
3 x 2 1/2	2 15/16	x 2	3 7/8
x 2	2 15/16	6 x 5	4 3/8
x 1 1/2	2 15/16	x 4	4 3/8
x 1 1/4	2 15/16	x 3 1/2	4 3/8
x 1	2 15/16	x 3	4 3/8
3 1/2 x 3	3 1/8	x 2 1/2	4 3/8
x 2 1/2	3 1/8	x 2	4 3/8
x 2	3 1/8	8 x 6	5 1/4
x 1 1/2	3 1/8	x 5	5 1/4

125-Pound Cast Iron Fittings

List of Sizes of Reducing Tees and Dimensions, in Inches



Reducing Tee

The prices of Reducing Tees on page 150 apply only to the sizes listed here and on the following page; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above.

Size a	Size b	Size c	K	L	M
1 1/4 x 3/4	x 1 1/4		1 3/4	1 9/16	1 3/4
	x 1		1 9/16	1 3/8	1 5/8
	x 3/4		1 7/16	1 5/16	1 9/16
1 1/4 x 1/2	x 1 1/4		1 3/4	1 1/2	1 3/4
	x 1		1 9/16	1 3/8	1 5/8
1	x 1	x 1 1/4	1 5/8	1 5/8	1 9/16
1 1/2 x 1 1/2	x 1 1/4		1 13/16	1 13/16	1 13/16
	x 1		1 5/8	1 5/8	1 3/4
	x 3/4		1 1/2	1 1/2	1 11/16
	x 1/2		1 3/8	1 3/8	1 5/8
1 1/2 x 1 1/4	x 1 1/2		1 15/16	1 13/16	1 15/16
	x 1 1/4		1 13/16	1 3/4	1 13/16
	x 1		1 5/8	1 9/16	1 3/4
	x 3/4		1 1/2	1 7/16	1 11/16
	x 1/2		1 3/8	1 5/16	1 5/8
1 1/2 x 1	x 1 1/2		1 15/16	1 5/8	1 15/16
	x 1 1/4		1 13/16	1 7/16	1 13/16
	x 1		1 5/8	1 7/16	1 3/4
	x 1/2		1 7/16	1 5/16	1 11/16
1 1/2 x 3/4	x 1 1/2		1 15/16	1 11/16	1 15/16
	x 1/2	x 1 1/2	1 15/16	1 5/8	1 15/16
	x 1/2	x 1 1/4	1 13/16	1 9/16	1 13/16
1 1/4 x 1 1/4	x 1 1/2		1 13/16	1 13/16	1 13/16
	x 1	x 1 1/2	1 13/16	1 3/4	1 13/16
1	x 1	x 1 1/2	1 3/4	1 3/4	1 5/8
2	x 2	x 1 1/2	2	2	2 1/8
		x 1 1/4	1 15/16	1 15/16	2 1/16
		x 1	1 3/4	1 3/4	2
		x 3/4	1 5/8	1 5/8	1 15/16
		x 1/2	1 1/2	1 1/2	1 7/8
	2 x 1 1/2	x 2	2	1 15/16	2 1/16
		x 1 1/2	2	1 13/16	2
		x 1 1/4	1 15/16	1 5/8	1 15/16
		x 1	1 3/4	1 1/2	1 7/8
		x 3/4	1 5/8	1 3/8	2 1/4
		x 1/2	1 1/2	2 1/16	2 1/8
	2 x 1 1/4	x 2	2	1 13/16	2 1/16
		x 1 1/2	1 15/16	1 3/4	2
		x 1 1/4	1 3/4	1 9/16	2 1/4
		x 1	1 5/8	2	2 1/8
	2 x 1	x 2	2	1 13/16	2 1/16
		x 1 1/2	1 7/8	1 3/4	2 1/4
		x 1 1/4	2	1 15/16	2 1/4
	2 x 3/4	x 2	2 1/4	1 15/16	2 1/4
		x 1 1/2	2 1/4	1 13/16	2 1/8
		x 1 1/4	2 1/8	2 1/16	2
		x 1	2 1/16	2	2 1/16
		x 3/4	2 1/16	2	1 15/16
1 1/2 x 1 1/2	x 2		2 1/8	2 1/16	2 1/16
	x 1 1/4		2 1/8	2 1/16	2
	x 1		2 1/16	2	1 15/16
	x 3/4		2 1/16	2	1 7/8
1 1/4 x 1 1/4	x 2		2 1/16	2	1 15/16
	x 1		2 1/16	2	1 7/8
2 1/2 x 2 1/2	x 2		2 1/2	2 1/4	2 7/16
	x 1 1/2		2 1/4	2 1/8	2 3/8
	x 1 1/4		2 1/8	1 15/16	2 5/16
	x 1		1 15/16	1 13/16	2 1/4
	x 3/4		1 13/16	1 13/16	2 1/4
	x 1/2		1 13/16	2 9/16	2 11/16
2 1/2 x 2	x 2 1/2		2 11/16	2 1/4	2 7/16
	x 2		2 1/2	2	2 3/8
	x 1 1/2		2 1/4	1 15/16	2 5/16
	x 1 1/4		2 1/8	1 3/4	2 1/16
	x 1		1 15/16	1 1/4	1 1/2

Size a	Size b	Size c	K	L	M
2 1/2 x 2	x 3/4		1 13/16	1 5/8	2 1/4
	x 1/2		1 3/4	1 1/2	2 3/16
2 1/2 x 1 1/2	x 2 1/2		2 11/16	2 7/16	2 11/16
	x 2		2 1/2	2 1/8	2 9/16
	x 1 1/2		2 1/4	1 15/16	2 7/16
2 1/2 x 1 1/4	x 2 1/2		2 11/16	2 7/16	2 11/16
	x 2		2 7/16	2 1/8	2 9/16
	x 1 1/2		2 3/16	1 15/16	2 7/16
2 1/2 x 1	x 2 1/2		2 11/16	2 5/16	2 11/16
	x 2		2 7/16	2 1/8	2 9/16
2 1/2 x 3/4	x 2 1/2		2 11/16	2 5/16	2 11/16
	x 1 1/2	x 2 1/2	2 11/16	2 5/16	2 11/16
	x 1/2	x 2	2 7/16	2 1/8	2 9/16
2	x 2	x 2 1/2	2 9/16	2 9/16	2 1/2
	x 1 1/2	x 2 1/2	2 9/16	2 7/16	2 1/2
	x 1 1/4	x 2 1/2	2 9/16	2 3/8	2 7/16
	x 1	x 2 1/2	2 9/16	2 3/8	2 7/16
1 1/2 x 1 1/2	x 2 1/2		2 7/16	2 7/16	2 1/4
3	x 3	x 2 1/2	2 3/4	2 3/4	3
	x 2		2 9/16	2 9/16	2 15/16
	x 1 1/2		2 5/16	2 5/16	2 3/4
	x 1 1/4		2 3/16	2 3/16	2 11/16
	x 1		2	2	2 5/8
	x 3/4		1 15/16	1 15/16	2 9/16
	x 1/2		1 15/16	1 15/16	2 9/16
3	x 2 1/2 x 3		3 1/8	3	3 1/8
	x 2 1/2		2 3/4	2 11/16	3
	x 2		2 9/16	2 1/2	2 15/16
	x 1 1/2		2 5/16	2 1/4	2 3/4
	x 1 1/4		2 3/16	2 1/8	2 11/16
	x 1		2	1 15/16	2 5/8
	x 1/2		2 1/16	1 15/16	2 11/16
3	x 2	x 3	3 1/8	2 15/16	3 1/8
	x 2 1/2		2 3/4	2 9/16	3
	x 2		2 9/16	2 1/4	2 15/16
	x 1 1/2		2 5/16	2	2 3/4
3	x 1 1/2 x 3		3 1/8	2 3/4	3 1/8
	x 2 1/2		2 13/16	2 9/16	3 1/16
3	x 1 1/4 x 3		3 1/8	2 3/4	3 1/8
	x 2 1/2		2 13/16	2 9/16	3 1/16
3	x 1	x 3	3 1/8	2 5/8	3 1/8
	x 2 1/2		2 13/16	2 9/16	3 1/16
3	x 3/4	x 3	3 1/8	2 5/8	3 1/8
2 1/2 x 2 1/2	x 3		3	3	2 3/4
	x 2	x 3	3 1/16	2 15/16	2 13/16
	x 1 1/2	x 3	3 1/16	2 15/16	2 13/16
	x 1 1/4	x 3	3 1/16	2 15/16	2 13/16
	x 1	x 3	3 1/16	2 15/16	2 13/16
2	x 2	x 3	2 15/16	2 15/16	2 9/16
3 1/2 x 3 1/2	x 3		3 3/16	3 3/16	3 3/8
	x 2 1/2		2 7/8	2 7/8	3 5/16
	x 2		2 5/8	2 5/8	3 1/16
	x 1 1/2		2 7/16	2 7/16	3
	x 1 1/4		2 5/16	2 5/16	2 15/16
	x 1		2 1/8	2 1/8	2 15/16
3 1/2 x 3	x 3 1/2		3 7/16	3 7/16	3 3/8
	x 3		3 3/16	3 1/8	3 5/16
	x 2 1/2		2 7/8	2 13/16	3 5/16
	x 2		2 5/8	2 9/16	3 3/16
	x 1 1/2		2 3/8	2 5/16	3 1/16

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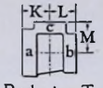
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125-Pound Cast Iron Fittings

Size a b c	K	L	M
Continued from preceding page.			
3½×3 ×1¼	2¼	2³⁄₁₆	3
×1	2⅛	2¹⁄₁₆	2¹⁵⁄₁₆
3½×2½×3½	3⁷⁄₁₆	3⁵⁄₁₆	3⁷⁄₁₆
×3	3³⁄₁₆	3⅛	3⅜
×2½	2⅞	2¹³⁄₁₆	3⁵⁄₁₆
×2	2⅝	2⁹⁄₁₆	3³⁄₁₆
3½×2 ×3½	3⁷⁄₁₆	3⁵⁄₁₆	3⁷⁄₁₆
×3	3³⁄₁₆	3⅛	3⅜
3½×1½×3½	3⁷⁄₁₆	3⁵⁄₁₆	3⁷⁄₁₆
×3	3³⁄₁₆	3⅛	3⅜
3½×1¼×3½	3⁷⁄₁₆	3⁵⁄₁₆	3⁷⁄₁₆
×3	3³⁄₁₆	3⅛	3⅜
3½×1 ×3½	3⁷⁄₁₆	3⁵⁄₁₆	3⁷⁄₁₆
3 ×3 ×3½	3⅜	3⅜	3³⁄₁₆
×2½×3½	3⅜	3⅜	3³⁄₁₆
×2 ×3½	3⅜	3⅜	3³⁄₁₆
×1½×3½	3⅜	3⅜	3³⁄₁₆
2½×2½×3½	3⁵⁄₁₆	3⁵⁄₁₆	2 ⅞
4 ×4 ×3½	3½	3½	3¹¹⁄₁₆
×3	3¼	3¼	3¹¹⁄₁₆
×2½	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⅝
×2	2¾	2¾	3½
×1½	2½	2½	3⅜
×1¼	2⅜	2⅜	3¼
×1	2³⁄₁₆	2³⁄₁₆	3³⁄₁₆
×¾	2³⁄₁₆	2³⁄₁₆	3³⁄₁₆
4 ×3½×4	3¾	3¾	3¾
×3½	3½	3¼	3¹¹⁄₁₆
×3	3¼	3¼	3⅝
×2½	2¹⁵⁄₁₆	2⅞	3⁹⁄₁₆
×2	2¹¹⁄₁₆	2⅝	3½
×1½	2⅝	2⅜	3⅝
×1¼	2⅝	2¼	3⅝
×1	2⅝	2¼	3⅝
4 ×3 ×4	3¾	3¼	3¹¹⁄₁₆
×3½	3½	3¼	3¹¹⁄₁₆
×3	3¼	3¼	3¹¹⁄₁₆
×2½	2¹⁵⁄₁₆	2⅞	3⅝
×2	2¾	2⅝	3½
×1½	2¾	2⅜	3⅝
×1¼	2¾	2¼	3⅝
×1	2¾	2¼	3⅝
4 ×2½×4	3¾	3⅛	3¹¹⁄₁₆
×3½	3½	3¼	3⅝
×3	3¼	3¼	3⅝
×2½	2¹⁵⁄₁₆	2¹³⁄₁₆	3⅜
×2	2¾	2½	3³⁄₁₆
×1½	2¾	2⅜	3⅝
×1¼	2¾	2¼	3⅝
×1	2¾	2¼	3⅝
4 ×2 ×4	3¾	3½	3¾
×3½	3¼	3¼	3¹¹⁄₁₆
×3	2¾	2¹⁵⁄₁₆	3½
×2	2¾	2⅜	3¾
4 ×1½×4	3¾	3¼	3¾
×1¼×4	3¾	3¼	3¾
×1 ×4	3¹¹⁄₁₆	3¹¹⁄₁₆	3½
3½×3½×4	3¹¹⁄₁₆	3¹¹⁄₁₆	3½
×3 ×4	3¹¹⁄₁₆	3¹¹⁄₁₆	3½
×2½×4	3¹¹⁄₁₆	3¹¹⁄₁₆	3½
×2 ×4	3¹¹⁄₁₆	3¹¹⁄₁₆	3¼
3 ×3 ×4	3⅝	3⅝	3¼
×2½×4	3⅝	3⅝	2¹⁵⁄₁₆
2½×2½×4	3⅝	3⅝	2¹⁵⁄₁₆
2 ×2 ×4	3¹⁵⁄₁₆	3¹⁵⁄₁₆	4⁵⁄₁₆
5 ×5 ×4	4	4	4⅜
×3½			
5 ×5 ×3	3⁷⁄₁₆	3⁷⁄₁₆	4¼
×2½	3⅛	3⅛	4³⁄₁₆
×2	2⅞	2⅞	4¹⁄₁₆
×1½	2⅝	2⅝	3¹⁵⁄₁₆
×1¼	2½	2½	3⅞
×1	2½	2½	3⅞
5 ×4 ×5	4½	4⁵⁄₁₆	4½
×4	3¹⁵⁄₁₆	3¾	4⁵⁄₁₆
×3½	3¾	3½	4¼
×3	3⁷⁄₁₆	3¼	4³⁄₁₆
×2½	3⅛	2¹⁵⁄₁₆	4³⁄₁₆
×2	2⅞	2¾	4
×1½	2¹¹⁄₁₆	2⅞	4
×1¼	2¹¹⁄₁₆	2⅞	4½
5 ×3½×5	4½	4⅜	4½
×4	4	3¾	4⅜
×3½	3¾	3½	4⅝
×3	3½	3½	4⅝
5 ×3 ×5	4½	4⅝	4½
×4	4	3¾	4⅝
×3½	3¾	3½	4⅝
5 ×2½×5	4½	4¼	4½
×4	4	3¾	4⅜
5 ×2 ×5	4½	4¹⁄₁₆	4½
×1½×5	4½	4¼	4½
×1¼×5	4½	4¼	4½
4 ×4 ×5	4⁵⁄₁₆	4⁵⁄₁₆	3¹⁵⁄₁₆
×3½×5	4⅜	4⅝	4
×3 ×5	4⅜	4⅝	4
×2½×5	4⅜	4⅝	4
3½×3½×5	4⅝	4⅝	4
×3 ×5	4⅝	4⅝	4
3 ×3 ×5	4⅝	4⅝	3¾
6 ×6 ×5	4⅝	4⅝	3¾
×4	4⅛	4⅛	5¹⁄₁₆
×3½	4⅛	4⅛	4¹⁵⁄₁₆
×3	3⅝	3⅝	4¹⁵⁄₁₆
×2½	3⅝	3⅝	4⅞
×2	3⅝	3⅝	4¹³⁄₁₆
×1½	3⅝	3⅝	4¹¹⁄₁₆
×1¼	3⅝	3⅝	4⅝
×1	3⅝	3⅝	4⅝
6 ×5 ×6	4⅝	4⅝	4⅝
×5	4⅝	4⅝	4⅝
×4	4⅛	4⅛	4⅝
×3½	4⅛	4⅛	4⅝
×3	3⅝	3⅝	4⅝
×2½	3⅝	3⅝	4⅝
×2	3⅝	3⅝	4⅝
×1½	3⅝	3⅝	4⅝
×1¼	3⅝	3⅝	4⅝
6 ×4 ×6	4⅝	4⅝	4⅝
×5	4⅝	4⅝	4⅝
×4	4⅛	4⅛	4⅝
×3	3⅝	3⅝	4⅝
6 ×3½×6	5⅛	4½	5
×5	4⅝	4⅞	5⅛
6 ×3 ×6	5⅛	4½	5
×5	4⅝	4	4¹⁵⁄₁₆
×4	4¹⁄₁₆	3¹⁵⁄₁₆	4¹³⁄₁₆
×3	3¹⁵⁄₁₆	4⅞	5⅛
6 ×2½×6	5⅛	4⅞	5⅛

List of Sizes of Reducing Tees and Dimensions, in Inches

Continued from preceding page



Reducing Tee

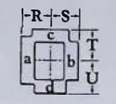
The prices of Reducing Tees on page 150 apply only to the sizes listed here and on the preceding page; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above.

Size a b c	K	L	M
6 ×2 ×6	5⅛	4¹¹⁄₁₆	5⅛
×1½×6	5⅛	4¹³⁄₁₆	5⅛
×1¼×6	5⅛	4¹³⁄₁₆	5⅛
5 ×5 ×6	5¹⁄₁₆	5¹⁄₁₆	4⅝
×4 ×6	5	5	4⅝
×3½×6	5	4⅞	4⅝
×3 ×6	5	4⅞	4⅝
4 ×4 ×6	4¹⁵⁄₁₆	4¹⁵⁄₁₆	4⅛
×3½×6	4¹⁵⁄₁₆	4¹⁵⁄₁₆	4¹⁄₁₆
8 ×8 ×6	5½	5½	6⁵⁄₁₆
×5	4¹⁵⁄₁₆	4¹⁵⁄₁₆	6³⁄₁₆
×4	4⁷⁄₁₆	4⁷⁄₁₆	6⅛
×3½	4½	4½	6⅛
×3	3¹⁵⁄₁₆	3¹⁵⁄₁₆	6
×2½	3⅝	3⅝	5¹⁵⁄₁₆
×2	3³⁄₈	3³⁄₈	5¹³⁄₁₆
8 ×6 ×8	6⁹⁄₁₆	6⁹⁄₁₆	6⁹⁄₁₆
×6	5⁹⁄₁₆	5⁹⁄₁₆	6³⁄₈
×5	5⁹⁄₁₆	5⁹⁄₁₆	6³⁄₈
×4	4½	4½	6⅛
8 ×5 ×5	5⁹⁄₁₆	5⁹⁄₁₆	6³⁄₈
×4 ×8	6⁹⁄₁₆	6⁹⁄₁₆	6⁹⁄₁₆
×2 ×8	6⁹⁄₁₆	6⁹⁄₁₆	6⁹⁄₁₆
6 ×6 ×8	6⁵⁄₁₆	6³⁄₈	5½
×5 ×8	6³⁄₈	6³⁄₈	5⁹⁄₁₆
5 ×5 ×8	6³⁄₈	6³⁄₈	5⁹⁄₁₆

125-Pound Cast Iron Fittings

List of Sizes of Reducing Crosses and Dimensions, in Inches



Reducing Cross

The prices of Reducing Crosses on page 151 apply only to the sizes listed here; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above. For example, if "a" size is 2½", "b" is 2", and "c" and "d" are 1", the size is written: 2½ x 2 x 1 x 1".

Size a b c d	R	S	T	U
1½×1½×1 ×1	1⅝	1⅝	1¹³⁄₁₆	1¹³⁄₁₆
×1¼×1 ×1	1⅝	1⅝	1¹³⁄₁₆	1¹³⁄₁₆
2 ×2 ×1 ×1	1¾	1¾	2	2
×1½×1¼×1¼	1⅞	1⅞	2¹⁄₁₆	2¹⁄₁₆
×1½×1 ×1	1¾	1¾	2	2
2½×2½×2 ×2	2⁷⁄₁₆	2⁷⁄₁₆	2⁹⁄₁₆	2⁹⁄₁₆
×1½×1½	2³⁄₁₆	2³⁄₁₆	2⁷⁄₁₆	2⁷⁄₁₆
×1½×1¼	2³⁄₁₆	2³⁄₁₆	2⁷⁄₁₆	2⁷⁄₁₆
×1¼×1¼	2⅛	2⅛	2⅜	2⅜
×1¼×1	2¹⁄₁₆	2¹⁄₁₆	2⅜	2⅜
×1 ×1	1¹⁵⁄₁₆	1¹⁵⁄₁₆	2⅝	2⅝
2½×2 ×2	2⅞	2⅞	2⅝	2⅝
×1½×1½	2³⁄₁₆	2³⁄₁₆	2⅞	2⅞
×1¼×1¼	2¹⁄₁₆	2¹⁄₁₆	2⅜	2⅜
×1¼×1	1¹⁵⁄₁₆	1¹⁵⁄₁₆	2⅝	2⅝
×1 ×1	1¹⁵⁄₁₆	1¹⁵⁄₁₆	2⅝	2⅝
2½×1½×1 ×2	2⅞	2⅞	2⅝	2⅝
×1¼×1¼	2¹⁄₁₆	2¹⁄₁₆	2⅜	2⅜
3 ×3 ×2½×2½	2¹³⁄₁₆	2¹³⁄₁₆	3¹⁄₁₆	3¹⁄₁₆
×2 ×2	2⅞	2⅞	2¹⁵⁄₁₆	2¹⁵⁄₁₆
×2 ×1½	2⅞	2⅞	2¹⁵⁄₁₆	2¹⁵⁄₁₆
×1½×1½	2⅝	2⅝	2¹³⁄₁₆	2¹³⁄₁₆
×1½×1¼	2⅝	2⅝	2¹³⁄₁₆	2¹³⁄₁₆
×1¼×1¼	2⅜	2⅜	2¾	2¾
×1¼×1	2⅜	2⅜	2¾	2¾
×1 ×1	2¹⁄₁₆	2¹⁄₁₆	2¹¹⁄₁₆	2¹¹⁄₁₆
3 ×2½×2½×2	2¹³⁄₁₆	2¹³⁄₁₆	3¹⁄₁₆	3¹⁄₁₆
×2 ×2	2⅞	2⅞	2¹⁵⁄₁₆	2¹⁵⁄₁₆
×2 ×1½	2⅞	2⅞	2¹⁵⁄₁₆	2¹⁵⁄₁₆
×1½×1½	2⅝	2⅝	2¹³⁄₁₆	2¹³⁄₁₆
×1½×1¼	2⅝	2⅝	2¾	2¾
×1¼×1¼	2⅜	2⅜	2¾	2¾
×1¼×1	2⅜	2⅜	2¹¹⁄₁₆	2¹¹⁄₁₆
×1 ×1	2¹⁄₁₆	2¹⁄₁₆	3¹⁄₁₆	3¹⁄₁₆
3½×3½×3 ×3	3³⁄₁₆	3³⁄₁₆	3⅜	3⅜
×2½×2½	2⅞	2⅞	3⁵⁄₁₆	3⁵⁄₁₆
×2 ×2	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×1½	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×1¼	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1½	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1¼	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1	2¼	2¼	3	3
×1¼×1¼	2¼	2¼	3	3
×1 ×1	2⅛	2⅛	3	3
3½×3 ×2½×2½	2⅞	2⅞	3⁵⁄₁₆	3⁵⁄₁₆
×2½×2	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×2	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×1½	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×1½×1½	2³⁄₈	2³⁄₈	3¹⁄₁₆	3¹⁄₁₆
×1½×1¼	2³⁄₈	2³⁄₈	3¹⁄₁₆	3¹⁄₁₆
×1½×1	2¼	2¼	3	3
×1¼×1¼	2¼	2¼	3	3
×1 ×1	2⅛	2⅛	3	3
3½×3 ×2½×2½	2⅞	2⅞	3⁵⁄₁₆	3⁵⁄₁₆
×2½×2	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×2	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×1½	2⅝	2⅝	3³⁄₁₆	3³⁄₁₆
×2 ×1¼	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1½	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1¼	2⅜	2⅜	3¹⁄₁₆	3¹⁄₁₆
×1½×1	2¼	2¼	3	3

Size a b c d	R	S	T	U
3½×3 ×1¼×1¼	2¼	2¼	3	3
×1 ×1	2¼	2¼	3	3
4 ×4 ×3½×3½	3¾	3¾	3¾	3¾
×3 ×3	3¼	3¼	3⅝	3⅝
×2½×2½	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⁹⁄₁₆	3⁹⁄₁₆
×2½×2	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⁹⁄₁₆	3⁹⁄₁₆
×2 ×2	2¹¹⁄₁₆	2¹¹⁄₁₆	3½	3½
×2 ×1½	2¹¹⁄₁₆	2¹¹⁄₁₆	3½	3½
×1½×1½	2⅞	2⅞	3⅝	3⅝
×1¼×1¼	2⅝	2⅝	3⅝	3⅝
×1 ×1	2⅝	2⅝	3⅝	3⅝
4 ×3½×2½×2½	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⁹⁄₁₆	3⁹⁄₁₆
×2½×1	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⁹⁄₁₆	3⁹⁄₁₆
×2 ×2	2¹¹⁄₁₆	2¹¹⁄₁₆	3½	3½
×2 ×1½	2¹¹⁄₁₆	2¹¹⁄₁₆	3½	3½
×1½×1½	2⅞	2⅞	3⅝	3⅝
×1½×1	2⅞	2⅞	3⅝	3⅝
×1¼×1¼	2⅝	2⅝	3⅝	3⅝
×1¼×1	2⅝	2⅝	3⅝	3⅝
4 ×3 ×2½×2	2¹⁵⁄₁₆	2¹⁵⁄₁₆	3⁹⁄₁₆	3⁹⁄₁₆
5 ×5 ×4 ×4	4	4	4³⁄₈	4³⁄₈
×3½×3½	4	4	4³⁄₈	4³⁄₈
×3 ×3	3½	3½	4⁵⁄₁₆	4⁵⁄₁₆
×2½×2½	3³⁄₁₆	3³⁄₁₆	4¼	4¼
×2½×2	3³⁄₁₆	3³⁄₁₆	4¼	4¼
×2 ×2	2¹⁵⁄₁₆	2¹⁵⁄₁₆	4⅛	4⅛
×2 ×1½	2¹⁵⁄₁₆	2¹⁵⁄₁₆	4⅛	4⅛
×1½×1½	2¹¹⁄₁₆	2¹¹⁄₁₆	4	4
×1½×1¼	2¹¹⁄₁₆	2¹¹⁄₁₆	4	4
×1¼×1¼	2⁹⁄₁₆	2⁹⁄₁₆	3¹⁵⁄₁₆	3¹⁵⁄₁₆
5 ×4 ×3 ×3	3½	3½	4⅝	4¼
×2½×2½	3³⁄₁₆	3³⁄₁₆	4¼	4¼
×2½×2	3³⁄₁₆	3³⁄₁₆	4¼	4¼
×2 ×2	2¹⁵⁄₁₆	2¹⁵⁄₁₆	4⅛	4⅛
×1½×1½	2¹¹⁄₁₆	2¹¹⁄₁₆	4	4
6 ×6 ×5 ×5	4⅝	4⅝	5	5
×4 ×4	4¹⁄₁₆	4¹⁄₁₆	4¹⁵⁄₁₆	4¹⁵⁄₁₆
×3½×3½	4¹⁄₁₆	4¹⁄₁₆	4¹⁵⁄₁₆	4¹⁵⁄₁₆
×3 ×3	3⁹⁄₁₆	3⁹⁄₁₆	4¹³⁄₁₆	4¹³⁄₁₆
×2½×2½	3¼	3¼	4¾	4¾
×2½×2	3¼	3¼	4¾	4¾
×2 ×2	3	3	4⅝	4⅝
×1½×1½	2¾	2¾	4½	4½
×1¼×1¼	2⅝	2⅝	4⅞	4⅞
6 ×5 ×3 ×3	3⁹⁄₁₆	3⁹⁄₁₆	4¹³⁄₁₆	4¹³⁄₁₆
×2 ×2	3	3	4⅝	4⅝
×1½×1½	2¾	2¾	4½	4½
8 ×8 ×6 ×6	5⁹⁄₁₆	5⁹⁄₁₆	6³⁄₈	6³⁄₈
×5 ×5	5⁹⁄₁₆	5⁹⁄₁₆	6³⁄₈	6³⁄₈
×4 ×4	4½	4½	6⅛	6⅛
8 ×6 ×4 ×4	4½	4½	6⅛	6⅛

List prices....pages 150 and 151
Description...pages 150 and 151
Thread engagement....page 152
Iron Plugs.....page 166
Iron Bushings.....page 167

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125-Pound Cast Iron Fittings

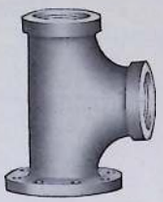
Sprinkler Type

WORKING PRESSURES
125 pounds saturated steam
175 pounds water


90° Long Turn Elbow
Flanged and Screwed


90° Short Turn Elbow
Flanged and Screwed


45° Short Turn Elbow
Flanged and Screwed


Long Turn Tee
Flanged, Screwed, Screwed


Long Turn Tee
Flanged, Screwed, Flanged

List Prices, Each

Size		Inches	2½	3	3½	4	5	6	8
Elbows	90° Long Turn, Flanged and Screwed	Black		10.00		14.00	18.00	25.00	
		Galv.		20.00		28.00	36.00	50.00	
	90° Short Turn, Flanged and Screwed	Black	5.50	6.50	8.50	9.50	12.00	15.00	30.00
		Galv.	11.00	13.00	17.00	19.00	24.00	30.00	60.00
	45° Short Turn, Flanged and Screwed	Black	6.00	7.00	9.00	10.00	13.00	18.00	35.00
		Galv.	12.00	14.00	18.00	20.00	26.00	36.00	70.00
Long Turn Tees	Flanged, Screwed, Screwed	Black		14.00		20.00	26.00	34.00	
		Galv.		28.00		40.00	52.00	68.00	
	Flanged, Screwed, Flanged	Black		19.00		25.00	31.00	41.00	
		Galv.		38.00		50.00	62.00	82.00	

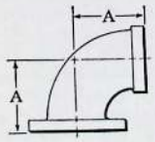
Sprinkler fittings: These cast iron fittings have one opening threaded and one opening flanged, except for the tees which are made with one end of the run flanged and the other end threaded, but with the outlet either threaded or flanged. When ordering tees, be sure to specify the type wanted.

The fittings are primarily used in sprinkler piping, but they are equally well suited for other services where combination screwed and flanged iron fittings for 125 pounds steam or for 175 pounds water are needed.

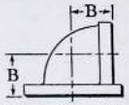
Flanged ends: On flanged ends, the dimensions and drilling of the flange conforms to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flange is plain faced, with a smooth finish, and is regularly furnished faced and drilled.

Underwriters' approved: These fittings have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

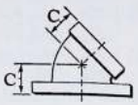
Other sprinkler items: The Crane line includes a wide variety of items suitable for sprinkler piping. Cast Iron Screwed Fittings are shown in this section, pages 149 to 157; Cast Iron Flanged Fittings and Flanges are shown on pages 195 to 204; for other Underwriters' items, see the alphabetical index.



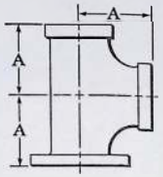
90° Long Turn Elbow



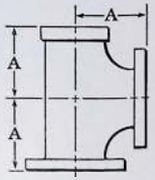
90° Short Turn Elbow



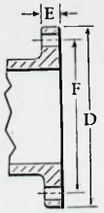
45° Short Turn Elbow



Long Turn Tee



Long Turn Tee



Dimensions, in Inches

Size	Inches	2½	3	3½	4	5	6	8
A			5		6½	7½	9	
B		2 11/16	3⅛	3 7/16	3¾	4 1/2	5⅛	6 9/16
C		1 15/16	2 3/16	2⅜	2⅝	3 1/16	3 7/16	4 1/16
D		7	7½	8½	9	10	11	13½
E		11/16	¾	13/16	15/16	15/16	1	1⅛
F		5½	6	7	7½	8½	9½	11¾
No. of bolts		4	4	8	8	8	8	8
Dia. of bolts		⅝	⅝	⅝	⅝	¾	¾	¾

250-Pound Cast Iron Fittings

Short Pattern

WORKING PRESSURES
250 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock


90° Elbow
No. 182 E


45° Elbow
No. 186 E


Tee
No. 188 E, Straight
No. 190 E, Reducing

List Prices, Black, Each

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8
No. 182 E, 90° Elbows		.47	.47	.53	.63	.76	1.10	1.40	1.95	3.00	4.40	7.30	8.80	13.00	17.50	35.00
No. 186 E, 45° Elbows				.62	.72	.85	1.20	1.55	2.20	3.50	5.00	8.00	10.00	14.50	20.00	40.00
No. 188 E, Tees, Straight		.76	.76	.82	.90	1.10	1.50	1.95	2.60	4.25	6.40	10.00	12.00	20.00	25.00	50.00
No. 190 E, Tees, Reducing					1.10	1.30	1.75	2.20	3.00							

Galvanized fittings are made to order; add 100% to list prices of black fittings shown above.

Rugged construction: Crane 250-Pound Cast Iron Fittings are of the Short Pattern. They are unusually rugged and have a high factor of safety above the recommended working pressure.

Threading: The thread lengths are longer than those found in standard weight fittings, and the threads are accurately cut to gauge. All openings are in true alignment and are slightly chamfered to assure easy entrance of the pipe.

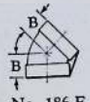
Sprinkler service; Underwriters' approved: Crane 250-Pound Cast Iron Fittings have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

Reducing tees: The prices of reducing tees apply to regularly listed sizes only, as shown in the dimension table below. The size of the largest opening determines the price. All other sizes are special; prices on application.

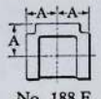
Dimensions, in Inches



No. 182 E
90° Elbow



No. 186 E
45° Elbow

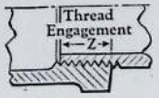


No. 188 E
Tee, Straight



No. 190 E
Tee, Reducing

Size	A	B	Z
¼	1¼		⅜
⅜	1⅜		⅜
½	1¼	1	½
¾	1 7/16	1⅛	9/16
1	1⅝	1 5/16	1 1/16
1¼	2	1½	1 1/16
1½	2⅛	1 11/16	1 1/16
2	2½	2	¾
2½	2 15/16	2¼	1 5/16
3	3⅜	2½	1
3½	3¾	2 9/16	1 1/16
4	4⅛	2 13/16	1⅛
5	4⅞	3 3/16	1¼
6	5⅝	3 11/16	1 5/16
8	7	4⅝	1 7/16

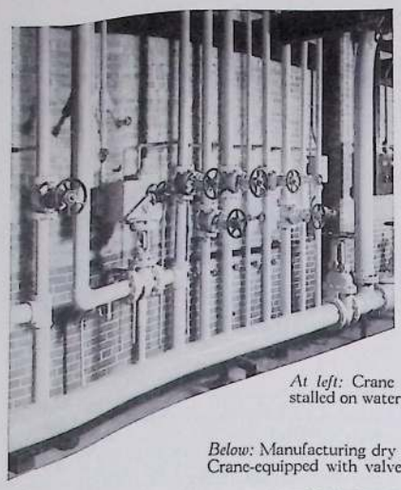


Dimension "Z", shown in the table at the left, applies to all 250-Pound Cast Iron Fittings. It is the engagement normally required between male and female pipe threads to make a tight joint; see pages 494 and 495 for explanation.

Size a	b	c	D	E	F
¾	¾	½	1 5/16	1 5/16	1⅜
1	1	¾	1½	1½	1 9/16
		½	1½	1½	1 9/16
1¼	1¼	1	1¾	1¾	1 13/16
		¾	1¾	1¾	1 15/16
1½	1½	1¼	2	2	2 1/16
		1	2	2	2 1/16
		¾	1⅞	1⅞	2
2	2	1½	2¼	2¼	2⅜
		1¼	2¼	2¼	2⅜
		1	2	2	2 3/16
		¾	2	2	2 3/16

When specifying reducing tees, always name the size of openings in the sequence of the lower case letters, as shown above.

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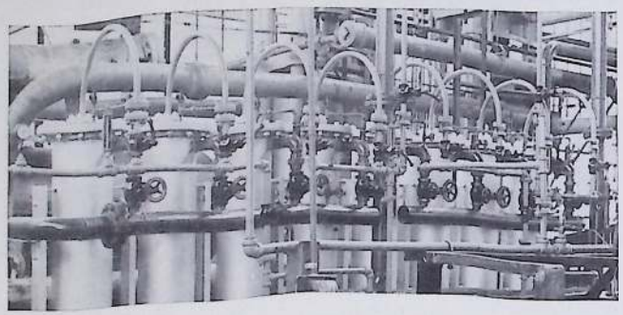
One Source

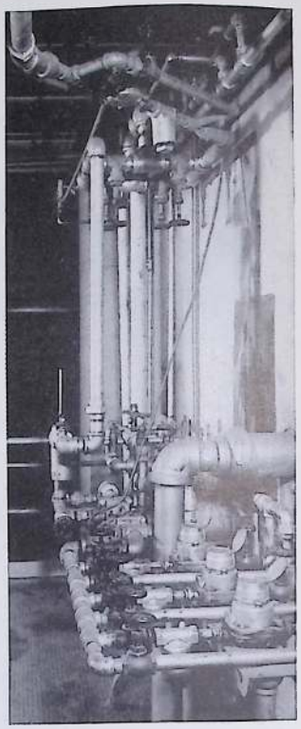
CRANE

For Valves
For Fittings
For Pipe

At left: Crane Iron Gate Valves installed on water lines in an oil refinery.

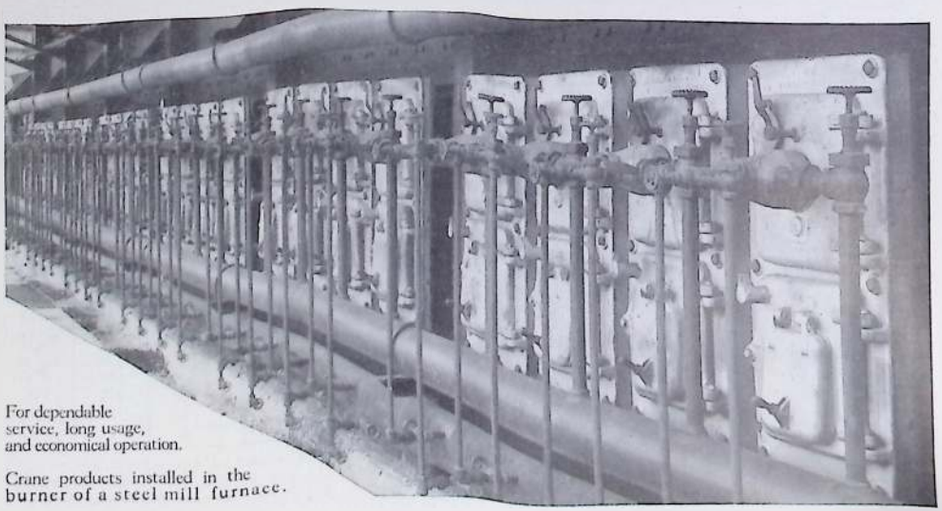
Below: Manufacturing dry ice and carbon dioxide gas. Crane-equipped with valves, fittings, and pipe bends.





Small Crane valves and fittings satisfy many users. Illustrated above is a typical installation in a sewage disposal plant.

14



For dependable service, long usage, and economical operation.

Crane products installed in the burner of a steel mill furnace.

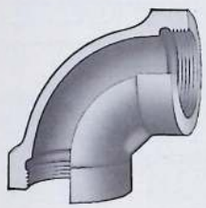
Cast Iron Drainage Fittings

Elbows . . . . . pages 160 and 161
Tees . . . . . page 161
90° Y-Branches . . . . . page 162
45° Y-Branches . . . . . page 163

Couplings . . . . . page 161
Increasers . . . . . page 161
Roof Connections . . . . . page 161
Tucker Connections . . . . . page 161
Traps . . . . . page 163

Crane-Hulbert Drainage Fittings . . . . . page 164

Other Cast Iron Screwed Fittings . . . . pages 149 to 157



Unobstructed flow: The inside diameter of Crane Cast Iron Drainage Fittings is approximately the same as the inside diameter of wrought pipe. When a joint is made, the end of the pipe practically meets the shoulder at the back of the thread chamber, forming a smooth passageway to prevent catching or clogging of foreign matter. Each opening is chamfered to permit easy entrance of the pipe.

Pitched openings: Fittings having openings at right angles have the threads tapped pitched so that the horizontal line will pitch ¼ inch per foot, assuring positive drainage; wherever practicable, the face of the pitched opening is tilted ¼ inch per foot. All fittings having pitched threads are so indicated on the following pages.

Materials: Except for the 2-inch No. 1048 Tucker Connection which is malleable iron, all Crane Drainage Fittings are made of high grade cast iron.

Malleable Iron Drainage Fittings, made from the patterns used for cast iron, can be furnished on special order; prices on application.

Brass Drainage Fittings also can be furnished on special order; prices on application.

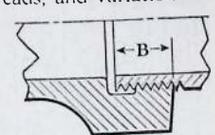
Coatings: These fittings are regularly listed black (being coated with black japan) and galvanized. Uncoated or plain fittings, for communities requiring fittings that are not coated, can also be furnished when so specified, at the same price as black fittings.

Vacuum cleaning: Crane Drainage Fittings are well suited for vacuum cleaning installations. Regular pitched fittings are furnished unless orders specify "unpitched". Unpitched drainage fittings are special at all times; prices on application.

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American Standard: Crane Cast Iron Drainage Fittings comply with the American Standard for Cast Iron Screwed Drainage Fittings, B16.12-1942.

Thread engagement: The normal engagement between Crane shoulder type Drainage Fittings and American Standard Taper Male Pipe Threads is shown in the table below. The fittings have American Standard Taper Female Threads, and variations in tapping are limited to one turn small and no turn large from the standard size as determined by the working gauge. The male thread on the pipe should not be threaded small to gauge and not more than one turn large.



Shoulder Type Drainage Fitting Threads

Thread Engagement, in Inches

Size	1¼	1½	2	2½	3	4	5	6	8	10
B	5/8	5/8	5/8	7/8	15/16	1 1/16	1 3/16	1 1/4	1 3/8	1 9/16

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Cast Iron Drainage Fittings



*No. 1000
90° Elbow



No. 1002
60° Elbow



No. 1003
45° Elbow



No. 1005
22½° Elbow



No. 1006
11¼° Elbow



*No. 1008
90° Elbow
2-inch Side
Outlet



*No. 1009
90° Elbow
2-inch Heel
Outlet



*No. 1010
Three-Way Elbow



No. 1057
90° Street Elbow



No. 1058
45° Street Elbow

List Prices, Each

Size	No. 1000 90° Elbows Straight		No. 1000 90° Elbows †Reducing		No. 1002 60° Elbows		No. 1003 45° Elbows		No. 1005 22½° Elbows		No. 1006 11¼° Elbows	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼	.61	.79			.70	.90	.61	.79	.70	.90	.70	.90
1½	.72	.95	.80	1.05	.80	1.05	.72	.95	.80	1.05	.80	1.05
2	1.05	1.35	1.20	1.55	1.20	1.60	1.05	1.35	1.20	1.60	1.20	1.60
2½	2.10	2.75			2.30	3.00	2.10	2.75	2.30	3.00	2.30	3.00
3	3.00	3.90			3.50	4.60	3.00	3.90	3.50	4.60	3.50	4.60
4	5.00	6.50	5.40	7.00	5.60	7.25	5.00	6.50	5.60	7.25	5.60	7.25
5	9.00	12.00			10.00	13.00	8.50	11.00				
6	12.00	16.00			14.00	18.00	11.30	14.70				
8	33.50	43.50					30.00	39.00				
10	53.00	69.00					50.00	65.00				

Size	No. 1008 90° Elbows with 2-inch Side Outlet		No. 1009 90° Elbows with 2-inch Heel Outlet		No. 1010 Three-Way Elbows Straight		No. 1010 Three-Way Elbows †Reducing		No. 1057 90° Street Elbows		No. 1058 45° Street Elbows	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼					1.65	2.15			.75	.98	.75	.98
1½					1.80	2.35	1.95	2.55	.86	1.15	.86	1.15
2					2.30	3.00	2.50	3.25	1.45	1.90	1.45	1.90
4	7.50	9.75	7.50	9.75								

*Inlets are pitched ¼-inch per foot.

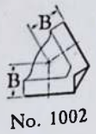
†Prices of Reducing 90° Elbows and Reducing Three-Way Elbows apply only to the sizes shown in the table at the lower right; the size of the largest opening determines the price. When specifying, always name the size of openings in the sequence of the lower case letters shown on the dimensional illustrations below.

15

Dimensions, in Inches



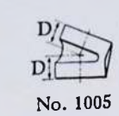
No. 1000



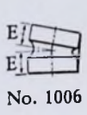
No. 1002



No. 1003



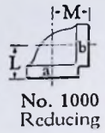
No. 1005



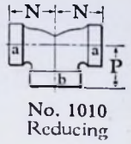
No. 1006



No. 1008

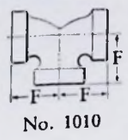


No. 1000 Reducing



No. 1010 Reducing

Size	A	B	C	D	E	F	G	H	J	K
1¼	1¾	1 9/16	1 5/16	1⅛	1 1/16	2¼	1⅝	2⅝	1 3/16	1⅞
1½	1 15/16	1¾	1 7/16	1¼	1¼	2½	1 13/16	2 15/16	1¼	2
2	2¼	2 1/16	1 11/16	1 7/16	1⅜	3 1/16	2⅛	3 5/16	1¾	2 7/16
2½	2 11/16	2½	2 1/16	1¾	1⅝					
3	3 1/16	2⅞	2 3/16	2	1 13/16					
4	3 13/16	3⅜	2⅝	2 5/16	2					
5	4½	3⅞	3 1/16							
6	5⅛	4¼	3 7/16							
8	6½		4 3/16							
10	8 1/16		5 3/16							



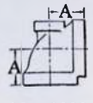
No. 1010



No. 1057



No. 1058



No. 1009

No. 1000, Reducing Size a	b	L	M
1½	×1¼	1 13/16	1⅞
2	×1½	2⅛	2 5/16
4	×3	3 3/8	3¾

No. 1010, Reducing Size a	b	N	P
1¼	×1½	2½	2 3/8
1½	×2	2 15/16	2 11/16

Description . . . page 159

Normal thread engagement . . . page 494

Cast Iron Drainage Fittings



*No. 1001
90° Elbow
Long Turn



*No. 1001½
90° Elbow
Extra Long Turn

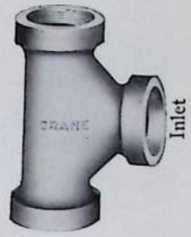


No. 1004
45° Elbow
Long Turn



*No. 1017, Tee

*Inlets are pitched ¼-inch per foot.



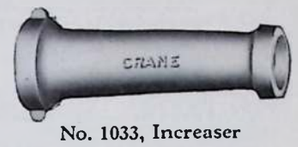
*No. 1018, Basin Tee

List Prices, Each

Size	No. 1001 90° Elbows Long Turn		No. 1001½ 90° Elbows Extra Long Turn		No. 1004 45° Elbows Long Turn		No. 1017, Tees Straight		No. 1017, Tees †Reducing	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼	.75	.98	1.10	1.40	.75	.98	.85	1.10		
1½	.90	1.15	1.30	1.70	.90	1.15	1.10	1.45	1.20	1.55
2	1.35	1.80	1.85	2.40	1.35	1.80	1.85	2.40	2.05	2.65
2½	2.70	3.50	3.65	4.75	2.70	3.50	3.50	4.55	3.85	5.00
3	3.60	4.70	5.00	6.50	3.60	4.70	4.60	6.00	5.00	6.50
4	6.40	8.30	8.50	11.00	6.40	8.30	7.70	10.00	8.50	11.00
5	12.00	15.50			12.00	15.50				
6	16.50	21.50			16.50	21.50				

Size	No. 1018 Basin Tees		No. 1033 †Increasers		No. 1034 Roof Connections		No. 1048 Tucker Connections		No. 1070 Couplings	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼	1.20	1.60					1.45	1.90	.95	1.25
1½	1.65	2.15			1.40	1.80	1.60	2.10	1.10	1.45
2	2.50	3.25	2.65	3.45	1.65	2.15	1.95	2.55	1.40	1.80
2½									1.90	2.45
3			4.15	5.40	2.10	2.75	3.50	4.55	2.90	3.80
4			5.85	7.60	3.05	4.00	7.25	9.50	4.15	5.40
5			9.20	12.00			11.50	15.00	7.00	9.10
6			11.00	14.50			14.00	18.20	9.30	12.00
8									19.00	24.70

†Prices of Reducing Tees and Increasers apply only to the sizes shown at the lower right; the size of the largest opening determines the price. When specifying reducing tees, always name the size of openings in the sequence of the lower case letters shown on the dimensional illustration below.



No. 1033, Increaser



No. 1034
Roof Connection
(Straight threads)



No. 1070
Coupling

Roof Connections, used on steel or wrought iron vent pipes at the point they pass through a roof, form a counter-flashing at the top edge of the roof flashing around the pipe.

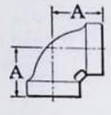


No. 1048
Tucker
Connection

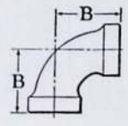
Tucker Connections in sizes 4 to 6-inch have a loose ring (not illustrated). The 2-inch size is malleable iron; it will fit within a 4-inch wall.

15

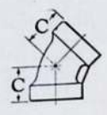
Dimensions, in Inches



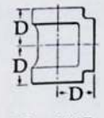
No. 1001



No. 1001½



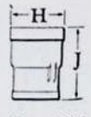
No. 1004



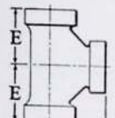
No. 1017



No. 1034



No. 1048



No. 1018



No. 1070

Size	A	B	C	D	E	F	G	H	J	K
1¼	2¼	3	1¾	1¾	2 5/16			3¼	3¾	3
1½	2½	3½	1⅞	1 15/16	2 11/16	2⅞	3	3½	4	3⅜
2	3 1/16	4	2¼	2⅝	3½	3 13/16	2½	3⅜	4½	3¾
2½	3 11/16	4½	2½	2 11/16						4
3	4¼	5¼	2 15/16	3 1/16		4 15/16	3	5 5/16	4¾	4¼
4	5 3/16	6¼	3½	3 13/16		6	3	6⅝	7	4½
5	6⅛		4⅛					7 13/16	7	4¾
6	7⅛		4⅞					9	7	5
8										5⅝



No. 1033

No. 1033 Increasers Size	L
2×1½	9
3×2	9
4×3 ×2	9 9
5×4	9
6×5 ×4	9 9

No. 1017
Reducing

No. 1017 Reducing Tee Size a	b	c	M	N
1½	×1½	×1¼	1 15/16	1 15/16
2	×2	×1½	2 1/32	2 3/16
		×1¼	2 1/32	2 3/16
2½	×2½	×2	2 13/32	2⅝
3	×3	×2	2 17/32	2⅞
		×1½	2 17/32	2⅞
4	×4	×3	3½	3¾
		×2	2¾	3 7/16

Description . . . page 159

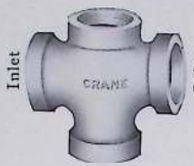
Thread engagement . . . page 494

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Cast Iron Drainage Fittings



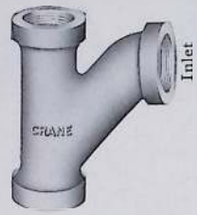
No. 1020
90° Y-Branch



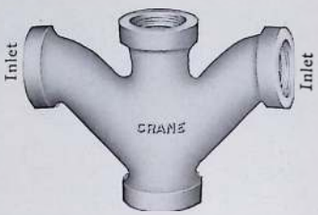
No. 1024
90° Double Y-Branch

Tee Pattern

All inlets on Y-Branches are pitched ¼-inch per foot.



No. 1022
90° Y-Branch



No. 1026
90° Double Y-Branch

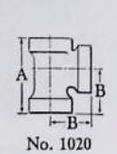
Long Turn, Tee Pattern

List Prices, Each

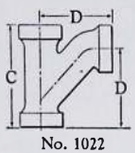
Size	90° Y-Branches								90° Double Y-Branches							
	No. 1020 Tee Pattern				No. 1022 Long Turn, Tee Pattern				No. 1024 Tee Pattern				No. 1026 Long Turn, Tee Pattern			
	Straight		*Reducing		Straight		*Reducing		Straight		*Reducing		Straight		*Reducing	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼	.85	1.10			1.45	1.90			1.55	2.00			2.30	3.00		
1½	1.10	1.45	1.20	1.55	1.75	2.30	2.00	2.60	1.85	2.40	2.05	2.65	2.75	3.50	3.00	3.90
2	1.85	2.40	2.05	2.65	3.10	4.00	3.30	4.30	2.75	3.55	3.00	3.90	4.50	5.80	5.00	6.50
2½	3.50	4.55	3.85	5.00	5.60	6.90	6.10	8.00								
3	4.60	6.00	5.00	6.50	8.30	10.80	9.00	11.70	7.50	9.75	8.50	11.00	12.00	15.50	13.00	17.00
4	7.70	10.00	8.50	11.00	14.00	18.00	16.00	21.00	14.00	18.00	15.50	20.00	21.50	28.00		
5	13.00	16.90	14.50	20.00												
6	20.00	26.00	21.00	27.50												

*The prices of Reducing 90° Y-Branches apply only to the sizes shown at the lower right; the size of the largest opening determines the price. When specifying, always name the size of openings in the sequence of the lower case letters shown on the dimensional illustrations below.

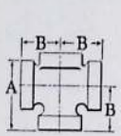
Dimensions, in Inches



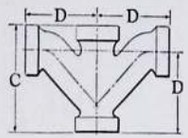
No. 1020



No. 1022



No. 1024



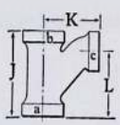
No. 1026

Size	A	B	C	D
1¼	3¾	2¼	4¾	3⅝
1½	4¼	2½	5⅜	4⅛
2	5 3/16	3 1/16	7	5¼
2½	6 5/16	3 11/16	8¼	6¼
3	7¼	4¼	9⅞	7½
4	8¾	5 3/16	13	9⅞
5	10 5/16	6⅛		
6	11 15/16	7⅛		

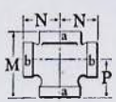
Description . . . . page 159



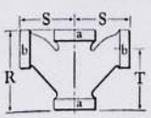
No. 1020, Reducing



No. 1022, Reducing



No. 1024, Reducing



No. 1026, Reducing

Reducing 90° Y-Branches

Size a	b	c	No. 1020 F	G	H	No. 1022 J	K	L
1½×1½×1¼			3⅞	2½	2⅜	5⅛	3⅞	3 15/16
×1¼×1¼			3⅞	2½	2⅜	—	—	—
2 ×2	×1½		4⅝	2 15/16	2 11/16	5¾	4⅜	4 7/16
	×1¼		4⅜	2 13/16	2 11/16	5¾	4⅜	4 7/16
2 ×1½×2			4 13/16	3 1/16	3 1/16	6⅜	5 7/16	5 7/16
	×1½		4⅝	2 15/16	2 11/16	—	—	—
2½×2½×2			5½	3 5/16	3¼	7⅜	5¾	5¾
3 ×3	×2½		—	—	—	9⅞	7½	7½
	×2		5 11/16	3⅝	3 5/16	7 9/16	6 1/16	5 15/16
	×1½		5 1/16	3 5/16	2 15/16	5 15/16	5	4⅝
	×1¼		5 1/16	3 5/16	2 15/16	—	—	—
4 ×4	×3		7⅜	4¾	4 5/16	10	8 1/16	7⅝
	×2		5 13/16	4 1/16	3⅜	7 11/16	6⅝	6 1/16
	×1½		5¼	3 13/16	3	6 1/16	5 7/16	4¾
5 ×5	×4		9⅛	5 11/16	5⅜	—	—	—
6 ×6	×5		10 9/16	6⅝	6¼	—	—	—
	×4		9¼	6 3/16	5 7/16	—	—	—

Size a	b	No. 1024 M	N	P	No. 1026 R	S	T
1½×1¼		3⅞	2½	2⅜	5⅛	3⅞	3 15/16
2 ×1½		4⅝	2 15/16	2 11/16	5¾	4⅜	4 7/16
	×1¼	4⅝	2 15/16	2 11/16	5¾	4⅜	4 7/16
3 ×2		5 11/16	3⅝	3 5/16	7 9/16	6 1/16	5 15/16
	×1½	5¼	3 7/16	3	—	—	—
4 ×2		5 13/16	4 1/16	3⅜	—	—	—
	×1½	5¼	3 13/16	3	—	—	—

Normal thread engagement . . . . page 494

Cast Iron Drainage Fittings



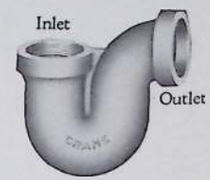
No. 1028
45° Y-Branch



No. 1030
45° Double Y-Branch



No. 1059
P Trap



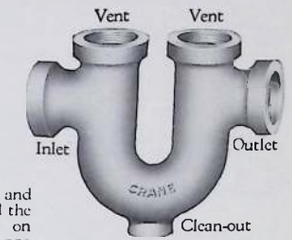
No. 1059½
Bath P Trap

List Prices, Each

Size	No. 1028 45° Y-Branches				No. 1030 45° Double Y-Branches			
	Straight		*Reducing		Straight		*Reducing	
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
1¼	1.05	1.40			2.20	2.90		
1½	1.50	2.00	1.65	2.15	2.80	3.65		
2	2.50	3.25	2.75	3.55	3.90	5.00	4.30	5.60
2½	4.45	5.75	4.70	6.15	6.50	8.50		
3	5.85	7.60	6.60	8.60	9.80	12.70	10.80	14.00
4	11.00	14.50	12.00	15.60	18.00	23.50		
5	16.50	21.50	18.50	24.00				
6	26.50	34.50	29.00	36.00				
8	64.00	83.00	70.00	91.00				
10	97.00	126.00						

Size	No. 1038 Running Traps		No. 1059 P Traps		No. 1059½ Bath P Traps	
Inches	Black	Galv.	Black	Galv.	Black	Galv.
1¼	4.40	5.75	1.80	2.35		
1½	4.75	6.20	2.00	2.60	2.00	2.60
2	7.00	9.10	3.50	4.55	3.00	3.90
3	14.00	18.00	7.00	9.10		
4	28.00	36.50	17.50	23.00		

The outlet on P and Bath P Traps and the inlet and outlet on Running Traps are pitched ¼-inch per foot.

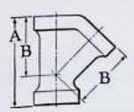


No. 1038
Running Trap

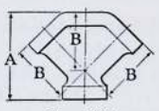
*The prices of Reducing 45° Y-Branches apply only to the sizes shown at the lower right; the size of the largest opening determines the price. When specifying, always name the size of openings in the sequence of the lower case letters shown on the dimensional illustrations below.

Description . . . . page 159
Normal thread engagement . . . . page 494

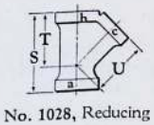
Dimensions, in Inches



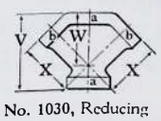
No. 1028



No. 1030

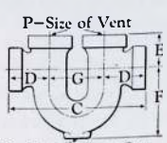


No. 1028, Reducing

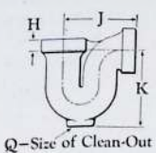


No. 1030, Reducing

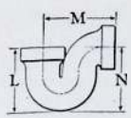
Size	A	B
1¼	5	3¼
1½	5½	3⅝
2	6½	4⅜
2½	7⅞	5⅜
3	9	6 3/16
4	10⅞	7 11/16
5	12 15/16	9 3/16
6	14⅜	10¾
8	18 13/16	13 9/16
10	23	16½



Q–Size of Clean-Out
No. 1038



Q–Size of Clean-Out
No. 1059



No. 1059½

Size	C	D	E	F	G	H	J	K	L	M	N	P	Q
1¼	7 5/8	2¼	2	4½	3 1/8	¾	3 15/16	4½				1¼	¾
1½	8⅜	2½	2¼	4 15/16	3⅜	⅞	4⅜	5	4⅜	4½	4⅝	1½	1
2	10 1/8	3 1/16	2 9/16	5 11/16	4	⅞	5 5/16	5 11/16	5⅜	5 5/16	5⅜	2	1
3	13¾	4 3/16	3½	7¾	5⅜	1 3/16	7⅛	7¾				3	1¼
4	17¼	5 1/8	4 3/16	9 3/8	7	1½	9¼	9 3/16				4	2

Reducing 45° Y-Branches

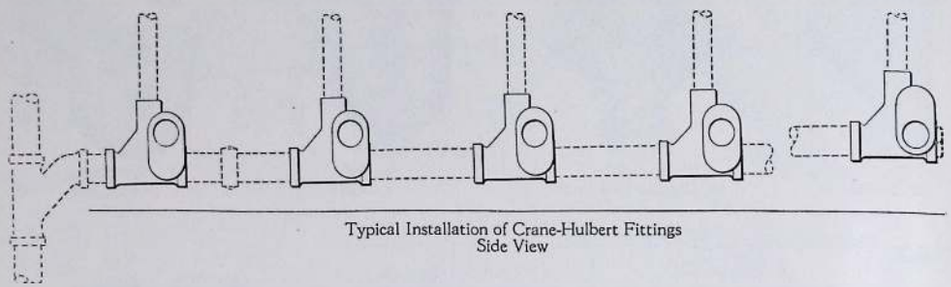
Size a	b	c	No. 1028 S	T	U
1½×1½×1¼			5¼	3½	3 7/16
2 ×2	×1½		5⅞	4 1/16	4⅛
	×1¼		5⅞	4 1/16	4⅛
2 ×1½×1½			5 7/16	3⅝	3⅝
2½×2½×2			7 1/16	4 15/16	5⅛
	×1½		6 7/16	4 9/16	4⅝
3 ×3	×2½		8	5 11/16	5 13/16
	×2		7⅜	5 5/16	5⅜
	×1½		6⅝	4 15/16	5 1/16
4 ×4	×3		9¼	6⅞	7 3/16
	×2		7 11/16	6	6 5/16
	×1½		7 3/16	5¾	6 1/16
5 ×5	×4		11⅜	8 7/16	8½
6 ×6	×5		13	9 13/16	10
	×4		11⅞	9 1/16	9 3/8
8 ×8	×6		14 15/16	11⅞	12 3/8
	×4		11 7/16	10 7/16	11

Size a	b	No. 1030 V	W	X
2×1½		5⅞	4 1/16	4⅛
3×2		7⅜	5 5/16	5⅜

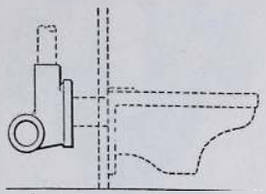
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Crane-Hulbert Drainage Fittings

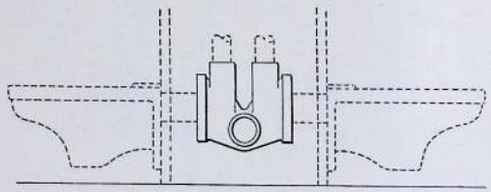
For Wall Closets



Typical Installation of Crane-Hulbert Fittings
Side View



Single Battery of Wall Closets
End View



Double Battery of Wall Closets
End View

Designed to Simplify Wall Closet Installation

Crane-Hulbert Drainage Fittings are especially designed to facilitate the installation of single or double batteries of wall closets. Their compact construction, economy of installation, and simplification of waste and vent piping are a combination of features that fulfill a specific need with efficiency and thoroughness.

Permits Drain Line Above the Floor

The primary function of the fittings is to permit installation of a lateral drain line above the floor, accurately pitched according to proper plumbing practice, with the closets of the battery set at a uniform height from the floor. To accomplish such an arrangement, Crane-Hulbert Fittings have inlet openings located at progressive distances above the center of the drain line.

Used with Two Types of Wall Closets

The fittings are used with wall closets of two types: the blow-out or the siphon jet. When the blow-out type is used, twelve closets in a single battery or twenty-four closets in a double battery may be installed. When the siphon jet type is used, six closets in a single battery or twelve closets in a double battery may be installed. In either case, a high sanitary standard is maintained. Drainage is rapid and thorough. The unobstructed space beneath the closet bowl is easily cleaned.

Low Cost—Easy Installation

With Crane-Hulbert Fittings, expensive construction costs are minimized. Their use eliminates the need to raise floors or to provide grooves in ceilings to accommodate the piping essential to the installation of floor type closets. Each fitting combines into a single casting the advantages of a drainage elbow, nipple, and Y-branch, thus eliminating two fittings and two screwed joints on every closet installed.

A Complete Line

The complete line includes long turn fittings with screwed ends or with hub and spigot ends in a wide assortment of types and sizes. The fittings are furnished black or galvanized. In addition to the long turn design illustrated on this page, Short Turn Crane-Hulbert Drainage Fittings are available. Short Turn Fittings are furnished single pattern with screwed ends only. They are used to advantage where space is limited, especially near the stack.

Supporting Fittings Also Available

Supporting fittings for wall closets are also available. Two type are furnished: the supporting flange type for use with iron pipe connections, and the supporting chair type for use with either iron or lead pipe connections. The chair type has a base which is built into the floor; the flange type has leveling bolts instead of a base. Complete information will be furnished on request.

Complete information, prices, and dimensions will be furnished on application.

15

Iron Plugs and Bushings; Steel Nipples; Couplings; Clamps

Plugs and Bushings
Iron.....pages 166 and 167

Nipples
Wrought Steel.....pages 168 and 169

Pipe Couplings
Steel.....page 170

Couplings
Dresser.....page 172
Rolagrip.....page 172
Gruvagrip.....page 172

Clamps
Single Strap and Double Strap.....page 171
Band-It.....page 171
Dresser.....page 172

The fittings mentioned above have been grouped together in this section of the catalog because they are used generally with Malleable Iron and Cast Iron Screwed Fittings.

16

For greater convenience, the following fittings are shown with related products in other sections of this catalog:

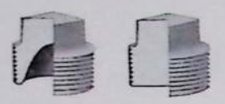
Hydrant Clamps.....page 67
Wood Rod Couplings.....page 67
Street Washer Keys.....page 67
Hydrant Handles.....page 67

Brass Couplings.....pages 184 and 186
Brass Locknuts.....page 184
Brass Plugs and Bushings.....page 185
Brass Nipples.....page 186

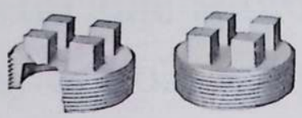
Steel Plugs and Bushings.....page 260
Malleable Iron Couplings.....pages 140, 144 and 146
AAR Malleable Iron Couplings.....page 148
Forged Steel Couplings.....pages 258 and 259

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Iron Plugs



Cored Solid
Square Head Plugs



Cored Solid
Bar Plugs



Countersunk Plug
¼ and ⅜-inch sizes have a hexagon hole.

List Prices, Each

Size	Square Head Plugs Right Hand				Bar Plugs Right Hand				Countersunk Plugs Right Hand	
	Cored		Solid		Cored		Solid			
Inches	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
⅛			.07	.12						
¼			.07	.12					.13	.22
⅜			.07	.12					.13	.22
½			.07	.12					.13	.22
¾	.09	.15	.18	.30					.18	.30
1	.10	.17	.20	.34					.20	.34
1¼	.14	.24	.22	.37					.22	.37
1½	.19	.32	.29	.49					.29	.49
2	.27	.46	.40	.68					.40	.68
2½	.46	.78	.58	.98					.58	.98
3	.65	1.10	.94	1.60					.94	1.60
3½	1.00	1.70	1.45	2.45					1.65	2.80
4					1.15	1.95	1.75	3.00	2.80	4.75
5					1.95	3.30	2.90	4.90		
6					2.30	3.90	3.50	6.00		
8					4.40	7.50	6.00	10.00		

Service suggestions: Cored and Countersunk Plugs are generally used with:

125-Pound Cast Iron Fittings
150-Pound Malleable Iron Fittings

Solid Plugs are generally used with:

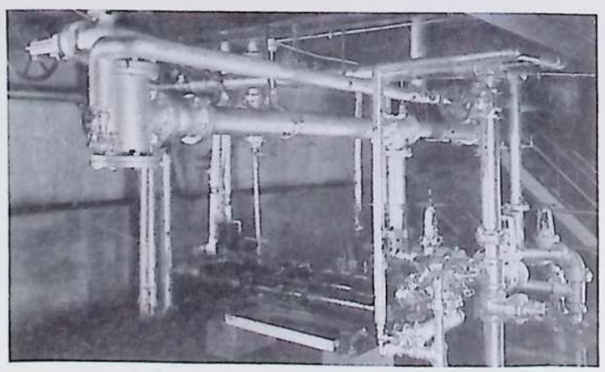
250-Pound Cast Iron Fittings
300-Pound Malleable Iron Fittings

Solid Plugs sizes ⅜-inch and smaller are recommended for the same pressures and temperatures as the No. 309 Steel Plugs shown on page 260.

American Standard: These plugs conform to the American Standard for Ferrous Plugs with Pipe Threads (B16.14–1949).

Materials

Style		Steel	Malleable Iron	Cast Iron
Square Head	Cored			All sizes
	Solid	⅛ to ½"		¾" and larger
Bar	Cored			All sizes
	Solid			All sizes
Countersunk		¼ to ½"	¾ to 1¼"	1½" and larger



Diversified and complete, the Crane line fulfills the requirements of specialized or general piping installations.

Iron Bushings



Outside Hexagon



Inside Hexagon



Face

Face Bushings in sizes ¾-inch and smaller do not have lugs (not illustrated).



Eccentric

List Prices, Each

Size	Hexagon Bushings		Face Bushings		Eccentric Bushings	
Inches	Black	Galv.	Black	Galv.	Black	Galv.
¼	.12	.18	.18	.27		
⅜	.12	.18	.18	.27		
½	.13	.20	.20	.30		
¾	.15	.22	.24	.36		
1	.17	.26	.28	.42		
1¼	.21	.32	.36	.54	.60	.90
1½	.25	.38	.45	.69	.66	1.00
2	.30	.45	.61	.92	.90	1.35
2½	.42	.63	.80	1.20	1.50	2.25
3	.57	.85	1.05	1.60	2.10	3.15
3½	.90	1.35	1.75	2.65	2.80	4.25
4	1.15	1.75	2.10	3.15	3.70	5.50
5	2.00	3.00	3.20	4.80	5.00	7.50
6	2.40	3.60	4.80	7.20	6.60	10.00
8	4.50	6.70	13.00	19.50		

List prices shown at the left apply only to stock items. A tabulation of the sizes carried in stock and the materials from which they are made—cast iron, malleable iron, or steel—is shown in the table below. Other sizes or materials are special; prices are furnished on application.

Bushings Carried in Stock

Hexagon			Face		Eccentric	
¼ ×⅛ s	2 ×1½ m	4×3½	¼ ×⅛ s	2½×2 m	1¼×¾	3½×2½
⅜ ×¼ s	×1¼	×3	⅜ ×¼ s	×1½ m	×½	×2
×⅛ s	×1	×2½	×⅛ s	×1¼ m	1½×¾	×1½
½ ×⅜ m	×¾	×2	½ ×⅜ s	3 ×2½ m	×½	×1¼
×¼ m	×½	×1½	×¼ s	×2 m	2 ×1¼	4 ×3
×⅛ m	×⅜	×1¼	×⅛ s	×1½ m	×1	×2½
¾ ×½ m	×¼	×1	¾ ×½ s	×1¼ m	×¾	×2
×⅜ m	2½×2 m	5×4	×⅜ s	3½×3 m	×½	×1½
×¼	×1½	×3½	×¼ s	×2½ m	2½×1½	×1¼
×⅛	×1¼	×3	1 ×¾ m	×2 m	×1¼	×1
1 ×¾ m	×1	×2½	×½ m	4 ×3½ m	×1	5 ×4
×½	×¾	×2	×⅜ m	×3 m	×¾	×3½
×⅜	×½	6×5	×¼ m	×2½ m	×½	×3
×¼	3 ×2½	×4	1¼×1 m	×2	3 ×2	×2½
×⅛	×2	×3½	×¾ m	5 ×4 m	×1½	×2
1¼×1 m	×1½	×3	×½ m	×3	×1¼	6 ×4
×¾	×1¼	×2½	1½×1¼ m	6 ×5 m	×1	×3
×½	×1	×2	×1 m	×4	×¾	×2½
×⅜	×¾	8×6	×¾ m	×3	×½	×2
×¼	×½	×5	×½ m	8 ×6 m		
1½×1¼ m	3½×3	×4	2 ×1½ m			
×1	×2½	×3½	×1¼ m			
×¾	×2	×3	×1 m			
×½	×1½		×¾ m			
×⅜	×1¼		×½ m			
×¼	×1					

Notes

m—Letter "m" indicates sizes made of malleable iron.
s—Letter "s" indicates sizes made of steel.
Sizes not indicated with either "m" or "s" are made of cast iron.

Hexagon bushing sizes set in light face type have an inside hexagon. Other sizes (set in bold face type) are made with an outside hexagon.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 103 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/103

Wrought Steel Nipples



Close Nipple



Long Nipple

Standard Black Right Hand Nipples

Pipe Size	Length Inches	List Prices, Each																
			Length															
Inches	Close	Close	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	9	10	11	12
⅛	¾	.19	.19	.20	.21	.22	.23	.25	.27	.29	.31	.33	.38	.42	.46	.50	.53	.57
¼	⅞	.18	.19	.20	.21	.22	.23	.25	.27	.29	.31	.33	.38	.42	.46	.50	.53	.57
⅜	1	.18	.19	.20	.21	.22	.23	.25	.27	.29	.31	.33	.38	.42	.46	.50	.53	.57
½	1⅛	.19	.20	.22	.23	.25	.27	.29	.31	.33	.35	.37	.43	.47	.51	.56	.60	.65
¾	1⅜	.24		.26	.27	.29	.31	.33	.36	.39	.42	.45	.52	.58	.63	.69	.74	.80
1	1½	.35		.38	.41	.43	.46	.49	.52	.56	.59	.62	.70	.78	.85	.93	1.01	1.09
1¼	1⅝	.44		.48	.50	.53	.57	.61	.65	.70	.74	.78	.89	.99	1.09	1.19	1.29	1.39
1½	1¾	.53		.56	.61	.65	.70	.75	.80	.85	.90	.95	1.07	1.19	1.31	1.43	1.55	1.67
2	2	.68			.75	.82	.88	.95	1.02	1.09	1.16	1.23	1.38	1.54	1.70	1.86	2.02	2.18
2½	2½	1.36				1.48	1.60	1.72	1.82	1.94	2.06	2.18	2.45	2.72	2.99	3.26	3.53	3.80
3	2⅝	1.72				1.84	1.98	2.12	2.24	2.39	2.54	2.69	3.04	3.39	3.74	4.09	4.44	4.79
3½	2¾	2.46						2.94	3.10	3.37	3.63	3.89	4.37	4.85	5.33	5.81	6.29	6.77
4	2⅞	2.80						3.36	3.55	3.85	4.15	4.45	4.99	5.54	6.09	6.64	7.19	7.74
5	3	4.88							6.05	6.44	6.83	7.22	7.97	8.72	9.47	10.22	10.97	11.72
6	3⅛	6.57							8.10	8.61	9.11	9.63	10.59	11.55	12.51	13.47	14.43	15.39
8	3½	14.88								16.60	17.18	17.76	18.92	20.08	21.24	22.40	23.56	24.72
10	3⅞	20.35								21.89		23.47	25.05	26.63	28.21	29.79	31.37	32.95
12	4½	27.00										30.44		35.04	37.34	39.64	41.94	44.24

Extra Strong Black Right Hand Nipples

Pipe Size	Length Inches	List Prices, Each																
			Length															
Inches	Close	Close	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	9	10	11	12
⅛	¾	.39	.40	.43	.46	.49	.52	.55	.58	.62	.66	.70	.80	.89	.97	1.05	1.13	1.21
¼	⅞	.28	.28	.30	.32	.34	.36	.38	.40	.43	.46	.49	.56	.61	.67	.72	.78	.84
⅜	1	.28	.28	.30	.32	.34	.36	.38	.40	.43	.46	.49	.56	.61	.67	.72	.78	.84
½	1⅛	.28	.30	.32	.34	.37	.40	.43	.47	.50	.53	.56	.65	.71	.77	.83	.89	.96
¾	1⅜	.36		.39	.41	.44	.47	.50	.54	.58	.62	.66	.76	.84	.92	1.00	1.08	1.17
1	1½	.53		.57	.61	.64	.68	.72	.77	.81	.86	.91	1.03	1.14	1.25	1.36	1.48	1.60
1¼	1⅝	.66		.70	.75	.80	.85	.91	.97	1.03	1.09	1.15	1.32	1.47	1.61	1.76	1.90	2.04
1½	1¾	.79		.84	.91	.97	1.04	1.11	1.18	1.26	1.33	1.41	1.58	1.76	1.93	2.11	2.29	2.47
2	2	1.03			1.13	1.23	1.32	1.42	1.53	1.63	1.74	1.84	2.07	2.30	2.54	2.78	3.02	3.26
2½	2½	2.02				2.19	2.37	2.55	2.69	2.87	3.04	3.22	3.61	4.00	4.40	4.80	5.20	5.60
3	2⅝	2.58				2.74	2.95	3.16	3.34	3.56	3.78	4.00	4.52	5.04	5.56	6.08	6.60	7.12
3½	2¾	3.65						4.36	4.59	4.99	5.37	5.79	6.49	7.19	7.89	8.59	9.29	9.99
4	2⅞	4.17						5.00	5.28	5.72	6.17	6.61	7.41	8.23	9.04	9.85	10.67	11.48
5	3	7.31							9.06	9.65	10.23	10.82	11.94	13.06	14.18	15.37	16.43	17.54
6	3⅛	9.98							12.34	13.12	13.89	14.69	16.17	17.65	19.13	20.61	22.10	23.58

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For description and footnotes, see the opposite page.

Genuine Wrought Iron Nipples — prices on application.

Wrought Steel Nipples



Close Nipple



Long Nipple

Standard Galvanized Right Hand Nipples

Pipe Size	Length Inches	List Prices, Each																
			Length															
Inches	Close	Close	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	9	10	11	12
⅛	¾	.23	.23	.25	.27	.29	.31	.33	.35	.38	.41	.44	.52	.57	.62	.67	.72	.77
¼	⅞	.22	.22	.24	.26	.28	.30	.32	.34	.36	.38	.41	.49	.53	.57	.62	.66	.71
⅜	1	.22	.22	.24	.26	.28	.30	.32	.34	.36	.38	.41	.49	.53	.57	.62	.66	.71
½	1⅛	.22	.24	.26	.28	.30	.33	.35	.37	.40	.43	.45	.53	.58	.63	.69	.74	.80
¾	1⅜	.28		.31	.33	.35	.38	.41	.44	.48	.51	.55	.64	.71	.77	.85	.92	.99
1	1½	.42		.45	.49	.52	.56	.60	.64	.68	.72	.76	.86	.96	1.05	1.15	1.25	1.35
1¼	1⅝	.53		.57	.61	.64	.69	.75	.80	.86	.91	.97	1.10	1.23	1.35	1.48	1.60	1.73
1½	1¾	.63		.68	.74	.79	.85	.91	.98	1.05	1.11	1.17	1.32	1.47	1.62	1.77	1.92	2.07
2	2	.82			.91	.99	1.07	1.16	1.25	1.34	1.43	1.52	1.71	1.91	2.11	2.31	2.52	2.72
2½	2½	1.69				1.84	1.99	2.15	2.28	2.43	2.59	2.74	3.09	3.43	3.78	4.12	4.47	4.81
3	2⅝	2.14				2.29	2.47	2.65	2.82	3.01	3.20	3.39	3.84	4.28	4.73	5.18	5.62	6.07
3½	2¾	3.04						3.66	3.86	4.20	4.53	4.85	5.46	6.07	6.68	7.29	7.90	8.51
4	2⅞	3.47						4.19	4.43	4.81	5.19	5.57	6.25	6.95	7.65	8.35	9.05	9.75
5	3	6.01							7.49	7.99	8.48	8.98	9.92	10.88	11.83	12.83	13.73	14.68
6	3⅛	8.09							10.02	10.67	11.30	11.96	13.18	14.39	15.61	16.83	18.05	19.27

Crane Nipples, shown on this and the opposite page, are of unusually high quality and have accurately cut threads. They are made of new, full weight, mill tested pipe.

Standard Butt Nipples, Right Hand: Standard Black Butt Nipples ⅛ to 12-inch and Standard Galvanized Butt Nipples ⅛ to 6-inch can be furnished at an advance in price over corresponding Close Nipples; see the Crane Discount Sheet.

Standard Right and Left Nipples, Black: Standard Right and Left Nipples, Black only, 4 inches long only, in ⅜ to 2-inch pipe sizes, can be furnished at an advance in price over the corresponding Standard Black Right Hand Nipples; see the Crane Discount Sheet.

Extra Strong Galvanized Right Hand Nipples: Extra Strong Galvanized Right Hand Nipples in ⅛ to 6-inch pipe sizes can be furnished at an advance in price over Extra Strong Black Right Hand Nipples; see the Crane Discount Sheet.

Seamless Steel Nipples: Seamless Steel Black Right Hand Nipples can be furnished as follows: (1) Standard in 2 to 12-inch pipe sizes; they use the same list prices as corresponding Standard Wrought Steel Nipples but are sold at an advance in price. (2) Extra Strong in 2 to 6-inch pipe sizes; they use the same list prices as corresponding Extra Strong Wrought Steel Nipples but are sold at an advance in price. (3) Double Extra Strong in 2 to 6-inch pipe sizes; these are sold at an advance in price over corresponding Extra Strong Seamless Steel Nipples. See the Crane Discount Sheet.

Seamless Steel Pressure Tube Nipples: Seamless Steel Pressure Tube Nipples (I.P.S.), Right Hand Black only, can be furnished as follows: Standard in ⅛ to 1½-inch sizes, Extra Strong in ⅛ to 1½-inch sizes, and Double Extra Strong in ½ to 1½-inch sizes. See the Crane Discount Sheet for prices.

Standard Tank Nipples



Tank Nipple

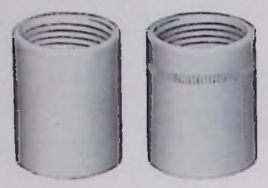
Tank Nipples have a Standard Taper Pipe Thread on one end. The other end has a Standard Taper Pipe Thread running into an American Standard Locknut Thread for a total thread length of 4 inches.

Pipe Size	Length	List Prices Each	
Inches	Inches	Black	Galv.
¼	6	.83	.96
⅜	6	.83	.96
½	6	.89	1.02
¾	6	1.10	1.27
1	6	1.35	1.55
1¼	6	1.75	2.01
1½	6	2.05	2.35
2	6	2.63	3.03
2½	6	4.50	5.18
3	6	5.35	6.16

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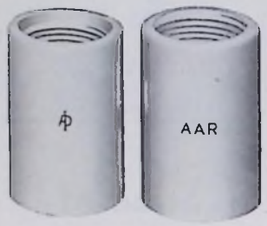
Steel Pipe Couplings



Standard Right Hand — Standard Right and Left



Extra Heavy
Right Hand—Recessed
Right Hand—Not Recessed
Right and Left—Not Recessed



API Line Pipe Right Hand Recessed — AAR 300-Pound Right Hand Not Recessed



Half Coupling
Standard or Extra Heavy
Not Recessed

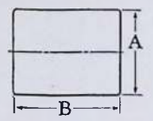
List Prices, per 100 Pieces

Asterisk indicates straight tapped couplings; all others are taper tapped.

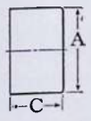
Type	Size	Standard Couplings		Extra Heavy Couplings "Not Recessed" R.H. Couplings furnished only when specified. Not Recessed		Extra Heavy Couplings Recessed		API Line Pipe Couplings Recessed		AAR Couplings Not Recessed	
	In.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.
Right Hand	1/8	* 3.30	* 5.10	†14.10	†17.25	†14.10	†17.25	On request		—	—
	1/4	* 4.90	* 6.50	†19.90	†21.70	†19.90	†21.70	19.90	21.70	19.90	21.70
	3/8	* 5.30	* 6.70	†21.20	†23.00	†21.20	†23.00	21.20	23.00	21.20	23.00
	1/2	* 7.60	* 8.90	†28.00	†33.80	†28.00	†33.80	28.00	33.80	28.00	33.80
	3/4	*10.80	*13.30	†34.50	†40.00	†34.50	†40.00	34.50	40.00	34.50	40.00
	1	*15.60	*18.60	†51.80	†57.30	†51.80	†57.30	51.80	57.30	51.80	57.30
	1 1/4	*19.00	*23.20	†54.00	†61.80	†54.00	†61.80	54.00	61.80	54.00	61.80
	1 1/2	*25.40	*30.30	†58.20	†67.00	†58.20	†67.00	58.20	67.00	58.20	67.00
	2	*38.30	*47.40	98.80	122.00	98.80	122.00	98.80	122.00	98.80	122.00
	2 1/2	71.40	86.90	162.00	192.00	162.00	192.00	162.00	192.00	162.00	192.00
	3	105.00	127.80	192.60	224.00	192.60	224.00	192.60	224.00	192.60	224.00
	3 1/2	155.00	191.40	256.50	303.60	256.50	303.60	256.50	303.60	—	—
	4	193.00	226.00	291.00	339.60	291.00	339.60	291.00	339.60	—	—
	5	On request		On request		On request		On request		—	—
	6									—	—
	8	—	—	—	—					—	—
	10	—	—	—	—					—	—
	12	—	—	—	—					—	—
Right and Left	1/4	10.30	11.90	On request							
	3/8	10.80	12.60								
	1/2	15.50	18.30	27.50	35.00						
	3/4	19.20	21.70	40.00	48.60						
	1	26.20	29.30	58.00	70.00						
	1 1/4	30.00	34.20	63.00	77.00						
	1 1/2	35.60	40.60	70.50	83.40						
	2	60.00	69.00	109.00	132.00						
	2 1/2	On request		On request							
	3										
Half, Right Hand	1/8	* 2.60	* 4.10	On request							
	1/4	* 3.90	* 5.20	15.90	17.40						
	3/8	* 4.30	* 5.40	17.00	18.40						
	1/2	* 6.10	* 7.10	22.30	27.00						
	3/4	* 8.70	*10.70	27.60	32.10						
	1	*12.50	*14.90	41.50	45.80						
	1 1/4	*15.30	*18.60	43.30	49.50						
	1 1/2	*20.30	*24.30	46.60	53.50						
	2	*30.60	*38.00	79.00	97.70						
	2 1/2	57.10	69.50	129.60	153.60						
	3	84.00	102.20	154.00	179.30						
	3 1/2	124.00	153.00	205.20	243.00						
	4	154.30	180.70	232.80	271.70						
	5	On request		On request							
	6										

*These sizes (regularly straight tapped) are available taper tapped; prices on request.
†These sizes (regularly taper tapped) are available straight tapped; prices on request.

Dimensions, in Inches



Coupling



Half Coupling

Type	Size	A	B	C
Standard	1/8	.563	13/16	11/32
	1/4	.719	13/16	17/32
	3/8	.875	13/16	17/32
	1/2	1.063	1 9/16	23/32
	3/4	1.313	1 5/8	3/4
	1	1.576	2	15/16
	1 1/4	1.900	2 1/16	31/32
	1 1/2	2.200	2 1/16	31/32
	2	2.750	2 1/8	1
	2 1/2	3.250	3 1/8	1 1/2
	3	4.000	3 1/4	1 9/16
	3 1/2	4.625	3 3/8	1 5/8
	4	5.000	3 1/2	1 11/16
	5	6.296	3 3/4	1 3/4
	6	7.390	4	1 7/8
Extra Heavy, API Line Pipe, or AAR	1/8	.563	1 1/16	15/32
	1/4	.719	1 5/8	3/4
	3/8	.875	1 5/8	3/4
	1/2	1.063	2 1/8	1
	3/4	1.313	2 1/8	1
	1	1.576‡	2 5/8	1 1/4
	1 1/4	2.054	2 3/4	1 5/16
	1 1/2	2.200	2 3/4	1 5/16
	2	2.875	2 7/8	1 3/8
	2 1/2	3.375	4 1/8	2
	3	4.000	4 1/4	2 1/16
	3 1/2	4.625	4 3/8	2 1/8
	4	5.200	4 1/2	2 3/16
	5	6.296	4 5/8	2 3/16
	6	7.390	4 7/8	2 5/16
	8	9.625	5 1/4	—
	10	11.750	5 3/4	—
	12	14.000	6 1/8	—

‡For "Not Recessed" Extra Heavy and AAR Couplings in the 1-inch size, Dimension "A" is 1.660".

These strong, rugged couplings are inspected during all stages of manufacture to insure high quality. Threads are accurately cut to gauge. The special bevel or recess at the ends protects the first threads and assures easy starting and true alignment. Right and Left Couplings are knurled on the end having the left hand thread.

Standards: Standard and Extra Heavy Couplings conform to dimensions listed in the American Iron and Steel Institute Steel Products Manual, Section 18, dated December, 1951. API Couplings conform to American Petroleum Institute's Standard No. 5-L, 12th Edition, dated March, 1951; they bear the API monogram. AAR Couplings conform to specifications of the Association of American Railroads Manual of Standard and Recommended Practice, 1951 Revision.

Other couplings: Drive Pipe, Water Well Casing, Well Driller, and other types of Couplings are also available; prices on request.

Malleable Iron Couplings....pages 140 to 148 *Forged Steel Couplings....pages 258 and 259*

Single Strap and Double Strap Clamps

Malleable Iron with Wrought Steel Straps

Sizes and List Prices

Type and Catalog No.		Clamp Will Fit: Wrought Pipe Size Inches	Clamp Will Fit: O.D. Casing Size Inches	Clamp Will Fit: Cast Iron Pipe Size Inches	Clamp Will Fit: O.D. of Circle Inches	Size of Pipe Tapping in Clamp Inches	List Prices Black Each
Single Strap Clamps	No. 0	1 1/2			1 7/8	1/2 or 3/4	2.30
	No. 1	2	2 1/2		2 3/8	1/2 to 1	2.60
	No. 2	2 1/2	2 3/4 & 3	2	2 7/8	1/2 to 1 1/4	2.90
	No. 3	3	3 1/2		3 1/2	1/2 to 1	3.25
	No. 4	3	3 1/2		3 1/2	1 1/4 to 2	3.25
	No. 5	3 1/2	4	3	4	1/2 to 1	3.75
	No. 6	3 1/2	4	3	4	1 1/4 to 2	3.75
	No. 7	4	4 1/2		4 1/2	1/2 to 1 1/2	4.25
	No. 8	4	4 1/2		4 1/2	2	4.25
	No. 13	5	5 1/2		5 9/16	3/4 to 1 1/2	4.75
	No. 14	5	5 1/2		5 9/16	2	4.75
	No. 19	6	6 5/8		6 5/8	3/4 to 1 1/2	5.25
	No. 20	6	6 5/8		6 5/8	2	5.25
Double Strap Clamps	No. 41	2	2 1/2		2 3/8	1/2 to 1 1/2	5.25
	No. 42	2 1/2	2 3/4 & 3	2	2 7/8	3/4 to 1 1/2	5.85
	No. 43	3	3 1/2		3 1/2	3/4 to 2	6.50
	No. 44	3 1/2	4	3	4	3/4 to 2	7.50
	No. 45	4	4 1/2		4 1/2	3/4 to 2	8.50
	No. 47	5	5 1/2		5 9/16	3/4 to 2	9.50
	No. 49	6	6 5/8		6 5/8	3/4 to 2	10.50
	No. 50	6	6 5/8		6 5/8	2 1/2, 3, 4	13.00

Galvanized Single Strap or Double Strap Clamps are made to order at an advance of 50 per cent over the prices of Black Clamps.



Single Strap Clamp



Showing Application of Single Strap Clamp



Double Strap Clamp

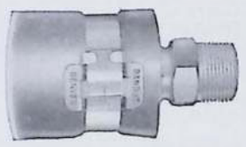
Ordering: When ordering Single Strap or Double Strap Clamps, specify the catalog number of the Clamp and the size of the pipe tapping

Band-It Pipe and Hose Clamps



Use Band-It as a pipe repair clamp

Band-It is used effectively with all types of pressure and suction hose. The clamps will even hold old, oil-soaked hose.



Use Band-It as a pipe hose clamp

Repair leaks or splits in any size pipe or tank. Place packing over leak and under band; no need to disconnect the pipe or tank.

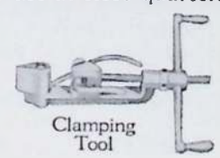
Any permanent or emergency clamping job from 1/2-inch to thirty feet in diameter is easy to handle with Band-It Clamping Bands. Economical, portable, and easy to use. Band-It stops leaks, and repairs, conserves, and extends the life of hose, steel pipe, tanks, electrical cables, wooden beams, etc.

Bands: Clamping bands, formed from one continuous roll of stainless steel band, are furnished in widths of 3/8, 1/2, 5/8, and 3/4-inch.

Buckles: Buckles, made of stainless steel, are furnished one hundred to the package in widths of 3/8, 1/2, 5/8, and 3/4-inch.

Scru-Lokt Buckles: Scru-Lokt Buckles are recommended for use in close quarters. They are available in a 1/2-inch width for use with 3/8 or 1/2-inch bands, and in a 3/4-inch width for use with 5/8 or 3/4-inch bands. Packaged one hundred to the box.

Clamping Tool: Clamping tools effectively clamp bands of all widths. A ball-bearing action provides easy operation.

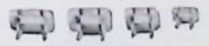


Clamping Tool

Prices on application



Clamping Band



Clamping Band Buckles



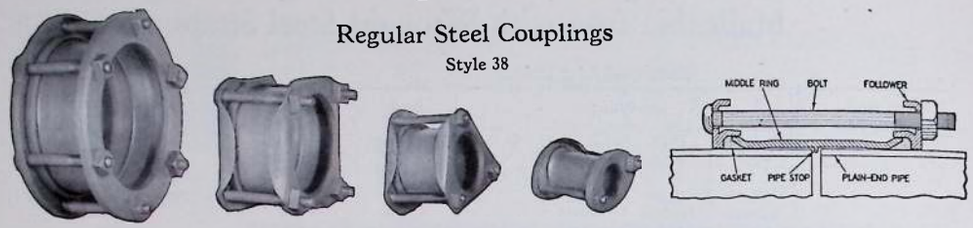
Clamping Band Scru-Lokt Buckle

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 105 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/105

Dresser Couplings and Clamps

Regular Steel Couplings

Style 38



These couplings make tight connections on steel, cast iron, and other lines. Parts consist of two resilient gaskets, a steel middle ring, and two steel follower rings, which fit over plain-end pipe and are bolted together. Resulting joints absorb expansion, contraction, vibration, and deflection.

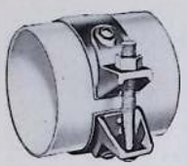
The couplings can be used over and over again simply by replacing the gaskets and bolts. Gaskets for gas, water, oil, air, and other services, as well as asbestos gaskets for temperatures over 215° F., are available; specify service on order. Data on larger sizes, up to 24-inch, furnished on request.

Dimensions, in Inches

Pipe Size	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	5	6	6
Outside diameter	.675	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.000	4.500	5.000	5.563	5.563	6.625	6.625
Number of bolts	2	2	2	2	2	2	3	3	4	4	4	4	4	4	6	6
Bolt diameter	⅜	⅜	½	½	½	½	⅝	⅝	⅝	⅝	⅝	⅝	⅝	⅝	⅝	⅝
Length of bolt	5	5	6¾	6¾	6¾	6¾	8	8	8	8	8	8	8	10	8	10

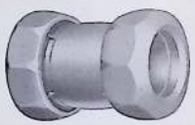
Band Clamps

Style 77 B



Use these clamps to repair small holes and leaks appearing in straight runs of steel pipe. The one-piece steel band is sprung over the pipe and bolted together. Cone gaskets or sheet rubber are supplied, if specified; use asbestos gaskets for temperatures over 215° F. Available in widths of 2, 4, and 6 inches for pipe sizes up to 5-inch, and in widths of 3 and 6 inches for larger pipe sizes.

No-Thread Fittings



Regular Coupling

These compression fittings are designed to simplify the joining of plain-end pipe in sizes up to 2-inch. No threading is necessary. Regular and long couplings, elbows, tees, threaded branch tees, caps, etc. are available.

Rolagrip and Gruvagrip Couplings



Rolagrip Coupling
For Plain End Pipe



Gruvagrip Coupling
For Grooved End Pipe

Rolagrip and Gruvagrip are sturdy, easy-to-use couplings designed for quick joining of pipe ends. They are widely used on air, water, brine, natural gas, crude oil, gasoline (including aromatics), butane, propane, naphtha, and other services. They are particularly useful on lines subject to vibration or misalignment.

The couplings consist of two housing halves, a specially compounded gasket, and bolts. The gasket is slipped over the pipe ends; the housing halves are placed around the gasket and bolted together to form a tight, leak-proof connection. No threading, welding, or flanging is necessary. Rolagrip features steel rollers that grip both pipe and coupling; Gruvagrip fits into grooves in the pipe. Both can be used again and again.

Gruvagrip fittings (not illustrated) include elbows, tees, crosses, laterals, nipples, caps, and reducers. Used with Gruvagrip couplings or grooved end pipe, they are quickly installed into tight leak-proof connections. Sizes ¾ to 6-inch (1000 psi) and 8 to 12-inch (800 psi) are available.

Sizes and Ratings

Pipe Sizes	Working Pressures, psi, 200° F. Max. Temp.		
	*Rolagrip		Gruvagrip
Inches	Regular	Super	
1½	1000	—	1000
2	1000	—	1000
2½	1000	—	1000
3	1000	2000	1000
3½	1000	—	1000
4	1000	2000	1000
5	1000	—	1000
6	800	—	1000
8	800	—	800
10	800	—	800
12	600	—	800

*Rolagrip couplings for copper tubing: 4 and 5-inch OD.....1000 psi
6-in. OD..500 psi 7-in. OD..800 psi

Prices on application

Iron
Unions, Union Fittings, and Flange Unions

(Including AAR Forged Steel Unions)

Malleable Iron Unions
150-Pound, Gasket Type.....page 174
150-Pound, Ground Joint.....page 175
300-Pound.....page 177
Railroad.....page 176
AAR.....page 178
AAR, with Steel Male Tail-Piece.....page 180

AAR Forged Steel Unions.....page 180

Malleable Iron Union Fittings
150-Pound, Gasket Type.....page 174
150-Pound, Ground Joint.....page 175
Railroad.....page 176
AAR.....page 179
AAR, with Steel Male Tail-piece.....page 180

Flange Unions
Cast Iron, Gasket Type.....page 181
Malleable Iron, Ground Joint.....page 181
Tongue and Groove.....page 182

Saving Materials and Labor with Unions and Union Fittings....pages 174 and 264

Crane manufactures an unusually diversified line of unions and union fittings. Whether it be an inexpensive ground joint malleable iron union for a domestic water line, a massive steel union for a central power station—a union for any service—it can be purchased from Crane.

The line includes brass, malleable iron, 18-8 Mo, and forged steel unions, brass and malleable iron union fittings, and cast iron, malleable iron, and forged steel flange unions.

Crane Unions are exceptionally strong, tough, and durable. Each part is liberally proportioned and amply reinforced at points subjected to greatest stress. Special attention has been given to the interchangeability of parts.

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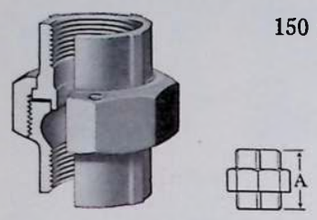
For greater convenience, several lines of unions and union fittings are included with allied material in other sections of this catalog. See the pages referred to below:

Brass Unions and Union Elbows.....page 187
Brass Solder-Joint Unions.....page 423
Circulating Boiler Fittings.....page 145
Forged Steel Unions.....pages 263 and 264
Forged Steel Flange Unions.....page 265
Forged Steel Combination Elbows.....page 266
18-8 Mo Unions.....page 383

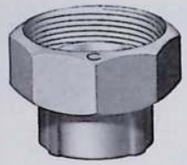
Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 106 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/106

Malleable Iron—Gasket Type
150-Pound Unions and Union Elbow

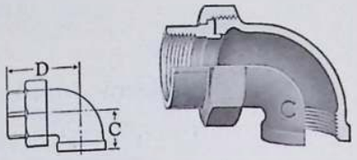
WORKING PRESSURES
150 pounds saturated steam — 300 pounds cold water



No. 1219, Union
Female



No. 1218, Two-Third Union
Female



No. 1290, 90° Elbow
Female Union

List Prices and Dimensions

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Price, Each	No. 1219, Unions Female	Black	.85	.85	.90	1.00	1.30	1.80	2.20	2.75	5.60	9.25
		Galv.	1.10	1.10	1.20	1.30	1.70	2.35	2.85	3.55	7.30	12.00
	No. 1218, Two-Third Unions Female	Black	.50	.50	.54	.60	.78	1.08	1.32	1.65	3.35	5.60
		Galv.	.65	.65	.70	.78	1.00	1.40	1.70	2.15	4.40	7.25
	No. 1290, 90° Elbows With Female Union	Black	1.10	1.10	1.30	1.55	1.90	2.70	3.50	4.80	9.75	14.50
		Galv.	1.35	1.35	1.60	1.95	2.40	3.40	4.35	6.00	12.00	18.00
Dimensions, in Inches	A		1⅝	1¾	1⅞	2⅛	2⅜	2⅝	2 15/16	3¼	3 5/16	3 15/16
	C		1 3/16	1 5/16	1⅛	1 5/16	1 7/16	1¾	1 15/16	2¼	2 11/16	3⅛
	D		1 13/16	2 1/16	2 5/16	2⅝	3	3 7/16	3 13/16	4⅜	4⅞	5⅝

Gaskets: The No. 1219 Unions and the No. 1290 90° Elbows are equipped with a rubber gasket. For extra gaskets, see page 476.

Sturdy construction: These are well proportioned and sturdily constructed unions and union elbows. A long lip on the inside edge of the gasket seating area on the tail-piece serves to retain the gasket after the union is assembled.

Two-Third Union: The No. 1218 Two-Third Union consists of a union ring and a tail-piece (the gasket is not furnished).

This type of union is principally used by equipment manufacturers, the equivalent of the thread-piece being made as an integral part of the equipment, and the Two-Third Union being used to complete the union connection.

Thread engagement . . . . page 494

Crane Unions and Union Fittings Save Material and Labor

Figure A

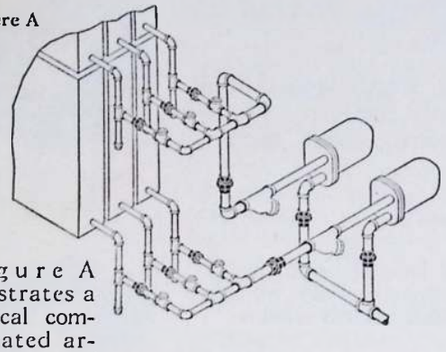


Figure A illustrates a typical complicated arrangement of piping on the return side of double tiered blast heaters. The return from the stacks in each tier are drained individually by a trap, and the condensation is accumulated by a single return header. The illustration shows the most common method of providing union joints on such an installation; only female unions are used.

Figure B shows an improved and economical arrangement made by using male and female unions and union fittings in place of ordinary pipe fittings and female unions. The connections are more compact, and the piping has been simplified. Easy access to traps and all parts of the lines is maintained. 18 nipples, 36 pipe threads, 9 fittings, and 27 joints have been eliminated.

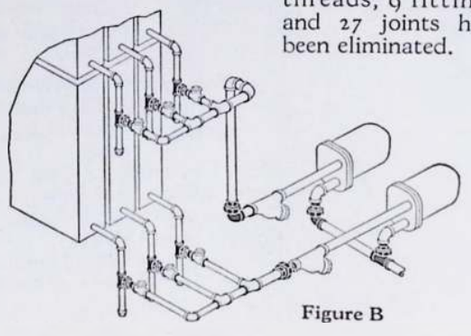
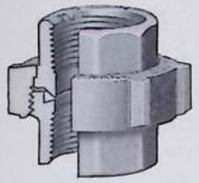
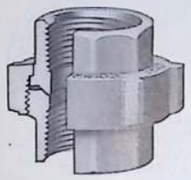


Figure B

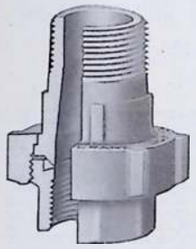
Malleable Iron—Ground Joint
150-Pound Unions and Union Fittings



No. 1280, Union
Female
Brass to Iron Seat



No. 1280½, Union
Female
All-Iron Seat



No. 1281, Union
Male and Female
Brass to Iron Seat

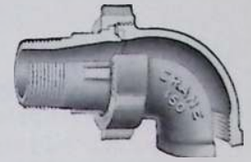
WORKING PRESSURES
150 pounds saturated steam
300 pounds cold water, air, oil, gas, or gasoline, non-shock

FEATURES
Brass to Iron Seat
(Underwriters' Approved)
or
All-Iron Seat
Ground Joint—Air Tested

SERVICE RECOMMENDATIONS
These rugged unions and union fittings are ideal for domestic service and for a wide variety of industrial applications on steam, hot water, cold water, oil, air, gas, and gasoline lines.



No. 1282, 90° Elbow
Female Union



No. 1283, 90° Elbow
Male Union

Brass to Iron Seat



No. 1284, Tee
Female Union on Run



No. 1285, Tee
Male Union on Run

Brass to Iron Seat

List Prices, Each

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Unions	No. 1280, Female	Black	1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00
		Galv.	1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50
	No. 1280½, Female	Black	1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00
		Galv.	1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50
	No. 1281, Male and Female	Black	1.25	1.25	1.45	1.95	2.45	3.40	4.05	5.40	9.70	15.25
		Galv.	1.50	1.50	1.75	2.35	2.95	4.10	4.85	6.50	11.50	18.25
90° Elbows	No. 1282, with Female Union	Black	1.45	1.45	1.70	2.05	2.50	3.50	4.60	6.30		
		Galv.	1.80	1.80	2.10	2.55	3.15	4.35	5.75	8.00		
	No. 1283, with Male Union	Black	1.60	1.60	2.00	2.70	3.25	4.55	5.80	8.10		
		Galv.	2.00	2.00	2.50	3.40	4.10	5.75	7.25	10.00		
Tees	No. 1284, with Female Union	Black	1.90	1.90	2.20	2.60	3.00	4.10	5.20	7.00		
		Galv.	2.40	2.40	2.75	3.25	3.75	5.10	6.50	8.75		
	No. 1285, with Male Union	Black	2.05	2.05	2.50	3.25	3.75	5.15	6.40	8.80		
		Galv.	2.55	2.55	3.10	4.05	4.70	6.50	8.00	11.00		

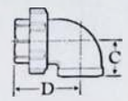
These unions and union fittings, designed to combine liberal strength with light weight and minimum over-all dimensions, have a high safety factor. Female tail-pieces and thread-pieces have octagon ends. Union rings and male tail-pieces are circular in shape and have generous size lugs to provide a good wrench grip.

Ground joint: The ground joint seat holds pressure easily; no gasket is required. It can be taken apart and reassembled repeatedly without affecting the strength or tightness of the joint.

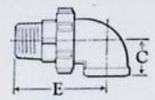
Seats: All of the union fittings and the No. 1280 and No. 1281 Unions have a non-corrosive brass to iron seat. The brass ring is forced in under high pressure and will not loosen in service.

The No. 1280½ Unions have an all-iron seat suitable for services that are corrosive to brass but where all-iron construction is satisfactory; the seat is integral with the thread-piece. For identification of all-iron, the union ring is painted green.

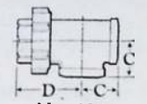
Underwriters' Specifications: Crane 150-Pound Malleable Iron Unions and Union Fittings with Brass to Iron Seat have been approved by the Underwriters' Laboratories, Inc., for use on hazardous liquids. They are marked "CU."



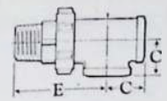
No. 1282



No. 1283



No. 1284



No. 1285



No. 1280 or
No. 1280½



No. 1281

For thread engagement, see page 494.

Dimensions, in Inches

Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3
A	1⅜	1½	1 11/16	1⅞	2¼	2 5/16	2⅜	2 9/16	3¼	3 9/16
B	2 3/16	2⅜	2⅝	3	3 5/16	3⅝	3 15/16	4¼	4 15/16	5⅝
C	1 3/16	1 5/16	1⅛	1 5/16	1½	1¾	1 15/16	2¼		
D	1 11/16	1⅞	2⅛	2 7/16	2⅞	3 3/16	3⅜	3⅞		
E	2 7/16	2⅞	3	3 3/16	3 15/16	4 7/16	4⅞	5½		

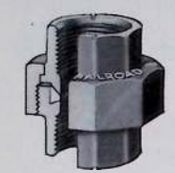
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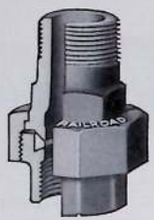
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Malleable Iron
Railroad Unions and Union Elbows

Unions

WORKING PRESSURES
250 pounds saturated steam
500 pounds cold water, air, oil, gas, or gasoline, non-shock

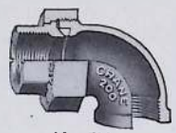

No. 519
Union
Female


No. 519½
Union
Male and Female

Union Elbows

WORKING PRESSURES
200 pounds saturated steam
400 pounds cold water, air, oil, gas, or gasoline, non-shock

FEATURES
Brass to Iron Seat
Ground Joint
Air Tested


No. 590
90° Elbow
Female Union


No. 592
90° Elbow
Male Union

SERVICE RECOMMENDATIONS

Crane Railroad Unions and Union Elbows are recommended for exacting service on pipe lines carrying steam, water, oil, air, gas, gasoline, or other fluids. They are especially suitable for railroad work and are used on general locomotive, car, shop, and yard service. They are furnished with female or with male and female ends.

List Prices, Each

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Unions	No. 519, Female	Black	1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00
		Galv.	1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50
	No. 519½, Male and Female	Black	1.25	1.25	1.45	1.95	2.45	3.40	4.05	5.40	9.70	15.25
		Galv.	1.50	1.50	1.75	2.35	2.95	4.10	4.85	6.50	11.50	18.25
90° Elbows	No. 590, with Female Union	Black	1.45	1.45	1.70	2.05	2.50	3.50	4.60	6.30		
		Galv.	1.80	1.80	2.10	2.55	3.15	4.35	5.75	8.00		
	No. 592, with Male Union	Black	1.60	1.60	2.00	2.70	3.25	4.55	5.80	8.10		
		Galv.	2.00	2.00	2.50	3.40	4.10	5.75	7.25	10.00		

Dependable construction: All parts are heavy and ruggedly constructed and will withstand strains resulting from making up joints, expansion and contraction, vibration, etc.

Brass to iron seat, ground joint: No gasket is necessary. The brass to iron ground joint is non-corrosive and makes a tight seat very easily. It can be taken apart and reassembled repeatedly without affecting its strength or tightness. The brass seat ring is forced in under high pressure, and it will not loosen in service.

Test: Each union and union fitting is given an air-under-water test.

Interchangeability: The tail-pieces and union rings of the unions are interchangeable, size for size, with the corresponding parts of the 90° elbows.

Underwriters' Specifications: All of the Railroad Unions and Railroad Union Elbows shown on this page have been approved by the Underwriters' Laboratories, Inc., for use on hazardous liquids. They are marked "CU".

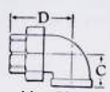

No. 519

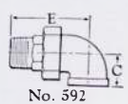

No. 519½

Dimensions, in Inches

Size		¼	⅜	½	¾	1	1¼	1½	2	2½	3
Unions	A	1⅝	1¾	1⅞	2⅛	2⅜	2⅝	2 15/16	3¼	3⅞	4½
	B	2¼	2 7/16	2 11/16	3 1/16	3 5/16	3 11/16	4	4 5/16	4⅞	5⅝
90° Elbows	C	1 13/16	1 5/16	1⅛	1 5/16	1 7/16	1¾	1 15/16	2¼		
	D	1 13/16	2 1/16	2 5/16	2⅝	3	3 7/16	3 13/16	4⅜		
	E	2 7/16	2¾	3 1/16	3½	3 15/16	4 7/16	4¾	5⅜		

Thread engagement . . . page 494


No. 590

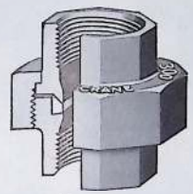

No. 592

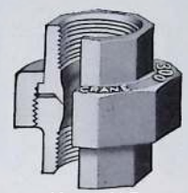
300-Pound Malleable Iron Unions

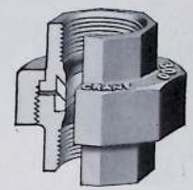
WORKING PRESSURES
No. 198 E — 300 pounds steam, 550° F.
No. 198½ E — 300 pounds steam, 550° F.
No. 197 E — 300 pounds saturated steam
All types—600 pounds cold water, air, oil, or gas, non-shock

Tested 150 pounds air-under-water

FEATURES
Brass to Iron, All-Iron, or Brass to Brass Seat
Ground Joint *Octagon Ends


No. 198 E
Female Union
Brass to Iron Seat


No. 198½ E
Female Union
All-Iron Seat


No. 197 E
Female Union
Brass to Brass Seat

*No. 198 E Unions have round ends on the ⅛-inch size and decagon ends on the 4-inch size.

List Prices, Each

Size		Inches	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
Brass to Iron Seat	No. 198 E	Black	1.10	1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00	23.50
		Galv.	1.30	1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50	28.00
All-Iron Seat	No. 198½ E	Black		1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00	
		Galv.		1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50	
Brass to Brass Seat	No. 197 E	Black		1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00	
		Galv.		1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50	

Service recommendations: Crane 300-Pound Malleable Iron Unions are recommended where long life and dependability are desired on lines conveying steam, water, oil, air, gas, or similar fluids. Their sturdy construction makes them especially suitable for severe services.

Unusually rugged: All parts are massive and rugged. The malleable iron from which they are made has high tensile strength and is characterized by pressure tightness, stiffness, and toughness.

Choice of seat construction: The unions are made with three types of seat construction:
Brass to Iron Seat—No. 198 E
All-Iron Seat—No. 198½ E
Brass to Brass Seat—No. 197 E

Brass seat unions: Brass seat unions have durable, non-corrosive seating surfaces. The large brass rings are forced into the retaining grooves under high pressure; they will not loosen in service.

All-iron unions: All-iron unions have seating surfaces integral with the end-pieces. They are suitable for steam, oil, air, or gas lines where a non-corrosive seat is not desired, and for acid lines where all-iron material is satisfactory.

Ground joint: All of these unions have a ground joint seat that holds pressure easily; no gasket is needed. The unions can be taken apart and reassembled repeatedly without affecting their strength or tightness.

Interchangeability: The corresponding parts of these unions are interchangeable, size for size.

Identification of seat:
Brass to iron seat black unions are all black.
All-iron black unions have the union ring enameled green.
Brass to brass seat black unions have the union ring enameled maroon.
Galvanized unions are all-galvanized, with no other distinguishing color on the union ring.



Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
A	1½	1⅝	1 13/16	1 15/16	2¼	2 7/16	2 13/16	3	3⅜	4	4 5/16	5

Thread engagement . . . page 494

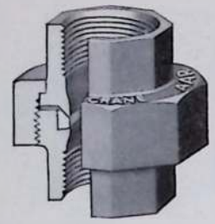
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AAR Malleable Iron Unions

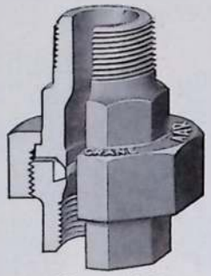
WORKING PRESSURES
300 pounds steam, 550° F.
600 pounds cold water, air, oil, gas, or gasoline, non-shock

Tested 150 pounds air-under-water

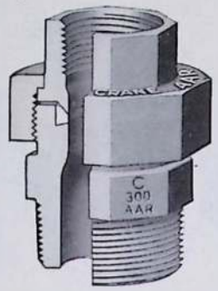
FEATURES
Brass to Iron Seat — Ground Joint
Octagon Ends



No. 819 E
Union
Female



No. 819½ E
Union
Male and Female



No. 817 E
Reducing Air Pump Union
(Male end is larger)

For straight size Air Pump Unions, use either the **No. 819½ E** shown at the left or the **No. 919½ E** shown on page 180.

For FORGED STEEL AAR Unions, see page 180.

List Prices, Unions

Size	Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
No. 819 E, Female	Black Each	1.10	1.10	1.15	1.30	1.70	2.35	2.85	3.60	7.35	12.00
	Galv. Each	1.30	1.30	1.40	1.55	2.05	2.85	3.45	4.30	8.80	14.50
No. 819½ E, Male and Female	Black Each	1.25	1.25	1.45	1.95	2.45	3.40	4.05	5.40	9.70	15.25
	Galv. Each	1.50	1.50	1.75	2.35	2.95	4.10	4.85	6.50	11.50	18.25

List Prices, Air Pump Unions

Size	Inches	1¼ x 1	1½ x 1¼	2 x 1	2 x 1¼	2 x 1½
No. 817 E, Reducing, Black	Each	3.75	4.50	6.00	6.00	6.00

Service recommendations: Crane AAR Unions and Union Fittings are ideal for service where long life and dependability are desired.

They are especially suited for railroad work because they easily withstand abuse, piping strains, vibration, expansion, and contraction.

Unusually rugged: All parts are of massive, sturdy construction. The malleable iron from which they are made is exceptionally strong and tough.

Brass to iron seat, ground joint: The brass to iron ground joint seat is non-corrosive and holds pressure easily; no gasket is needed. The brass seat ring is forced in under high pressure and will not loosen in service. The unions can be taken apart and reassembled repeatedly without affecting their strength or tightness.

Underwriters' Specifications: Crane AAR Unions (except No. 817 E) and Union Fittings have been approved by the Underwriters' Laboratories, Inc., for use on hazardous liquids.

Association of American Railroads: The unions shown on this page and the union fittings shown on the following page conform to the specifications and recommended practice of the Association of American Railroads (AAR) for 300-pound unions and union fittings. When subjected to tensile tests, their breaking strengths exceed those required by the specifications.

Interchangeability: The tail-pieces and the union rings on all of the AAR Unions and Union Fittings shown on this and the following two pages are interchangeable, size for size.

Dimensions, in Inches



No. 819 E

Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3
A—No. 819 E	1⅝	1 13/16	1 15/16	2¼	2 7/16	2 13/16	3	3⅜	4	4 5/16
B—No. 819½ E	2¼	2½	2 11/16	3⅛	3⅜	3¾	3 15/16	4 5/16	5 1/16	5½

Size	1¼ x 1	1½ x 1¼	2 x 1	2 x 1¼	2 x 1½
B—No. 817 E	3½	3 13/16	3¾	4	4⅛



No. 819½ E or No. 817 E

AAR Unions and Union Fittings with STEEL male tail-piece . . . page 180
AAR Malleable Iron Screwed Fittings . . . . page 148
AAR Brass Valves . . . . pages 38 to 40

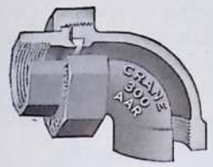
17

AAR Malleable Iron Union Fittings

WORKING PRESSURES
300 pounds steam, 550° F.
600 pounds cold water, air, oil, gas, or gasoline, non-shock

Tested 150 pounds air-under-water

FEATURES
Brass to Iron Seat — Ground Joint
Octagon Ends



No. 890 E
90° Elbow
Female Union



No. 891½ E
45° Elbow
Female Union



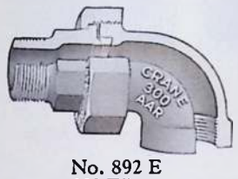
No. 894 E
Tee
Female Union on Run



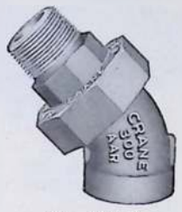
No. 895 E
Reducing Tee
Female Union on Run



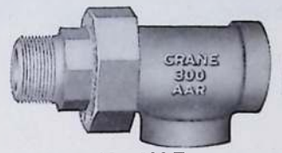
No. 898 E
Tee
Female Union on Outlet



No. 892 E
90° Elbow
Male Union



No. 893 E
45° Elbow
Male Union



No. 896 E
Tee
Male Union on Run



No. 897 E
Reducing Tee
Male Union on Run



No. 898½ E
Tee
Male Union on Outlet

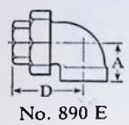
List Prices, Each, Black

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
90° Elbows	No. 890 E, Female Union		1.45	1.45	1.70	2.05	2.50	3.50	4.60	6.30	12.60	18.75
	No. 892 E, Male Union		1.60	1.60	2.00	2.70	3.25	4.55	5.80	8.10	15.00	22.00
45° Elbows	No. 891½ E, Female Union		1.45	1.45	1.70	2.05	2.50	3.50	4.60	6.30	12.60	
	No. 893 E, Male Union		1.60	1.60	2.00	2.70	3.25	4.55	5.80	8.10	15.00	
Tees	No. 894 E, Female Union on Run		1.90	1.90	2.20	2.60	3.00	4.10	5.20	7.00	15.75	22.00
	No. 896 E, Male Union on Run		2.05	2.05	2.50	3.25	3.75	5.15	6.40	8.80	18.00	25.00
	No. 898 E, Female Union on Outlet		2.10	2.10	2.30	2.70	3.15	4.25	5.50	7.50	16.50	
	No. 898½ E, Male Union on Outlet		2.25	2.25	2.60	3.35	3.90	5.30	6.70	9.30	19.00	

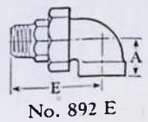
Size		Inches	1 x 1 x ⅜	1 x 1 x ½	1 x 1 x ¾
Reducing Tees	No. 895 E, Female Union on Run		3.15	3.15	3.15
	No. 897 E, Male Union on Run		3.90	3.90	3.90

Galvanized AAR Union Fittings can be made to order; prices are furnished on application.

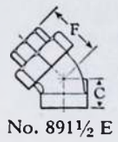
Dimensions, in Inches



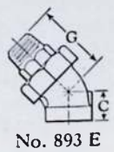
No. 890 E



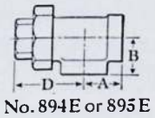
No. 892 E



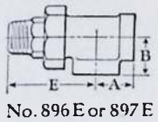
No. 891½ E



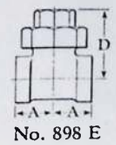
No. 893 E



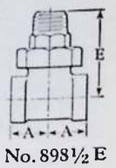
No. 894 E or 895 E



No. 896 E or 897 E



No. 898 E



No. 898½ E

Size	¼	⅜	½	¾	1	1¼	1½	2	2½	3	1×1×⅜	1×1×½	1×1×¾
A	15/16	1 1/16	1¼	1 7/16	1⅝	1 15/16	2⅛	2½	2 15/16	3⅜	1⅝	1 7/16	1½
B	15/16	1 1/16	1¼	1 7/16	1⅝	1 15/16	2⅛	2½	2 15/16	3⅜	1 7/16	1½	1 9/16
C	13/16	⅞	1	1⅛	1 5/16	1½	1 11/16	2	2¼				
D	2	2¼	2 7/16	2⅞	3 3/16	3 11/16	3 15/16	4½	5 7/16	5 15/16	2¾	2⅞	3
E	2 9/16	2⅞	3 3/16	3¾	4 1/16	4⅝	4⅞	5⅜	6 7/16	7 3/16	3 11/16	3 13/16	3 15/16
F	1⅝	1¾	1 15/16	2 3/16	2½	2⅞	3 3/16	3 11/16	4 3/16				
G	2 3/16	2 7/16	2 11/16	3 1/16	3 7/16	3 13/16	4⅛	4 9/16	5 3/16				

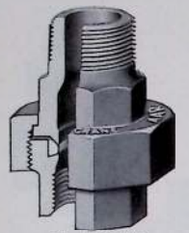
Description . . . page 178
Thread engagement . . . . page 494

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AAR Malleable Iron Unions and Union Fittings

With Steel Male Tail-Piece

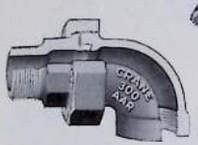


No. 919½ E
Union

WORKING PRESSURES
300 pounds steam, 550° F.
600 pounds cold water, air, oil, or gas, non-shock
Tested 150 pounds air-under-water
Brass to Steel Seat Ground Joint Octagon Ends

These unions and union fittings are the same as those shown on the preceding two pages except that they have a forged steel tail-piece on sizes 2-inch and smaller and a cast steel tail-piece on larger sizes. They are especially suited for severe services where the strength and toughness of steel is needed in the male end.

All parts are interchangeable, size for size, with the corresponding parts of Malleable Iron AAR Unions and Union Fittings (pages 178 and 179). Galvanized unions and union fittings are made to order; prices on application.



No. 992 E
90° Elbow



No. 993 E
45° Elbow



No. 996 E
Tee
Union on Run



No. 997 E
Reducing Tee
Union on Run



No. 998½ E
Tee
Union on Outlet

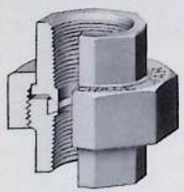
List Prices, Black, Each

Size Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
No. 919½ E, Unions	2.20	2.20	2.50	3.50	4.25	6.00	7.00	9.50	17.00	26.50
No. 992 E, 90° Elbows	2.55	2.55	3.00	4.25	5.00	7.25	8.75	12.25	22.50	33.50
No. 993 E, 45° Elbows	2.55	2.55	3.00	4.25	5.00	7.25	8.75	12.25	22.50	
No. 996 E, Tees	3.00	3.00	3.55	4.80	5.50	7.75	9.50	13.00	25.50	36.50
No. 998½ E, Tees	3.20	3.20	3.65	5.00	5.70	8.00	9.75	13.50	26.50	

Size Inches	1 x 1 x ⅜ 1 x 1 x ½ 1 x 1 x ¾
No. 997 E Reducing Tees	5.70

AAR Forged Steel Ground Joint Unions

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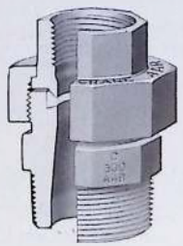
No. 950 H
Union
Female

WORKING PRESSURE
300 pounds steam
Tested 150 pounds air-under-water
Brass to Steel Seat Ground Joint Octagon Ends

These are light weight, rugged Forged Steel AAR Unions, ideal for locomotive and other railroad services subject to vibration, expansion, and contraction.

The brass to steel ground joint seat is non-corrosive and holds pressure easily; no gasket is required. Corresponding parts interchange with those of unions shown on page 178 and above.

These unions conform to the AAR specifications for 300-pound unions. The union ring is marked "Crane-AAR-300".



No. 953½ H
Reducing Air Pump Union
(Male end is larger)

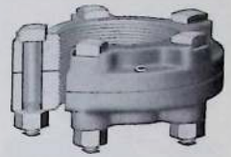
List Prices, Black

Size Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
No. 950 H, Female Unions Each	2.25	2.50	3.00	3.50	4.25	5.50	6.80	8.50	17.00	26.00
Size Inches	1¼ x 1	1½ x 1¼	2 x 1	2 x 1¼	2 x 1½					
No. 953½ H, Reducing Air Pump Unions Each	8.50	11.50	14.75	14.75	14.75					

Dimensions are the same as AAR Malleable Iron Unions and Union Fittings . . . see pages 178 and 179

Cast Iron Gasket Type Flange Unions

125-Pound



125-Pound
Faced, Plain Face

WORKING PRESSURES
125 pounds saturated steam
175 pounds cold water
or gas, non-shock

Galvanized unions have galvanized bolts.

List Prices and Dimensions

Size		Inches	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8
125-Pound	Black	Each	1.10	1.30	1.50	1.75	2.10	2.70	3.40	4.10	5.00	6.00	7.00	8.50	15.00
	Galvanized	Each	2.20	2.60	3.00	3.50	4.20	5.40	6.80	8.20	10.00	12.00	14.00	17.00	30.00
	End to end	Inches	1 3/16	1 5/16	1 7/16	1 9/16	1 11/16	1 13/16	2 5/16	2 7/16	2 9/16	2 11/16	2 15/16	3 1/16	3 9/16
	Dia. of flanges	Inches	2¾	3⅜	3⅝	4⅛	4½	5⅛	5⅞	6⅝	7¼	7¾	9⅛	10⅜	12¾
	No. and dia. of bolts		3-⅜	3-7/16	3-7/16	4-7/16	4-½	4-½	4-⅝	4-⅝	4-⅝	5-⅝	5-⅝	6-⅝	8-⅞

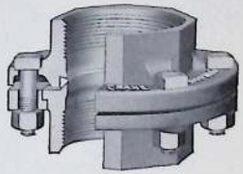
These 125-Pound Cast Iron Flange Unions are equipped with a cloth inserted rubber gasket. The unions are sturdy and compact and are suitable for steam, water, or gas service.

When unions larger than those listed above are required, two No. 553, 125-Pound Cast Iron Companion Flanges (shown on page 202) may be bolted together.

Extra gaskets . . . . page 476

Malleable Iron Ground Joint Flange Unions

Three-Part



No. 775
Flange Union

WORKING PRESSURES
600 pounds cold water, oil, or gas, non-shock
Sizes 4-inch and smaller — 300 pounds saturated steam
Sizes 5-inch and larger — 200 pounds saturated steam

Brass to Iron Seat Ground Joint
Loose ring makes it easy to line up bolt holes.

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List Prices and Dimensions

Size Inches	1	1¼	1½	2	2½	3	3½	4	5	6	8	10
No. 775, Black Each	5.50	6.20	7.20	9.00	11.50	15.00	20.00	23.00	40.00	64.00	94.00	185.00
End to end Inches	1½	3	3⅛	3 11/16	4⅛	4½	4 11/16	5	5⅜	5⅞	6⅞	8 3/16
Diameter of flanges Inches	3¾	4⅛	4⅝	5¼	6 3/16	7 3/16	7¾	8⅜	9¾	11	14⅛	16⅞
No. and dia. of bolts	4-7/16	4-7/16	4-½	5-½	5-9/16	5-⅝	5-⅝	6-⅝	6-⅝	8-¾	10-⅞	12-1

Advantages of the three-part construction: The No. 775 Union has three major parts: flange-piece, tail-piece, and loose ring. The ring combined with the ball type seat assures tightness even when the pipe line is slightly out of alignment. Being loose, the ring can be conveniently swiveled to any desired position to line up the bolt holes.

Brass to iron seat, ground joint: The brass to iron seat is non-corrosive, and the ground joint eliminates the need for a gasket. The brass seat ring is forced into the tail-piece under high pressure and will not loosen in service. The union can be taken apart and reassembled repeatedly without injuring its strength or seating qualities.

Identification: The loose ring is painted yellow so that the union can be easily identified.

Test: Each union is given a hydrostatic test.

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Tongue and Groove Flange Unions

WORKING PRESSURES

300 pounds steam or oil (500° F.)—**300** pounds ammonia
*1000 pounds cold water, oil, or gas, non-shock



No. 1589
With Cranite or Lead Gasket

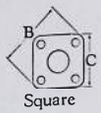
*The No. 1589 Union in the 4-inch size is rated for only 600 pounds cold water, oil, or gas, non-shock.



"A" is end to end of threads.



Oval



Square



Round

List Prices and Dimensions

Size	Inches	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
No. 1589	Each	2.75	3.00	3.35	3.75	4.75	5.80	6.90	8.20	12.50	19.50	27.00
Style of flanges		Oval				Square					Round	
A	Inches	1 5/16	1 1/2	1 11/16	1 13/16	2	2 1/8	2 3/16	2 1/4	2 13/16	3	3 3/8
B	Inches	3 5/8	3 13/16	4	4 3/4	4 1/2	5	6	6 1/2	7 1/2	8 1/4	10
C	Inches	1 5/8	1 3/4	2	2 1/4	3 9/16	3 15/16	4 11/16	5 1/16	5 15/16		
No. of bolts		2	2	2	2	4	4	4	4	4	8	8
Dia. of bolts		1/2	1/2	1/2	5/8	1/2	1/2	5/8	5/8	3/4	3/4	3/4

No. 1589 Unions in sizes 3-inch and smaller are forged steel; the 4-inch size is malleable iron. The unions are rugged and serviceable. They are made by bolting together a No. 1547 Tongue Flange and a No. 1545 Groove Flange (see the illustrations shown on page 415).

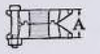
No. 1589 Unions are regularly furnished with a Cranite gasket; when so specified, they will be furnished with a lead gasket at no extra charge.



No. 1591½
With Cranite or Lead Gasket

List Prices and Dimensions

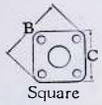
Size	Inches	1	1 1/4	2
No. 1591½	Each	4.25	4.75	8.20
Style of flanges		Oval		Square
A	Inches	2	2 1/8	2 11/16
B	Inches	4 3/4	5 1/4	5 13/16
C	Inches	2 5/8	3	4 1/2
No. and dia. of bolts		2-5/8	2-5/8	4-5/8



"A" is end to end of threads.



Oval



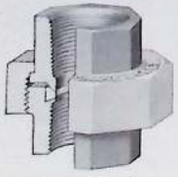
Square

No. 1591½, unusually compact forged steel unions, are made by bolting together a No. 1582½ Tongue Flange and a No. 1583½ Groove Flange (see page 415). The unions are ideal for making up pipe coils with close centers and for other services requiring a good joint in limited space. They are regularly furnished with a Cranite gasket; if specified, they will be furnished with a lead gasket at no extra charge.

Extra gaskets....page 416

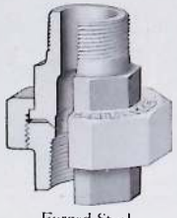
Crane Forged Steel Unions and Combination Elbows For High Pressure— High Temperature Service

See pages 263 to 266.



Forged Steel
Ground Joint
Female Unions
Brass to Steel Seat

See page 263



Forged Steel
Ground Joint
Male and Female Unions
Steel to Steel Seat

See page 263



Forged Steel
Ground Joint
Flange Unions
Steel to Steel or
Brass to Steel Seat

See page 265



Forged Steel
Combination Elbows
Complete with Flange,
Bolts, and Cranite
or Lead Gasket

See page 266

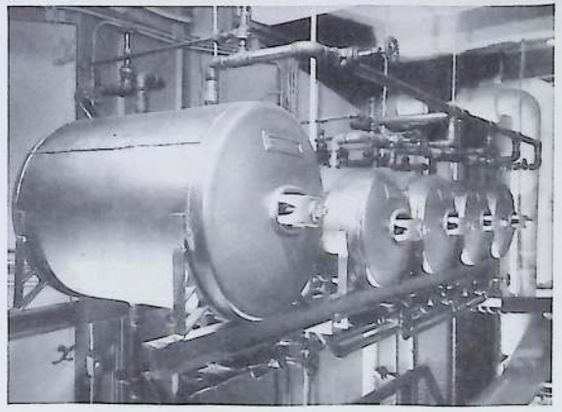
Brass
Fittings, Nipples, Unions, and Flanges

Screwed Fittings
125-Pound....pages 184 and 185
250-Pound....page 186

Flanges
150-Pound Companion Flanges....page 188
300-Pound Companion Flanges....page 188
Floor Flanges....page 184

Unions
125-Pound....page 187
200-Pound, Government Pattern....page 187
300-Pound....page 187

Union Elbows....page 187
Plugs and Bushings....page 185
Nipples....page 186



An installation of Crane brass screwed and solder-joint fittings, unions, and valves in a large commercial building. Office buildings, schools, and hospitals are among the commercial users who choose Crane equipment for dependable control of service lines.

How to read reducing fittings....page 577
Brass Solder-Joint Fittings....pages 422 to 425
Brass Fittings for Marine Service....page 399

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 111 of 314
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asbestosclaims.law/library/21276/111

125-Pound Brass Fittings


90° Elbow


90° Street Elbow

WORKING PRESSURES
125 pounds
saturated steam
175 pounds
cold water, oil or gas, non-shock
Air Tested


45° Elbow


45° Street Elbow


Tee


Cross


Cap


Right Hand Couplings


Right & Left


Reducer


Locknut


45° Y-Bend


Return Bend


Round Floor Flange Right Hand

List Prices, Rough, Each

Size			Inches	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Elbows	Straight	90°		.32	.32	.32	.48	.65	1.00	1.60	2.00	3.25	6.20	9.50	22.00
		45°		.35	.35	.35	.44	.65	1.10	1.76	2.20	3.58	6.80	10.50	24.00
		90° Street		.48	.48	.48	.60	.85	1.40	2.15	2.80	4.75			
		45° Street		.48	.48	.48	.60	.85	1.40	2.15	2.80	4.75			
	Reducing, 90°				.48	.48	.52	.71	1.25	1.90	2.40	4.25	7.50	11.50	26.00
Tees	Straight			.44	.44	.44	.56	.80	1.42	2.00	2.75	4.50	8.50	13.00	30.00
	Reducing	1 opening			.53	.53	.67	.96	1.70	2.40	3.30	5.40	10.00	15.50	36.00
		2 openings				.57	.73	1.05	1.85	2.60	3.50	5.85	11.00		
Crosses				.72	.72	.72	.90	1.30	2.00	3.00	4.00	8.00	15.00	22.00	45.00
Caps*				.24	.24	.24	.32	.42	.66	1.00	1.35	2.30	4.25	6.50	12.50
Couplings	Right Hand*			.32	.32	.32	.40	.53	.80	1.25	1.70	2.80	4.50	6.25	11.50
	Right & Left*					.85	1.00	1.18	1.70	2.40	2.80	4.00	6.50	8.50	
Reducers	Reducing 1 or 2 sizes				.34	.34	.43	.63	1.05	1.70	2.15	3.20	5.50	7.00	15.00
	Reducing 3 sizes							.70			2.35	3.50			
Locknuts*				.15	.15	.15	.25	.30	.45	.68	.88	1.40	2.50	4.00	8.00
45° Y-Bends						1.00	1.15	1.50	2.60	4.30	6.00	10.00			
Return Bends	Close	Center to center, Inches					1	1 1/4	1 1/2	1 3/4	2 3/16	2 5/8			
		Right Hand					.95	1.35	1.90	3.20	5.00	7.75			
	Open	Center to center, Inches					1 1/2	2	2 1/2	3	3 1/2	4			
		Right Hand					1.25	1.80	2.50	3.60	5.75	8.00			
Floor Flanges	Diameter		Inches	2 1/2	2 1/2		3	3	4	5	5	5			
	Right Hand			.75	.75	.88	1.20	1.88	2.15	3.00	4.00				

*Caps 3/8-inch and smaller, Couplings 1/8-inch and smaller, and Locknuts in the 1/8-inch size are made from bar stock.

The largest opening on reducing fittings determines the list price; for example, a

1 x 3/4 x 1" Tee (reducing 1 opening) is $1.70 list.

1 x 1/2 x 3/4" or 3/4 x 3/4 x 1" Tee (reducing 2 openings) is $1.85 list, etc.

Reducing tees: When specifying reducing tees, always name the size of openings in the sequence of the lower case letters shown on the illustration at the right.



Dimensions.....page 185
Brass Nipples.....page 186
Brass Unions.....page 187

Reducing Fittings Carried in Stock

List prices apply only to these sizes.

Reducing 90° Elbows

1/4 x 1/8	1 x 3/4	2 x 1 1/2
3/8 x 1/4	x 1/2	x 1 1/4
x 1/8	1 1/4 x 1	2 1/2 x 2
1/2 x 3/8	x 3/4	3 x 2 1/2
x 1/4	1 1/2 x 1 1/4	x 2
3/4 x 1/2	x 1	4 x 3

Reducers

1/4 x 1/8	1 x 3/4	2 x 1 1/2
3/8 x 1/4	x 1/2	x 1 1/4
x 1/8	1 1/4 x 1	2 1/2 x 2
1/2 x 3/8	x 3/4	3 x 2 1/2
x 1/4	1 1/2 x 1 1/4	x 2
3/4 x 1/2	x 1	4 x 3
x 3/8		
x 1/4		

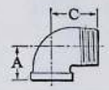
Reducing Tees

a	b	c	a	b	c	a	b	c	a	b	c
1/4 x 1/4 x 1/8	1	x 1	x 3/4	1 1/4 x 3/4	x 1 1/4		2	x 2	x 1 1/2
			x 1/2	1 1/4 x 1/2	x 1 1/4				x 1 1/4
			x 3/8	1 x 1	x 1 1/4				x 1
3/8 x 3/8 x 1/4									x 3/4
3/8 x 1/4 x 3/8	1	x 3/4	x 1						x 1/2
x 1/4			x 3/4	1 1/2 x 1 1/2 x 1 1/4		2	x 1 1/2 x 2		
			x 1/2		x 1				x 1 1/2
1/2 x 1/2 x 3/8	1	x 1/2	x 1		x 3/4		1 1/2 x 1 1/2 x 1		
x 1/4			x 3/4		x 1/2				2 1/2 x 2 1/2 x 2
1/2 x 3/8 x 1/2	3/4	x 3/4	x 1	1 1/2 x 1 1/4 x 1 1/2			2 1/2 x 2 1/2 x 2		
x 3/8			x 1/2		x 1 1/4		2	x 2	x 2 1/2
3/8 x 3/8 x 1/2				1 1/2 x 1	x 1 1/2		3	x 3	x 2 1/2
	1 1/4 x 1 1/4 x 1		x 3/4		x 1 1/4				x 2
3/4 x 3/4 x 1/2			x 3/8		x 1				
x 3/8			x 1/2	1 1/2 x 3/4	x 1 1/2		4	x 4	x 3
3/4 x 1/2 x 3/4	1 1/4 x 1	x 1 1/4	x 1	1 1/4 x 1 1/4 x 1 1/2					x 2
x 1/2			x 3/4	1 x 1	x 1 1/2				
1/2 x 1/2 x 3/4									

Dimensions of 125-Pound Brass Fittings

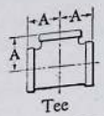
Dimensions are given in inches. For list prices see the preceding page.

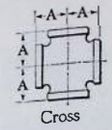

90° Elbow

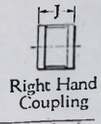

90° Street Ell


45° Elbow


45° Street Ell

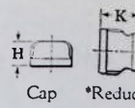

Tee


Cross

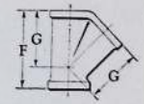

Right Hand Coupling

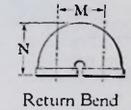
Size			1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
A			9/16	11/16	13/16	1	1 3/16	1 7/16	1 11/16	1 7/8	2 3/16	2 11/16	3 1/8	3 3/4
B			1/2	9/16	5/8	13/16	7/8	1 1/16	1 1/4	1 5/16	1 1/2	1 15/16	2 3/16	2 5/8
C			15/16	1 1/8	1 1/4	1 1/2	1 11/16	2	2 1/4	2 7/16	2 7/8			
D			7/16	5/8	11/16	13/16	15/16	1 1/16	1 1/4	1 3/8	1 11/16			
E			13/16	15/16	1 1/16	1 3/16	1 5/16	1 1/16	1 1/2	1 11/16	1 7/8	2 1/4		
F					1 13/16	2 3/16	2 5/8	3 3/16	3 7/8	4 1/4	5			
G					1 5/16	1 5/8	1 15/16	2 3/8	2 7/8	3 1/8	3 3/4			
H			1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 3/16	1 5/16	1 11/16	1 3/4	2
J			7/8	1 5/16	1 1/16	1 5/16	1 7/16	1 11/16	1 7/8	1 15/16	2 3/16	2 7/8	3 3/16	3 11/16
K*				1 5/16	1 1/16	1 1/8	1 3/8	1 9/16	1 11/16	1 7/8	2 1/16	3 1/4	3 11/16	4 3/8
Return Bends	Close	M					1	1 1/4	1 1/2	1 3/4	2 3/16	2 5/8		
		N					1 7/16	1 3/4	2 1/16	2 1/2	2 7/8	3 3/8		
	Open	M					1 1/2	2	2 1/2	3	3 1/2	4		
		N					1 11/16	2 1/8	2 9/16	3 1/16	3 1/2	4		
Floor Flange	Flange diameter			2 1/2	2 1/2	3	3	4	5	5	5			
	Flange thickness			5/32	3/16	7/32	3/16	1/4	1/4	9/32	9/32			
	Hub thickness			1/2	9/16	5/8	11/16	25/32	7/8	15/16	1 1/32			
	Bolt circle dia.			1 13/16	1 13/16	2 1/4	2 5/16	3 1/8	3 13/16	3 15/16	3 7/8			
	No. & dia. holes			3-7/32	3-7/32	4-1/4	4-1/4	4-1/4	4-1/4	5-1/4	5-9/32	5-9/32		
Z			1/4	3/8	3/8	1/2	9/16	11/16	11/16	11/16	3/4	15/16	1	1 1/8

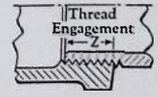
The dimensions shown cover most currently used straight size fittings and Reducers. Dimensions of reducing sizes and other types of fittings furnished on application.


Cap *Reducer

*K is for reducers with either one or two size reductions.


45° Y-Bend


Return Bend



For explanation, see page 494.

Brass Plugs and Bushings


Cored Plug Square Head


Solid Plug Square Head


Countersunk Plug


Bushing Outside Hexagon


Bushing Inside Hexagon


Face Bushing

List Prices, Rough

Size			Inches	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Plugs	Square Head	Cored	Each				.33	.38	.50	.75	.95	1.50	2.50	4.00	7.50
		Solid	Each	.21	.21	.21	.33	.40	.60	.90	1.25	2.10	3.70	6.00	14.50
	Countersunk		Each				.33	.40	.60	.90	1.25	2.10	3.70	6.00	14.50
Bushings	Hexagon	Reducing 1 or 2 sizes	Each		.20	.20	.25	.35	.53	.90	1.15	1.70	3.40	5.00	11.00
		Reducing 3 to 5 sizes	Each				.30	.42	.64	1.08	1.40	2.05	4.10	6.00	13.00
	Face		Each		.42	.42	.48	.66	.99	1.32	1.65	2.10			

Plugs: Generally, Cored and Countersunk Plugs are used with 125-Pound Brass Fittings (page 184), and Solid Plugs with 250-Pound Brass Fittings (page 186). Solid Plugs 3/8-inch and smaller are made from bar stock.

Hexagon Bushings: Hexagon Bushings have an outside or inside hexagon, as illustrated above, depending on the size of the bushing; see the table at the right. The 1/4 x 1/8-inch size is made from bar stock.

Face Bushings: Face Bushings in sizes 1/2-inch and smaller and in the 1 1/4-inch size do not have the two small lugs shown in the illustration above. Sizes 1/2-inch and smaller are made from bar stock.

250-Pound Brass Fittings..page 186 ***Brass Unions..page 187***

Bushings Carried in Stock

List prices apply only to these sizes.

Hexagon Bushings

1/4 x 1/8	1 1/4 x 1	2 1/2 x 2
3/8 x 1/4	x 3/4	x 1 1/2 †
x 1/8	x 1/2	x 1 1/4 †
1/2 x 3/8	x 3/8	x 1 †
x 1/4	1 1/2 x 1 1/4	3 x 2 1/2
x 1/8	x 1	x 2 †
3/4 x 1/2	x 3/4	x 1 1/2 †
x 3/8	x 1/2	x 1 1/4 †
x 1/4	2 x 1 1/2	4 x 3
1 x 3/4	x 1 1/4	x 2 1/2 †
x 1/2	x 1	x 2 †
x 3/8	x 3/4	x 1 1/2 †
x 1/4	x 1/2	

Face Bushings

1/4 x 1/8	
3/8 x 1/4	
1/2 x 3/8	
x 1/4	
3/4 x 1/2	
1 x 3/4	
x 1/2	
1 1/4 x 1	
1 1/2 x 1 1/4	
2 x 1 1/2	
x 1 1/4	

†Indicates Bushings made with inside hexagon.

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asbestosclaims.law/library/21276/112

250-Pound Brass Fittings


90° Elbow


45° Elbow

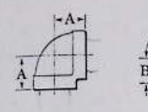

Tee

WORKING PRESSURES
250 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock
Air Tested


Cross


Coupling

Dimensions of 90° Elbows and Tees apply only to straight sizes; dimensions of reducing sizes will be furnished on request.



See page 494 for explanation

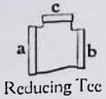
List Prices, Rough, Each, and Dimensions

Size			Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
Elbows	90°	Straight		.56	.56	.85	1.15	2.00	3.00	4.50	7.50	12.00	20.00	37.00
		Reducing				1.10	1.30	2.40	3.60	5.40	9.00	14.40	24.00	44.50
	45°			.62	.62	.88	1.20	2.10	3.15	4.75	7.75	12.50	21.00	39.00
Tees	Straight			.90	.90	1.20	1.65	2.60	4.20	6.00	10.00	15.00	24.00	41.00
	Reducing	1 opening				1.30	1.80	2.85	4.60	6.60	11.00	16.50	25.50	45.00
		2 openings					1.90	3.00	4.80	6.90				
Crosses				1.30	1.30	2.00	2.50	4.00	5.50	8.50	14.00	22.00	30.00	45.00
Couplings, Right Hand				.70	.70	1.00	1.25	1.90	2.70	4.00	5.50	9.00	13.00	20.00
Dimensions, in Inches	A	90° Elbows		13/16	15/16	1 1/8	1 5/16	1½	1¾	1 15/16	2¼	2 11/16	3⅛	3¾
		Tees		13/16	15/16	1 1/8	1 5/16	1½	1¾	1 15/16	2¼	2 13/16	3¼	4
		Crosses		¾	15/16	1 1/16	1 5/16	1½	1 13/16	2	2⅜	2⅞	3⅜	4 1/16
	B			¾	13/16	⅞	1	1⅛	1 5/16	1 7/16	1 11/16	1¾	2⅛	2 7/16
	F			1⅜	1½	1 7/16	1⅝	1 13/16	2⅛	2⅜	2 11/16	3 1/16	3¼	4
	Z			⅜	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1	1⅛

List prices of reducing 90° elbows and tees apply only to sizes carried in stock.

The largest opening on reducing fittings determines the price; for example, a 1 x ¾ x 1″ Tee (reducing 1 opening) is $2.85 list, a 1 x ¾ x ¾″ or ¾ x ¾ x 1″ Tee (reducing 2 openings) is $3.00 list, etc.

Reducing tees: When specifying reducing tees always name the size of openings in the sequence of the lower case letters as illustrated at the right.



Reducing Tee

Reducing Fittings Carried in Stock

Reducing 90° Elbows	Reducing Tees a b c	a b c	a b c	a b c	a b c
½ ×⅜	1½×1¼	½×½×⅜	1 ×¾ ×1	1¼×¾ ×1¼	1½×1 ×1½	3×3 ×2
¾ ×½	×1	¾×¾×½	×¾	1 ×1 ×1¼	1¼×1¼×1½	3×2½×3
1 ×¾	2 ×1½	×⅞	¾ ×¾ ×1			3×2 ×3
×½	×1¼	¾×½×¾	1¼×1¼×1	1½×1½×1¼	2 ×2 ×1½	
1¼×1	2½×2	×½	×¾	×1	×1¼	4×4 ×3
×¾	3 ×2½	½×½×¾	×½	×¾	×1	×2
	×2	1 ×1 ×¾	1¼×1 ×1¼	×½	×¾	4×3 ×4
	4 ×3	×½	×1	1½×1¼×1¼	×½	
				×1	2½×2½×2	

Red Brass Nipples


Close Nipple


Long Nipple

These are high quality Brass Nipples, made from new pipe, having clean, sharp threads accurately cut to gauge.

Brass Locknuts...page 184
Brass Plugs.....page 185
Brass Bushings...page 185
Brass Unions.....page 187

List Prices

Pipe Size Inches	Length Inches Close	List Prices, Each — Length, Inches: Close	1½	2	2½	3	3½	4	4½	5	5½	6
⅛	¾	.10	.12	.15	.17	.18	.20	.22	.24	.26	.28	.30
¼	⅞	.14	.18	.21	.24	.27	.30	.33	.37	.40	.43	.46
⅜	1	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.60
½	1⅛	.23	.25	.31	.37	.42	.47	.53	.59	.65	.71	.77
¾	1⅜	.32		.38	.46	.54	.62	.70	.78	.85	.93	1.00
1	1½	.44		.53	.63	.74	.84	.94	1.05	1.16	1.27	1.40
1¼	1⅝	.69		.92	.92	1.07	1.23	1.38	1.53	1.68	1.84	2.00
1½	1¾	.83		1.06	1.06	1.24	1.43	1.61	1.78	1.96	2.15	2.30
2	2	1.15			1.40	1.65	1.89	2.13	2.37	2.61	2.85	3.10
2½	2½	2.64				3.10	3.56	4.02	4.48	4.94	5.40	5.86
3	2⅝	3.85				4.47	5.06	5.70	6.26	6.90	7.53	8.16
4	2⅞	7.25						9.40	10.50	11.50	12.60	13.80
5	3	13.25						16.50	16.50	18.00	19.50	21.00
6	3⅛	18.00						22.00	22.00	24.00	26.00	28.00

Brass Ground Joint Unions

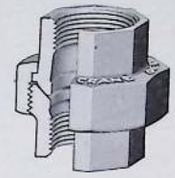
125-Pound

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas, non-shock


125-Pound
Octagon ends on sizes ⅜ to 2-inch; round ends on other sizes.

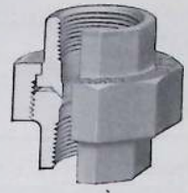
Government Pattern

WORKING PRESSURES
200 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock
Air Tested


No. 523½
Octagon Ends

300-Pound

WORKING PRESSURES
300 pounds steam, 550° F.
600 pounds cold water, oil, or gas, non-shock
Air Tested


No. 696 E
Octagon Ends

These unions have a ground joint; no gasket is required.

List Prices and Dimensions

Size		Inches	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3
125-Pound	Rough	Each	1.02	1.02	1.02	1.23	1.70	2.25	3.30	3.90	6.00	11.00	17.00
	End to End	Inches	1 11/32	1 19/32	1⅝	1¾	2 1/16	2 13/32	2⅜	2 15/32	2 15/16	3 13/16	3 13/16
Government Pattern	No. 523½, Rough	Each	1.25	1.25	1.25	1.60	2.25	3.00	4.20	5.40	8.50	13.70	23.40
	End to end	Inches	1 7/16	1 9/16	1¾	1 15/16	2⅛	2 7/16	2 11/16	2¾	3 3/16	3 9/16	3¾
300-Pound	No. 696 E, Rough	Each		2.75	2.75	3.15	4.40	6.00	8.50	10.50	15.50		
	End to end	Inches		1⅝	1 13/16	1 15/16	2¼	2 7/16	2 13/16	3	3⅜		

The No. 523½ Government Pattern Unions when cast in the required composition, comply with U. S. Navy Department Specifications.

The No. 696 E 300-Pound Unions are made of Crane Special Bronze, a hard, leaded tin bronze.

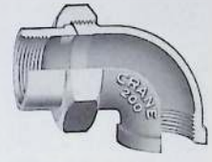
Ground joint: All of these unions have a ground joint seat that holds pressure easily; no gasket is required.

The unions can be taken apart and reassembled repeatedly without affecting their strength or tightness.

Brass Ground Joint Union Elbows

WORKING PRESSURES
200 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock

Air tested ***Ground joint*** ***No gasket required***


No. 524½
90° Union Elbow

No. 524½ Union Elbows have a semi-finished tail-piece; the elbow portion is rough. On sizes 1-inch and larger, the tail-piece has inside lugs, as illustrated; on smaller sizes, the tail-piece is made without lugs. The elbows have a ground joint seat that holds pressure easily; no gasket is required.

List Prices and Dimensions

Size		Inches	⅛	¼	⅜	½	¾	1	1¼	1½	2
No. 524½	Price	Each	2.15	2.15	2.15	2.90	3.90	5.70	8.00	10.00	15.00
	Center to end	Inches	9/16	13/16	15/16	1 1/8	1 5/16	1 7/16	1¾	1 15/16	2¼
	Center to union end	Inches	1½	1¾	1 15/16	2 3/16	2⅝	3	3 7/16	3¾	4¼

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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150 and 300-Pound Brass Flanges

Working Pressures
No. 2104
150 pounds saturated steam
225 pounds cold water, oil, or gas, non-shock



Companion Flange
No. 2104, 150-Pound
No. 2109, 300-Pound

Working Pressures
No. 2109
300 pounds steam
500 pounds cold water, oil, or gas, non-shock

List Prices and Dimensions

Size			1	1¼	1½	2	2½	3	4	5	6
150-Pound F. & D.	No. 2104, Screwed Flange	Each	7.00	8.00	10.00	13.50	17.00	21.00	30.00	36.00	44.00
	Diameter	Inches	4¼	4⅝	5	6	7	7½	9	10	11
	Thickness	Inches	3/8	13/32	7/16	1/2	9/16	5/8	11/16	3/4	13/16
300-Pound F. & D.	No. 2109, Screwed Flange	Each	8.75	10.00	12.50	16.50	21.00	26.00			
	Diameter	Inches	4⅞	5¼	6⅛	6½	7½	8¼			
	Thickness	Inches	19/32	5/8	11/16	3/4	13/16	29/32			

150-Pound: The No. 2104 Companion Flange is made of red brass. Dimensions conform to the MSS 150-Pound SP Bronze Flange and Flanged Fitting Standard (No. SP-2-1946).

All sizes interchange with American Standard Cast Iron Flanges, Class 125, differing only in thickness and in facing.

300-Pound: The No. 2109 Companion Flange is made of a high grade steam metal. Dimensions conform to the MSS 300-Pound SP Bronze Flange and Flange Fitting Standard (No. SP-2-1946).

All sizes interchange with American Standard Cast Iron Flanges, Class 250, differing only in thickness and in facing.

Facing: The flanges are plain faced, with two V-shaped concentric grooves between the port and the bolt holes. Full face gaskets should be used.

Drilling: These flanges are furnished faced and drilled (F. & D.) unless ordered faced only.

Prices include facing and drilling to the MSS Standard. No deduction is made when flanges are ordered faced only.

Bolting to iron or steel material: When brass flanges are bolted to iron or steel material which normally has a raised face, the raised face should be removed to provide a full face bearing for the gasket.

Brass flanged material should not be bolted to Cranelap Flanged Pipe Joints.

Templates for drilling . . . . page 458



At the Crane Chicago Works
Inspecting and checking the alignment of Crane Screwed Fittings.

Railing Fittings

Railing Fittings
Ball Pattern, Malleable Iron . . . . . page 190
Adjustable, Malleable Iron . . . . . page 191
Nu-Rail Slip-on, Aluminum . . . . . page 193

Railing Threads
Dimensions and Normal Engagement . . . . . page 192

Rivets
For Railing Fittings . . . . . page 192

Brass Floor Flanges . . . . . page 184
Iron Floor Flanges . . . . . page 203



2-inch Galvanized Double Pipe Railing — total length of railing 6000 feet
Fabricated in a Crane Branch House Shop

Crane Shops can furnish Pipe Railings of all descriptions and for a large variety of services. They can be manufactured from any kind of commercial pipe, using any of the regular railing fittings listed or special types when exceptional conditions prevail.

Pipe Railings can be supplied with the fittings and pipe loose, all completely cut to length and prepared ready for field assembly. Small sizes of railings and sections of large railings can be assembled in Crane Shops and delivered to the field site for final assembly by the user.

Beyond the scope of the regular Railing Fittings, Crane can provide special fittings for screwed, slip, or slip and pinned joints to fill every requirement. For long railings, the posts can be assembled separately, using threaded joints, and the horizontal runs of the fittings reamed and drilled for slip and pin connections; random runs of pipe can then be economically utilized to complete the railing in the field.

When so desired, special Pipe Railings requiring bent sections or welded construction can be fabricated in Crane Shops.

Orders and inquiries for price or information on Pipe Railings should be accompanied by a sketch showing dimensions. In the case of stair railings, the angle should be specified.

Inquiries or orders should also specify the kind and finish of the pipe, the type or figure number of the fittings, details regarding the openings, and whether or not partially or completely assembled.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Malleable Iron Ball Pattern Railing Fittings



90° Elbow
No. 1, Right Hand



Square Floor Flange
No. 7, Right Hand

Brass Round Floor Flanges....page 184
Iron Round Floor Flanges....page 203



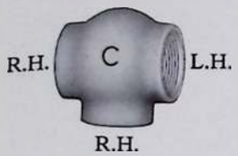
Male Ball Ornament
No. 8, Left Hand
No. 8½, Right Hand



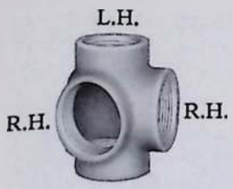
Female Ball Ornament
No. 13, Right Hand



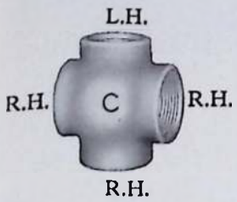
90° Side Outlet Elbow
No. 2, Right Hand



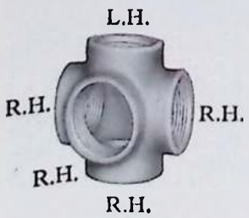
Tee
No. 3, Tapped as shown
No. 3½, Right Hand



Side Outlet Tee
No. 4, Tapped as shown
No. 4½, Right Hand



Cross
No. 5, Tapped as shown
No. 5½, Right Hand



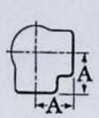
Side Outlet Cross
No. 6, Right Hand
No. 6½, Tapped as shown

List Prices, Each

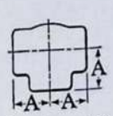
Size		Inches	½	¾	1	1¼	1½	2
90° Elbows	No. 1	Black	.43	.52	.64	.92	1.20	1.65
		Galv.	.56	.68	.83	1.20	1.55	2.15
90° Side Outlet Elbows	No. 2	Black	.57	.72	.84	1.20	1.60	2.20
		Galv.	.74	.94	1.10	1.55	2.10	2.85
Tees	No. 3 or 3½	Black	.47	.57	.70	1.00	1.30	1.80
		Galv.	.61	.74	.91	1.25	1.70	2.25
Side Outlet Tees	No. 4 or 4½	Black	.69	.82	1.10	1.45	1.95	2.60
		Galv.	.90	1.05	1.45	1.90	2.55	3.40
Crosses	No. 5 or 5½	Black	.60	.74	.95	1.30	1.75	2.35
		Galv.	.78	.96	1.20	1.65	2.25	2.95
Side Outlet Crosses	No. 6 or 6½	Black	.80	.93	1.20	1.65	2.20	2.95
		Galv.	1.05	1.20	1.55	2.15	2.85	3.85
Square Floor Flanges	No. 7	Black	.37	.48	.55	.92	1.35	2.35
		Galv.	.48	.62	.72	1.20	1.75	3.15
Male Ball Ornaments	No. 8 or 8½	Black	.67	.80	.95	1.15	1.40	1.75
		Galv.	.87	.99	1.25	1.50	1.80	2.35
Female Ball Ornaments	No. 13	Black	.67	.80	.95	1.15	1.40	1.75
		Galv.	.87	.99	1.25	1.50	1.80	2.35

Reamed fittings: Fittings with one or more openings reamed for slip joint, or with one or more openings reamed for slip joint and drilled for rivets, can be made to order at an advance over regular list prices. See the Crane Discount Sheet for prices. Orders should be accompanied by a sketch.

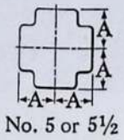
Dimensions, in Inches



No. 1



No. 3 or 3½



No. 5 or 5½



No. 2



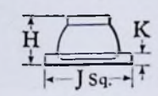
No. 4 or 4½



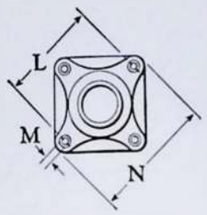
No. 6 or 6½

Size	½	¾	1	1¼	1½	2
A	1⅛	1 5/16	1½	1¾	1 15/16	2¼
E	2	2½	2 11/16	3⅜	3¾	4 11/16
F	2½	3 1/16	3 7/16	4 3/16	4 11/16	5 9/16
G	1½	1⅞	2 1/16	2½	2 13/16	3 7/16
H	1 3/16	1½	1¾	2 3/16	2½	2 15/16
J	2⅛	2½	3 5/16	4 3/16	4¾	5¾
K	¼	5/16	5/16	11/32	⅜	7/16
L	2⅛	2 15/32	3½	4⅝	5⅜	6¾
M	¼	¼	9/32	5/16	5/16	11/32
N	2¾	3¼	4⅜	5½	6⅜	7⅝

*Dimension "A" applies to the center to side outlet also.



No. 7—Side View



No. 7—Top View



No. 8 or 8½

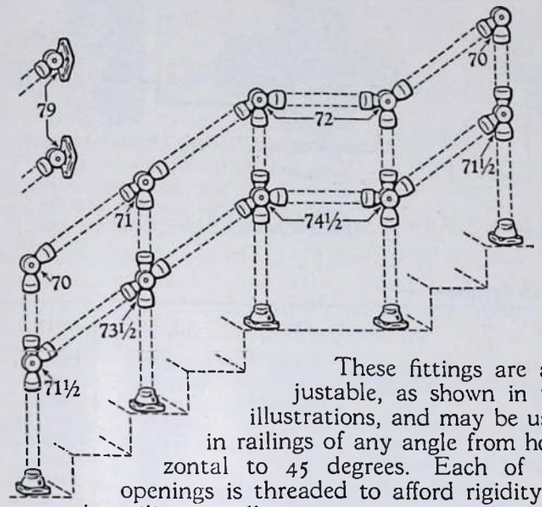


No. 13

For threading, thread engagement, and rivet data, see page 192.

Malleable Iron Adjustable Railing Fittings

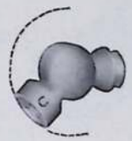
Ball Type



These fittings are adjustable, as shown in the illustrations, and may be used in railings of any angle from horizontal to 45 degrees. Each of the openings is threaded to afford rigidity to the railing installation.



Elbow
No. 70, Right Hand
Female



Elbow
No. 70½, Right Hand
Male and Female

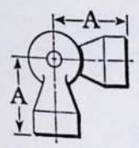
No. 70½ Male and Female Elbows may be used in combination with the Ball Pattern Railing Fittings shown on page 190. Such combinations provide for corner fittings and enable erecting railings at angles steeper than 45 degrees.

Galvanized fittings: Galvanized fittings are made to order; for list prices, add 50% to the prices of the black fittings shown below.

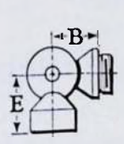
List Prices, Black

Size		Inches	1	1¼	1½	2
Elbows	No. 70	Each	2.70	2.90	3.70	5.75
	No. 70½	Each	3.00	3.30	4.10	6.30
Tees	No. 71	Each	3.50	4.15	4.60	8.00
	No. 71½	Each	3.50	4.15	4.60	8.00
	No. 72	Each	3.50	4.15	4.60	8.00
Crosses	No. 73	Each	4.20	5.10	6.00	10.00
	No. 73½	Each	4.20	5.10	6.00	10.00
	No. 74	Each	4.20	5.10	6.00	10.00
	No. 74½	Each	4.20	5.10	6.00	10.00
Flanges	No. 79	Each	3.45	4.10	4.75	8.50

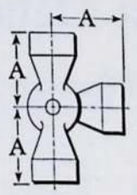
Dimensions, in Inches



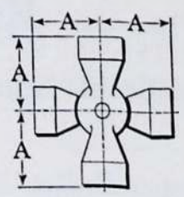
Elbow
Female



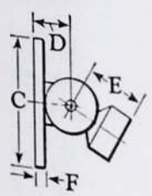
Elbow
Male and Female

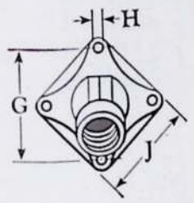


Tees



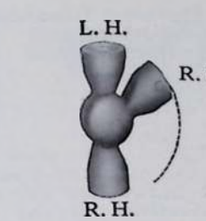
Crosses





Flange

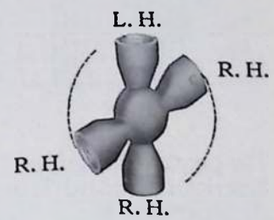
Size	1	1¼	1½	2
A	2¾	3¼	3¾	4¼
B	1 11/16	2⅛	2⅜	2 15/16
C	4⅜	5 9/16	6⅜	7¾
D	1 11/16	1 11/16	1⅞	2¼
E	2 3/16	2½	2 13/16	3¼
F	5/16	⅜	⅜	7/16
G	3¾	4 13/16	5 9/16	6¾
H	9/32	5/16	5/16	11/32
J	3 5/16	4 3/16	4¾	5¾



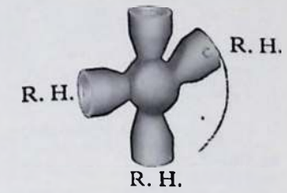
Tee
No. 71, Right Hand
No. 71½, Tapped as shown



Stair Landing Tee
No. 72, Right Hand



Cross
No. 73, Right Hand
No. 73½, Tapped as shown



Stair Landing Cross
No. 74, Right Hand
No. 74½, Tapped as shown



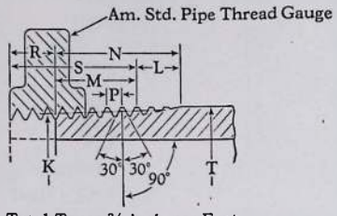
Flange
No. 79, Right Hand

For thread engagement, see page 192.

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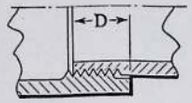
Crane Railing Pipe Threads

Threading Tolerance:
Nothing Large
One turn Small



Dotted lines show the amount that an American Standard Pipe Thread is shortened at the end.

Total Taper ¾-inch per Foot



Crane Railing Fitting Thread Assembly
The recess in the fitting provides a covering for the last scratch or imperfect thread on the Railing Pipe, making a neat appearing joint.

Dimensions, in Inches

Size of Pipe	T O.D. of Pipe	Number of Threads Per Inch	K Pitch Dia. at End of Male Thread	S Effective Length Am. Std. Pipe Thread	M Effective Length Am.Std. Railing Pipe Thread	N Total Length of Male Thread (Max.)	R Amount Am. Std. Pipe Thread is Shortened at the End Thds.	R Inches	P Pitch of Thread	L Imperfect Threads due to Lead of Die (Max.) Thds.	L Inches	D Length of Pipe Entering Recessed Railing Fitting
½	.840	14	.77182	.5337	.3194	.4980	3	.2143	.07143	2½	.1786	½
¾	1.050	14	.98107	.5457	.3314	.5100	3	.2143	.07143	2½	.1786	½
1	1.315	11½	1.22993	.6828	.4219	.6393	3	.2609	.08696	2½	.2174	⅝
1¼	1.660	11½	1.57343	.7068	.4459	.7068	3	.2609	.08696	3	.2609	11/16
1½	1.900	11½	1.81239	.7235	.4626	.7235	3	.2609	.08696	3	.2609	¾
2	2.375	11½	2.28532	.7565	.4956	.7565	3	.2609	.08696	3	.2609	¾

Cutting Railing Pipe Threads

The above Railing Pipe Threads are the same as the American Standard Taper Pipe Threads except they are shortened at the small end by three threads as shown in Column "R". Regular solid or adjustable dies may be used, making allowance for the three threads that this thread is shortened. The dies, therefore, should only be run on far enough to provide the specified "R" dimension.

The total thread length "N" is maximum and if necessary may be shorter provided the length of imperfect threads "L" caused by the lead of the die is reduced the same amount.

Crane Thread Lubricants....page 464

Rivet Data

For Malleable Iron Ball Pattern Railing Fittings

The Malleable Iron Ball Pattern Railing Fittings illustrated on page 190 can be especially prepared for rivets, when so ordered; prices on application.

When supplied for riveted joints, the diameter of the rivet hole and its location in relation to the end of the fitting will conform to the data shown in the table at the right. Any other drilling for rivets is considered special, and orders must be accompanied by complete details or a sketch; prices will be furnished on application.

For satisfactory results, users are urged to abide by these standard diameters and lengths of rivets.

Dimensions, in Inches

Nominal Pipe Size of Fitting	Drilling of Rivet Holes for all Malleable Iron Railing Fittings: Diameter of Hole	Center of Hole to End of Fitting	Diameter of Rivet	Length of Rivet Measured from under Head
½	3/16	5/16	3/16	1¼
¾	3/16	5/16	3/16	1½
1	¼	⅜	¼	1¾
1¼	¼	⅜	¼	2¼
1½	¼	⅜	¼	2½
2	5/16	⅜	5/16	3

Nu-Rail Slip-On Fittings


No. 10
Cross


No. 20
Corner


No. 30
Adjustable Cross


No. 30-A
Modified Cross


No. 30-B
Swivel

Low Cost Installations with Nu-Rail

Specially designed Nu-Rail Fittings effect a quick, easy, and economical method of pipe fitting. Attractive, modern appearance combined with engineering simplicity make them ideal for a host of applications. They are widely used in the construction of railings, storage bins and racks, truck racks, pipe enclosures, scaffolds, display stands, turnstiles, grandstand structures, etc.


No. 30-C
Adjustable Swivel


No. 40
Floor Flange

Designed for easy usage: Nu-Rail Fittings are extremely easy to use. They are equipped with knurled point, hardened steel set screws. Simply slip the pipe through the fitting and tighten the screws to lock the pipe in a firm, permanent grip. The screws are free of vibration.

The fittings feature an offset design which permits the pipe to cross and continue through the fitting. No threading or welding is necessary, and because the pipe slips through the fitting, cutting is reduced to a minimum. The result is easier installation and a substantial saving in labor cost.


No. 50
Wall Flange

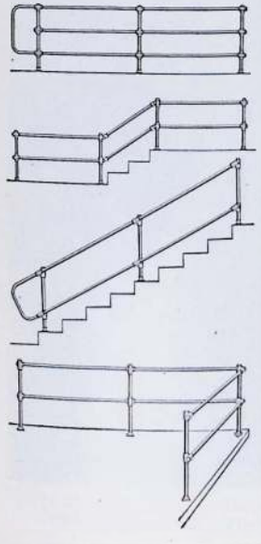

No. 60
Plug

Sturdy, corrosion-resistant materials: The fittings are made of virgin aluminum and magnesium alloy having a tensile strength of 35,000 to 45,000 pounds per square inch and an elongation of 11 to 15 per cent. They will safely carry full capacity loads and their use is limited only by the maximum strength of the pipe used.

Available Sizes, Inches

Catalog No.	Straight Sizes	Reducing Sizes
No. 10	¾, 1, 1¼, 1½, or 2	1 ×¾ 1¼×1 1½×1¼ or 2 ×1½
No. 20		
No. 30		
No. 30-A		
No. 30-B	¾, 1, 1¼, 1½, or 2	
No. 30-C		
No. 40		
No. 50		
No. 60		

Typical Applications



Snug pipe fit: Allowing for a reasonable variation in pipe size, Nu-Rail Fittings are gauged to fit standard iron pipe sizes of aluminum, brass, or iron with sufficient clearance to permit the fittings to slip easily on the pipe.

A wide choice: As shown in the small table at the upper right, Nu-Rail Fittings are available in a wide range of both straight and reducing sizes.

The complete line includes basic cross, corner, and swivel fittings, which, with the use of the No. 60 Plugs, can be used individually or in combination to make up any conceivable type of fitting. Refer to the large table at the right.

Completing the line and simplifying installation problems are a No. 40 Floor Flange and a No. 50 Wall Flange.

Prices and additional data will be furnished on application.

Varied Applications of Basic Fittings

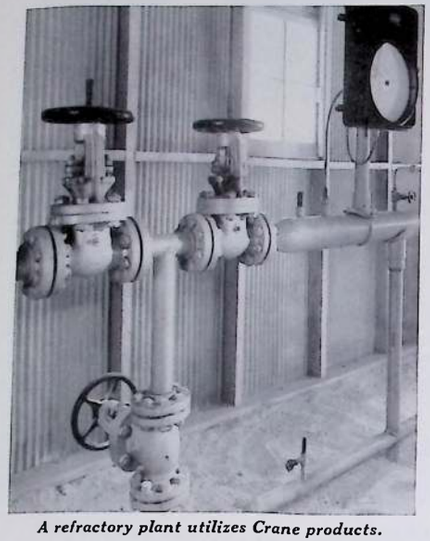
Type of Fitting Wanted		Use Fittings Listed Below
Non-Adjustable	Elbow Tee Cross	No. 10
	S.O. Elbow S.O. Tee	No. 20
Adjustable	Elbow Tee Cross S.O. Elbow S.O. Tee S.O. Cross	No. 30
Double Adjustable	Elbow Tee Cross	No. 10 with two No. 30-B
Adjustable Stair Landing	Tee Cross S.O. Tee S.O. Cross Double S.O. Tee Double S.O. Cross	No. 30-A with No. 30-C

19

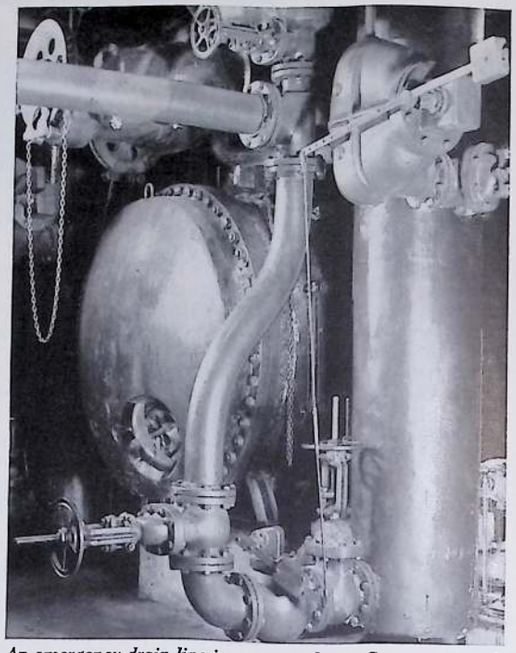
19

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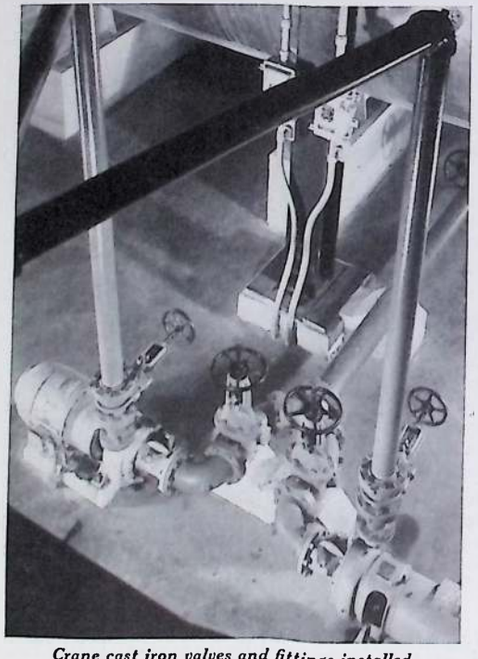
The Best in Piping Equipment Always — From Crane



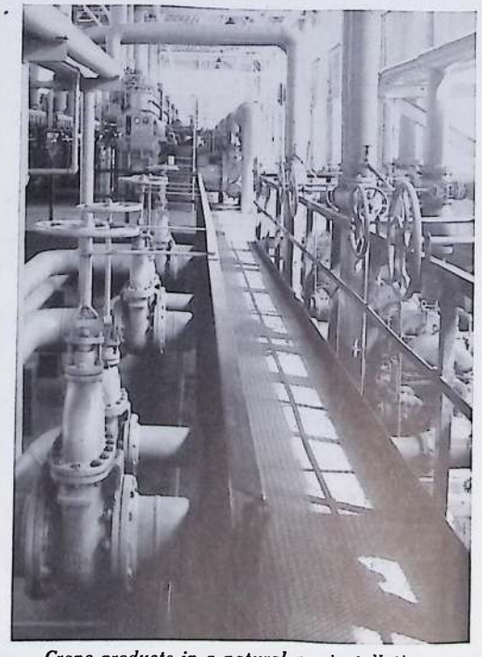
A refractory plant utilizes Crane products.



An emergency drain line in a power plant—Crane-equipped.



Crane cast iron valves and fittings installed in the mash transfer lines of a distillery.



Crane products in a natural gas installation; extension stems on valves facilitate operation.

Iron Flanged Fittings and Flanges

125-Pound Fittings
General Description....pages 196 to 198
Dimensions....pages 196 and 197
Working Pressures....page 198
List Prices....page 199

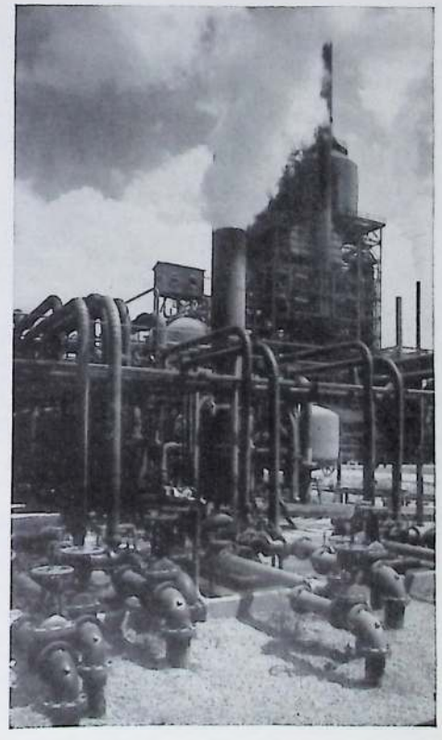
250-Pound Fittings
General Description....page 200
Dimensions....page 200
Working Pressures....page 200
List Prices....page 201

125-Pound Flanges....pages 202 and 203
250-Pound Flanges....page 204
Round Floor Flanges....page 203

These products are made of quality materials and are accurately machined and finished. Crane Cast Iron, used for the smaller sizes, and Crane Ferrosteel, used for the larger sizes, exceed the minimum requirements of A.S.T.M. Specification A 126, covering Gray-Iron Castings for Valves, Flanges, and Pipe Fittings.

Crane also manufactures a complete line of steel flanged fittings and flanges, 18-8 Mo flanged fittings and flanges, and brass flanges. For information on these and other allied products, see the pages referred to below:

Cast Steel Flanged Fittings....pages 267 to 274
Forged Steel Flanges....pages 291 to 298
Welding Fittings....pages 275 to 290
Brass Flanges....page 188
18-8 Mo Fittings and Flanges....page 383
Boiler Flanges....page 290



Crane Cast Iron Flanged Fittings, Cast Iron Flanges, and Iron Body Wedge Gate Valves are standard equipment in many oil and gasoline refineries.

Quality, performance, and durability are built into all Crane products.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 117 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/117

125-Pound Cast Iron Flanged Fittings

WORKING PRESSURES
1½ to 12-inch — **125** pounds saturated steam, **175** pounds cold water, oil, or gas, non-shock
14 to 24-inch — **100** pounds saturated steam, **150** pounds cold water, oil, or gas, non-shock

Pages 196 to 199 illustrate Crane 125-Pound Cast Iron Flanged Fittings. This line offers the user a complete selection of types and sizes. In addition, special fittings of any design can be made to order on receipt of drawings; prices on application.

Sprinkler service; Underwriters' approved: Crane 125-Pound Cast Iron Flanged Fittings sizes 1½ to 8-inch, inclusive, have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

American Standard: The material, dimensions, and drilling of these fittings conform to the American Standard for Cast Iron Flanged Fittings, Class 125 (B16.1-1948).

Material: All fittings sizes 12-inch and smaller are made of Crane Cast Iron, conforming to A.S.T.M. Specification A 126 for Class A Castings. Sizes 14-inch and larger are made of Crane Ferrosteel, conforming to A.S.T.M. Specification A 126 for Class B higher strength Gray Iron Castings.

Facing and drilling: The end flanges are plain faced, with a smooth finish. They are furnished drilled unless ordered faced only; faced only fittings are furnished at the same price as faced and drilled fittings.

The bolt holes are in multiples of four so that the fitting may be turned to face in any quarter; they are regularly drilled to straddle the center lines.

For bolts smaller than 1¾-inch diameter, the bolt holes are drilled ⅛-inch larger than the diameter of the bolts; for bolts 1¾-inch diameter and larger, ¼-inch larger than the diameter of the bolts.

Spot facing: The bolt holes on sizes 16-inch and smaller are not spot faced unless so ordered, and then at an extra price. The list price for spot facing bolt holes is 20 cents per hole. Fittings 18-inch and larger are regularly furnished spot faced at no extra charge.

Drilling to the 25-Pound Standard: When so ordered, sizes 5 to 24-inch, inclusive, can be drilled with smaller bolt holes to conform to the 25-Pound American Tentative Cast Iron Flanged Fitting Standard (B16b2-1931). See page 459 for templates.

Side outlet elbows: On side outlet elbows, all openings are on the intersecting center lines.

Base elbows: The base on Base Elbows is neither faced nor drilled unless so ordered, and then at the extra price shown on page 199. The base is intended for support in compression and is not to be used for anchoring or supporting in tension or shear.

The base on Round Base Elbows, when ordered faced and drilled, will be drilled to the template of the flange corresponding to the size of the supporting pipe, drilling only four holes in all cases, these being placed so as to miss or straddle the ribs.

When the base on Square Base Elbows is ordered faced and drilled, it also is drilled with four holes only, one in each corner. The center to center of opposite holes is the same as the diameter of the bolt circle on the base of the corresponding size Round Base Elbow.

Special angle elbows: Elbows from 1° to 45° have the same center to face dimensions as 45° Elbows; and from 46° to 90°, the same center to face as 90° Elbows. These fittings are made to order only.

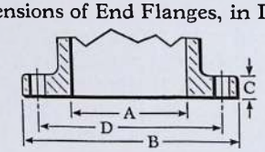
Galvanized fittings: Crane 125-Pound Cast Iron Flanged Fittings are regularly listed black only. Galvanized fittings, however, can be made to order, at an extra charge of 40 per cent over the price of the black fittings.

Machine bolts: On this class of material, ordinary practice in valve and fitting piping is to use steel machine bolts having a Regular Unfinished Square Head and equipped with a Heavy Unfinished Hexagon Nut. For machine bolts, see page 465.

Gaskets: A wide variety of gaskets for 125-pound cast iron flanged joints is listed on page 474, including 1/16-inch cloth inserted rubber, 1/16-inch "CC" Rubber, 4-ounce canvas, and 1/16-inch Cranite—all are either ring type or full face type.

Thread lubricants: Flanged joints are easier to make tight—and to take apart later if necessary—when a good thread lubricant is used on the bolts, flange faces, and gaskets. For thread lubricants, see page 464.

Dimensions of End Flanges, in Inches

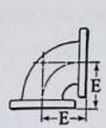


Size	A	B	C	D	No. of bolts	Dia. of bolts
1½	1½	5	9/16	3⅞	4	½
2	2	6	⅝	4¾	4	⅝
2½	2½	7	11/16	5½	4	⅝
3	3	7½	¾	6	4	⅝
3½	3½	8½	13/16	7	8	⅝
4	4	9	15/16	7½	8	⅝
5	5	10	15/16	8½	8	¾
6	6	11	1	9½	8	¾
8	8	13½	1⅛	11¾	8	¾
10	10	16	13/16	14¼	12	⅞
12	12	19	1¼	17	12	⅞
14	14	21	1⅜	18¾	12	1
16	16	23½	17/16	21¼	16	1
18	18	25	19/16	22¾	16	1⅛
20	20	27½	111/16	25	20	1⅛
24	24	32	1⅞	29½	20	1¼

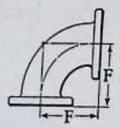
List prices . . . . . page 199
How to read reducing sizes . . . . page 577

125-Pound Cast Iron Flanged Fittings

Dimensions, in Inches



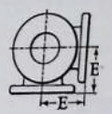
90° Elbow
No. 525, Straight
No. 545, Reducing



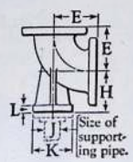
90° Long Radius Elbow
No. 551, Straight
No. 546, Reducing



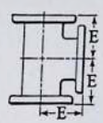
45° Elbow
No. 527
Straight



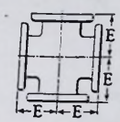
Side Outlet Elbow
No. 526
Straight



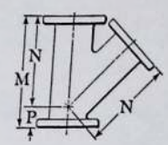
90° Base Elbow
No. 549, with Square Base
No. 550, with Round Base



Tee
No. 529, Straight
No. 531, Reducing



Cross
No. 537
Straight



45° Lateral
No. 541
Straight



Taper Reducer
No. 547



Eccentric Reducer
No. 548

Size Inches	E Center to face, 90° Elbow, Tee, or Cross	EE Face to face, Tee or Cross	F Center to face, 90° Long Radius Elbow	G Center to face, 45° Elbow	H Center to base, 90° Base Elbow	J Size of Supporting Pipe for Base	K Diameter of Round Base or Size of Square	L Thickness of Base	M Face to face, 45° Lateral	N Center to face, 45° Lateral	P Center to face, 45° Lateral	R Face to face, Reducer
1½	4	8		2¼								
2	4½	9	6½	2½					10½	8	2½	
2½	5	10	7	3					12	9½	2½	5½
3	5½	11	7¾	3					13	10	3	6
3½	6	12	8½	3½								6½
4	6½	13	9	4	5½	2	6	⅝	15	12	3	7
5	7½	15	10¼	4½	6¼	2½	7	11/16	17	13½	3½	8
6	8	16	11½	5	7	2½	7	11/16	18	14½	3½	9
8	9	18	14	5½	8⅜	4	9	15/16	22	17½	4½	11
10	11	22	16½	6½	9¾	4	9	15/16	25½	20½	5	12
12	12	24	19	7½	11¼	6	11	1	30	24½	5½	14
14	14	28	21½	7½								16
16	15	30	24	8								18
18	16½	33	26½	8½								
20	18	36	29	9½								
24	22	44	34	11								

Side outlet elbows: The center to face dimensions of Side Outlet Elbows are alike for all three openings; all openings are on intersecting center lines.

Reducing fittings and reducers: The center to face dimensions of Reducing 90° Elbows, Reducing 90° Long Radius Elbows, and Reducing Tees are the same as for the straight sizes corresponding to the size of the largest opening.

The face to face dimensions of Reducers are governed by the size of the larger opening, regardless of the size of the smaller opening. The face to face of Taper and Eccentric Reducers are alike for corresponding sizes.

Dimensions of reducing elbows, reducing tees, and reducers apply only to regularly listed sizes; see page 199. Dimensions of other sizes furnished on request.

Templates for drilling . . . . page 459
Taps and drains for flanged fittings . . . . page 578

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Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/118

125-Pound Cast Iron Flanged Fittings

WORKING PRESSURES

1½ to 12-inch—125 pounds saturated steam, 175 pounds cold water, oil, or gas, non-shock
14 to 24-inch—100 pounds saturated steam, 150 pounds cold water, oil, or gas, non-shock


No. 525
90° Elbow
Straight


No. 545
90° Elbow
*Reducing


No. 551
90° Long Radius Elbow
Straight


No. 546
90° Long Radius Elbow
*Reducing


No. 527
45° Elbow
Straight

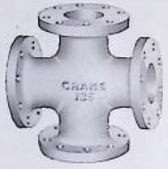

No. 526
Side Outlet Elbow
Straight


No. 549
90° Base Elbow
Square Base


No. 550
90° Base Elbow
Round Base


No. 529
Tee
Straight


No. 531
Tee
*Reducing


No. 537
Cross
Straight


No. 541
45° Lateral
Straight


No. 547
*Taper
Reducer


No. 548
*Eccentric
Reducer

***Reducing fittings:** The prices of Reducing Elbows, Reducing Tees, and of Reducers apply only to the regularly listed sizes as shown on the opposite page; the price is determined by the size of the largest opening. All other sizes are special; prices are furnished on application.

Reducing with flanges: To avoid delays and the higher cost of special fittings, orders for non-listed reducing sizes can be filled by bolting reducing companion flanges on regular fittings. Orders should specify "Reduce with flanges". The illustration at the right shows a No. 525 90° Elbow with a No. 557 Reducing Screwed Flange bolted on one end. For Reducing Flanges, see page 203.


Elbow with Reducing Flange Bolted On

Sprinkler service; Underwriters' approved: Crane 125-Pound Cast Iron Flanged Fittings, sizes 1½ to 8-inch inclusive, have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

Galvanized fittings: Crane 125-Pound Cast Iron Flanged Fittings are regularly listed black only. Galvanized fittings, however, can be made to order, at an extra charge of 40 per cent over the price of the black fittings.

Facing and drilling: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

The fittings are furnished with the end flanges faced and drilled unless ordered faced only; faced only fittings are furnished at the same price as faced and drilled fittings.

The base on Base Elbows is neither faced nor drilled unless so ordered, and then at the extra price shown on the opposite page.

Spot facing: The bolt holes on sizes 16-inch and smaller are not spot faced unless so ordered, and then at an extra price. The list price for spot facing bolt holes is **20** cents per hole. Fittings 18-inch and larger are regularly furnished spot faced at no extra charge.

Drilling to the 25-Pound Standard: When so ordered, sizes 5 to 24-inch, inclusive, can be drilled with smaller bolt holes to conform to the 25-Pound American Tentative Cast Iron Flanged Fitting Standard (B16b2-1931). See page 459 for templates.

Materials: Crane 125-Pound Cast Iron Flanged Fittings, sizes 12-inch and smaller, are made of cast iron; larger sizes are made of Ferrosteel.

125-Pound Cast Iron Flanged Fittings

List Prices, Black, Each—Faced and Drilled

Size Inches	No. 525 90° Elbow Straight	No. 545 90° Elbow Reducing	No. 551 90° Long Radius Elbow Straight	No. 546 90° Long Radius Elbow Reducing	No. 527 45° Elbow	No. 526 Side Outlet Elbow	No. 549 90° Square Base Elbow Base Plain	No. 550 90° Round Base Elbow Base Plain	Extra for Facing and Drilling Base on No. 549 or No. 550
1½	7.20				8.30				
2	7.20	13.20	12.00		8.30				
2½	8.10	14.00	13.50		9.30				
3	9.40	15.00	15.00	21.50	11.00				
3½	11.50		18.50		13.00				
4	12.50	18.50	19.50	27.00	14.50	62.00	21.50	21.50	7.00
5	15.50	21.50	24.00	35.00	18.00	68.00	32.50	32.50	8.00
6	21.50	28.00	31.00	44.00	22.00	70.00	38.50	38.50	8.00
8	33.00	41.00	54.00	76.00	33.00	108.00	51.00	51.00	11.50
10	60.00	64.00	81.00	135.00	59.00	160.00	82.00	82.00	11.50
12	86.00	111.00	130.00	195.00	86.00	230.00	118.00	118.00	17.50
14	114.00	157.00	203.00		114.00				
16	162.00	190.00	270.00		162.00				
18	230.00		338.00		230.00				
20	325.00		433.00		325.00				
24	420.00		810.00		420.00				

Size Inches	No. 529 Tee Straight	No. 531 Tee Reducing	No. 537 Cross	No. 541 45° Lateral	No. 547 Taper Reducer	No. 548 Eccentric Reducer
1½	9.50					
2	9.50	13.25	17.50	20.00		
2½	11.00	14.50	19.00	22.00	14.00	
3	12.00	17.50	21.00	24.50	15.00	15.00
3½	19.00				18.00	
4	20.00	25.00	30.00	34.00	20.00	20.00
5	24.50	30.00	38.00	43.00	24.50	24.50
6	29.00	35.00	49.00	58.00	30.00	30.00
8	43.00	60.00	76.00	86.00	38.00	38.00
10	86.00	90.00	113.00	130.00	68.00	68.00
12	108.00	130.00	162.00	189.00	103.00	103.00
14	189.00	200.00			148.00	
16	270.00				190.00	
18	325.00					
20	400.00					
24	600.00					

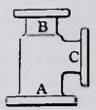
List of Reducing Elbows and of Reducers

The prices of the Nos. 545 and 546 Reducing Elbows and of the Nos. 547 and 548 Reducers apply only to the regularly listed sizes shown below; the price is determined by the size of the larger opening. All other non-listed sizes are special.

No. 545 90° Elbows		No. 546 90° Long Radius Elbows	No. 547 Taper Reducers			No. 548 Eccentric Reducers
2 ×1½	8 ×6	3 ×2½	2½×1½	6 ×5	12×10	3 ×2
2½×2	×5	×2	3 ×2½	×4	×8	4 ×3
3 ×2½	×4	4 ×3	×2	×3	×6	5 ×4
×2	10×8	5 ×4	×1½	×2½	14×12	6 ×5
4 ×3	×6	6 ×5	3½×3	×2	×10	×4
×2½	12×10	×4	4 ×3½	8 ×6	×8	8 ×6
×2	×8	8 ×6	×3	×5	×6	10×8
5 ×4	×6	×5	×2½	×4	16×14	12×10
×3	14×12	10×8	×2	10×8	×12	
6 ×5	16×12	12×10	5 ×4	×6	×10	
×4			×3			
×3			×2½			

List of Reducing Tees

The prices of the No. 531 Reducing Tees apply only to the regularly listed sizes shown below; the price is determined by the size of the largest opening.



A B C	A B C	A B C
2 ×2 ×1½	6×6×5	10×10×8
2½×2½×2	×4	×6
3 ×3 ×2½	×3	×5
×2	×2½	×4
×1½	×2	×3
3 ×2½×3	6×5×6	10×8 ×10
×2½	×5	×8
3 ×2 ×3	×4	×6
×2	6×4×6	8 ×8 ×10
2½×2½×3	×4	12×12×10
4 ×4 ×3	×3	×8
×2½	6×3×6	×6
×2	×4	×5
×1½	×3	×4
4 ×3 ×4	6×2×6	12×10×12
×3	5×5×6	×10
4 ×2½×4	4×4×6	×8
×3	8×8×6	×6
×2½	×5	12×8 ×12
4 ×2 ×4	×4	×8
3 ×3 ×4	×3	10×10×12
5 ×5 ×4	8×6×8	14×14×8
×3	×6	
×2½	×5	
×2	×4	
5 ×4 ×5	×3	
×4	8×5×8	
4 ×4 ×5	8×4×8	
	×6	
	6×6×8	

Dimensions ..... *pages 196 and 197*
Templates for drilling ..... *page 459*
How to read reducing sizes ..... *page 577*
Bolting on Flanges ..... *page 457*

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250-Pound Cast Iron Flanged Fittings

WORKING PRESSURES
250 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock

American Standard: Crane 250-Pound Cast Iron Flanged Fittings conform to the American Standard for Cast Iron Flanged Fittings, Class 250 (B16b-1944). This Standard does not include Crosses and 45° Laterals.

Sprinkler service; Underwriters' approved: Sizes 2 to 8-inch, inclusive, have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

Materials: Except 45° Laterals, all fittings sizes 10-inch and smaller are made of Crane Cast Iron, conforming to A.S.T.M. Specification A 126 for Class A Castings; 12-inch fittings are made of Crane Ferrosteel, conforming to A.S.T.M. Specification A 126 for Class B higher strength Gray Iron Castings. Laterals in sizes 6-inch and smaller are made of cast iron; larger sizes are Ferrosteel.

Facing and drilling: The drilling of end flanges conforms to the American Cast Iron Flange Standard, Class 250. The flanges have a 1/16-inch raised face which is finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish. The fittings are regularly furnished with end flanges faced and drilled; faced only fittings are supplied only when so ordered, and then at the same price as the faced and drilled.

Bolt holes (1/8-inch larger than the diameter of the bolts) are in multiples of four so that the fittings may be turned to face in any quarter; they straddle the center lines.

Base elbows: The base on Base Elbows is neither faced nor drilled unless so ordered, and then at the extra price shown on the opposite page. When ordered faced and drilled, it is drilled to the template of the flange corresponding to the size of the supporting pipe, drilling only four holes in all cases, these being placed so as to miss or straddle the ribs. The base is intended for support in compression and is not to be used for anchoring or supporting in tension or shear.

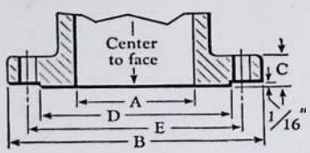
Spot facing: The bolt holes are not spot faced unless so ordered, and then at an extra list price of 20 cents per hole.

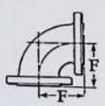
Galvanized fittings: These fittings are regularly listed black only, but galvanized fittings are made to order at an extra charge of 40 per cent over the price of black fittings.

Gaskets: Gaskets for 250-pound cast iron flanged joints are listed on page 474. These include 1/16-inch thick Cranite and "CC" rubber; corrugated copper gaskets can be furnished when ordered.

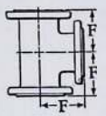
Thread lubricants: Flanged joints are easier to make tight—and to take apart later if necessary—when a good thread lubricant is used on the bolts, flange faces, and gaskets. See page 464 for a complete description of Crane lubricants.

Dimensions, in Inches

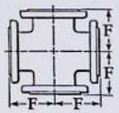




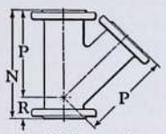
90° Elbow



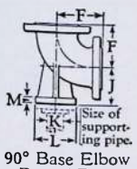
Tee



Cross



45° Lateral



90° Base Elbow Round Base



45° Elbow



Taper Reducer

Size	End Flanges							Center to Face and Face to Face									
	A	B	C	D	E	No. of Bolts	Dia. of Bolts	F	FF	H	J	K	L	M	N	P	R	S
2	2	6½	⅞	4 3/16	5	8	⅝	5	10	3								
2½	2½	7½	1	4 15/16	5⅞	8	¾	5½	11	3½								5½
3	3	8¼	1⅛	5 11/16	6⅝	8	¾	6	12	3½					14	11	3	6
3½	3½	9	1 3/16	6 5/16	7¼	8	¾	6½	13	4								
4	4	10	1¼	6 15/16	7⅞	8	¾	7	14	4½	6	2	6½	⅞	16½	13½	3	7
5	5	11	1⅜	8 5/16	9¼	8	¾	8	16	5	6¾	2½	7½	1	18½	15	3½	8
6	6	12½	1 7/16	9 11/16	10⅜	12	¾	8½	17	5½	7½	2½	7½	1	21½	17½	4	9
8	8	15	1⅝	11 15/16	13	12	⅞	10	20	6	9	4	10	1¼	25½	20½	5	11
10	10	17½	1⅞	14 1/16	15¼	16	1	11½	23	7	10½	4	10	1¼	29½	24	5½	12
12	12	20½	2	16 7/16	17¾	16	1⅛	13	26	8								

Reducing fittings and reducers: The center to face dimensions of reducing 90° elbows and reducing tees are the same as for the straight sizes corresponding to the size of the largest opening.

The face to face dimension of reducers is governed by the size of the larger opening, regardless of the size of the smaller opening.

Dimensions of reducing elbows, reducing tees, and reducers apply only to regularly listed sizes; see page 201. Dimensions of other sizes furnished on request.

250-Pound Cast Iron Flanged Fittings

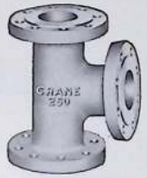

No. 101 E, 90° Elbow Straight


No. 121 E, 90° Elbow *Reducing


No. 103 E, 45° Elbow Straight


No. 123 E *Taper Reducer


No. 125½ E 90° Base Elbow Round Base


No. 105 E, Tee Straight


No. 107 E, Tee *Reducing

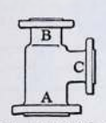

No. 113 E, Cross Straight


No. 117 E 45° Lateral Straight

List Prices, Black, Each—Faced and Drilled

Size	No. 101 E	No. 121 E	No. 103 E	No. 125½ E		No. 105 E	No. 107 E	No. 113 E	No. 117 E	No. 123 E
	90° Elbow Straight	90° Elbow Reducing	45° Elbow	90° Round Base Elbow Base Plain	Extra for Facing and Drilling Base	Tee Straight	Tee Reducing	Cross	45° Lateral	Taper Reducer
Inches										
2	11.00		12.00			16.00		32.00		
2½	11.50	21.00	13.50			16.50	23.00	34.00		19.50
3	13.50	23.00	15.50			18.50	26.00	38.00	42.00	21.00
3½	17.00		20.00			27.00				
4	18.00	34.00	21.00	51.00	10.50	28.00	36.00	49.00	54.00	30.00
5	22.00	41.00	26.00	58.00	12.00	39.00	49.00	65.00	71.00	37.00
6	31.00	50.00	31.00	69.00	12.00	49.00	61.00	80.00	88.00	44.00
8	48.00	83.00	47.00	102.00	17.50	75.00	88.00	124.00	136.00	60.00
10	86.00	122.00	86.00	186.00	17.50	117.00	132.00	195.00	215.00	101.00
12	125.00		125.00			169.00				

*List of Reducing Fittings



No. 107 E Tee

*The prices of the No. 121 E Reducing 90° Elbows, No. 107 E Reducing Tees, and No. 123 E Taper Reducers apply only to the regularly listed sizes, as shown below; the price is determined by the size of the largest opening. All other sizes are special, and prices are furnished on application.

No. 121 E Reducing 90° Elbows	No. 107 E Reducing Tees												No. 123 E Taper Reducers	
	A	B	C	A	B	C	A	B	C	A	B	C		
2½×2	2½×2½×2			5×5×4			8×8×6			10×10×8			2½×2	6 ×5
3 ×2½		×2	×2		×3			×5			×6		3 ×2½	×4
4 ×3	3	×3	×2½		×2½			×4			×5		×2	×3
×2½			×2		×2			×3			×4		4 ×3	×2½
5 ×4	3	×2½	×3	5×4×5				×2½		10×8	×10		×2½	×2
×3			×2½		×4			×2			×8		×2	8 ×6
6 ×5	3	×2	×3	6×6×5			8×6×8				×6		5 ×4	×5
×4			×2		×4			×6			×5		×3	×4
8 ×6	4	×4	×3		×3					10×6	×10		×2½	10×8
×5			×2½		×2½						×8		×2	×6
×4	4	×3	×2	6×5×6							×6			×5
10 ×8			×4		×2					8 ×8	×10			×4
×6			×3	6×5×5										
×5			×2		×5									

Reducing with Flanges



To avoid delays and the higher cost of special fittings, orders for non-listed reducing sizes can be filled by bolting reducing flanges on regular fittings. Orders should specify "Reduce with flanges". The illustration directly above shows a No. 101 E 90° Elbow with a No. 155 E Reducing Flange bolted on one end. See page 204 for flanges.

How to read reducing sizes ..... page 577
Taps and drains for flanged fittings ..... page 578
Bolting on Companion Flanges ..... page 457
Templates for drilling ..... page 460

Cast Steel Fittings

For higher pressures and temperatures, Crane Cast Steel Flanged Fittings are recommended. They are available in seven pressure classes, in a wide variety of types, and in sizes as large as 24 inches. See pages 267 to 274.

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125-Pound Cast Iron Flanges



No. 553
Screwed Flange

WORKING PRESSURES

Sizes 1 to 12-inch
125 pounds saturated steam
175 pounds cold water, oil, or gas, non-shock

Sizes 14 to 24-inch
100 pounds saturated steam
150 pounds cold water, oil, or gas, non-shock

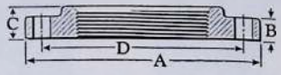


16 inches O.D. and smaller



19 inches O.D. and larger

No. 555
Blind Flange



List Prices and Dimensions

Size of pipe	List Prices, Black, Each		Dimensions, in Inches					
	No. 553 Screwed Flanges	No. 555 Blind Flanges	A Diameter of flange	B Thickness of flange	C Length through hub	D Diameter of bolt circle	No. of Bolts	Dia. of Bolts
Inches	Faced and Drilled	Faced and Drilled						
1	1.35	1.50	4¼	7/16	11/16	3⅛	4	½
1¼	1.45	1.60	4⅝	½	13/16	3½	4	½
1½	1.53	1.70	5	9/16	⅞	3⅞	4	½
2	1.70	1.85	6	⅝	1	4¾	4	⅝
2½	1.87	2.05	7	11/16	13/16	5½	4	⅝
3	2.30	2.55	7½	¾	1¼	6	4	⅝
3½	2.90	3.20	8½	13/16	1¼	7	8	⅝
4	3.45	3.85	9	15/16	15/16	7½	8	⅝
5	4.15	5.20	10	15/16	17/16	8½	8	¾
6	5.00	6.30	11	1	19/16	9½	8	¾
8	7.50	9.30	13½	1⅛	1¾	11¾	8	¾
10	11.00	13.70	16	13/16	115/16	14¼	12	⅞
12	15.00	21.00	19	1¼	23/16	17	12	⅞
14	24.00	33.50	21	1⅜	2¼	18¾	12	1
16	35.00	49.00	23½	17/16	2½	21¼	16	1
18	42.00	59.00	25	19/16	211/16	22¾	16	1⅛
20	50.00	70.00	27½	111/16	2⅞	25	20	1⅛
24	70.00	98.00	32	1⅞	3¼	29½	20	1¼

American Standard: The dimensions and drilling of these flanges conform to the American Standard for Cast Iron Flanges, Class 125 (B16.1-1948).

Sprinkler service; Underwriters' approved: Sizes 1 to 8-inch, inclusive, have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

Materials: Sizes 12-inch (19 inches outside diameter) and smaller are made of cast iron; larger sizes are regularly made of Crane Ferrosteel, to conform to the American Standard.

Facing and drilling: Crane 125-Pound Cast Iron Flanges are regularly supplied faced and drilled unless ordered faced only. Faced only flanges are furnished at the same price as the faced and drilled.

Flanges are plain faced, with a smooth finish.

Spot facing: The bolt holes on these flanges are not spot faced unless so ordered, and then at an extra price. The list price for spot facing bolt holes is **20** cents per hole.

Galvanized flanges: Cast iron flanges are regularly listed black only, but galvanized flanges can be made to order at an extra price. For galvanizing, add 40 per cent to the list prices of black flanges.

Templates for drilling . . . page 459

Gaskets . . . page 474

125-Pound Cast Iron Reducing Flanges

WORKING PRESSURES
125 pounds saturated steam
175 pounds cold water, oil, or gas, non-shock



No. 557
Reducing Screwed Flange

For information on facing, drilling, materials, sprinkler service, etc., see the opposite page.

How to order reducing flanges: When ordering reducing flanges, the screwed or reduced size should be designated first, and then the outside diameter of the flange. For example, a 125-Pound Flange to connect a 6-inch pipe to a 10-inch valve or fitting (outside diameter of flange on 10-inch valve or fitting: 16 inches) should be ordered:

6″ x 16″ Reducing Flange.

List Prices, Black, Each

Size Inches	No. 557 Faced and Drilled	Size Inches	No. 557 Faced and Drilled
1 ×5	2.20	3 ×10	6.25
1 ×6	2.45	4 ×10	
1¼×6		2 ×11	7.50
1½×6		2½×11	
1½×7	2.70	3 ×11	
2 ×7		4 ×11	
1½×7½	3.45	5 ×11	
2 ×7½		3 ×13½	11.20
2½×7½		4 ×13½	
3 ×8½	4.35	5 ×13½	
1½×9	5.20	6 ×13½	
2 ×9		6 ×16	16.50
2½×9		8 ×16	
3 ×9		8 ×19	22.50
3½×9		10 ×19	

Extra list price for spot facing bolt holes is 20 cents per hole.

Galvanized flanges are made to order; add 40 per cent to the list prices of black flanges shown above.

Round Floor Flanges

Cast Iron or Malleable Iron



Cast Iron
Floor Flange



Floor Flanges are cast with countersunk holes for screws and are not faced.



Malleable Iron
Floor Flange

List Prices and Dimensions

Size	Cast Iron Round Floor Flanges						Malleable Iron Round Floor Flanges					
	List Prices		Dimensions, in Inches				List Prices		Dimensions, in Inches			
	Black	Galv.	Flange thickness A	Hub length B	Bolt circle C	No. and dia. of holes	Black	Galv.	Flange thickness A	Hub length B	Bolt circle C	No. and dia. of holes
Inches	Each	Each					Each	Each				
¼ x 2 13/16	.26	.52	7/32	½	1⅞	4-¼						
⅜ x 3	.26	.52	7/32	7/16	2	4-¼						
½ x 3½	.32	.64	9/32	9/16	2½	4-¼	.32	.64	9/32	9/16	2½	4-¼
¾ x 3½	.32	.64	5/16	⅝	2½	4-¼	.32	.64	5/16	⅝	2½	4-¼
1 x 4	.40	.80	11/32	11/16	3	4-¼	.40	.80	11/32	11/16	3	4-¼
1¼ x 4	.40	.80	11/32	¾	3	4-¼	.40	.80	11/32	¾	3	4-¼
1½ x 4½	.50	1.00	⅜	⅞	3½	4-5/16	.50	1.00	⅜	⅞	3½	4-5/16
2 x 5½	.65	1.30	13/32	1	4¼	4-5/16	.65	1.30	13/32	1	4¼	4-5/16

Brass Floor Flanges . . . page 184

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250-Pound Cast Iron Flanges



No. 151 E
Screwed Flange

WORKING PRESSURES
250 pounds saturated steam
400 pounds cold water, oil, or gas, non-shock



No. 155 E
Reducing Screwed Flange

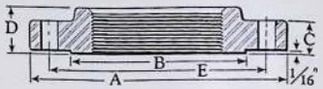


15-inch O.D. and smaller



17½-inch O.D. and larger

No. 153 E
Blind Flange



Screwed Flange

List Prices, Each, and Dimensions

Size of pipe	List Prices, Black		Dimensions, in Inches						
	No. 151 E Screwed Flanges Faced and Drilled	No. 153 E Blind Flanges Faced and Drilled	A	B	C	D	E	No. of Bolts	Dia. of Bolts
Inches									
1½	2.75	3.15	6⅛	3 9/16	13/16	1⅛	4½	4	¾
2	3.00	3.40	6½	4 3/16	⅞	1¼	5	8	⅝
2½	3.35	3.85	7½	4 15/16	1	1 7/16	5⅞	8	¾
3	4.15	4.50	8¼	5 11/16	1⅛	1 9/16	6⅝	8	¾
3½	5.20	5.60	9	6 5/16	1 3/16	1⅝	7¼	8	¾
4	6.20	6.80	10	6 15/16	1¼	1¾	7⅞	8	¾
5	7.50	9.40	11	8 5/16	1⅜	1⅞	9¼	8	¾
6	9.00	11.50	12½	9 11/16	1 7/16	2	10⅝	12	¾
8	13.50	17.00	15	11 15/16	1⅝	2 3/16	13	12	⅞
10	20.00	24.50	17½	14 1/16	1⅞	2⅜	15¼	16	1
12	27.00	38.00	20½	16 7/16	2	2 9/16	17¾	16	1⅛

Size	No. 155 E Reducing Screwed Flanges Faced and Drilled
Inches	Black, Each
2 ×8¼	6.20
2½×8¼	
3 ×10	9.50
4 ×11	11.00
4 ×12½	13.50
5 ×12½	
6 ×15	20.00

American Standard: The dimensions and drilling of these flanges conform to the American Standard for Cast Iron Flanges, Class 250 (B16b-1944).

Sprinkler service; Underwriters' approved: Sizes 1½ to 8-inch, inclusive, have been approved by the Underwriters' Laboratories, Inc., for sprinkler service.

Materials: Sizes 10-inch and smaller are made of cast iron; the 12-inch size is Crane Ferrosteel.

Facing and drilling: Crane 250-Pound Cast Iron Flanges are regularly supplied faced and drilled unless ordered faced only. Faced only flanges are furnished at the same price as the faced and drilled.

The flanges have a 1/16-inch raised face which is finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

Spot facing: The bolt holes on these flanges are not spot faced unless so ordered, and then at an extra price. The list price for spot facing bolt holes is 20 cents per hole.

Galvanized Flanges: Cast iron flanges are regularly listed black only, but galvanized flanges can be made to order at an extra price. For galvanizing, add 40 per cent to the list prices of black flanges.

How to order reducing flanges: When ordering reducing flanges, the screwed or reduced size should be designated first, and then the outside diameter of the flange. For example, a 250-Pound Flange to connect a 3-inch pipe to a 4-inch valve or fitting (O.D. of 4-inch flange, 10 inches) should be ordered:

3" x 10" Reducing Flange.

Steel flanges; 800-Pound Hydraulic: For higher pressures or for high temperature service, Crane Forged Steel Flanges are recommended; see pages 291 to 298.

When 800-Pound Hydraulic Iron Flanges are needed, use 600-Pound Forged Steel Flanges; they have the same outside diameter, the same facing, the same bolt circle, and take the same number and diameter of bolts or bolt-studs.

Templates for drilling . . . page 460

Gaskets . . . . page 474

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Crane Pressure-Seal Bonnet and Lip-Seal Bonnet Valves

(Patented and Patents Pending)

Pressure-Seal Bonnet Valves
General Description of Pressure-Seal Bonnet . . . pages 206 and 207
Ratings, Tests, and Service Recommendations . . . . . page 208

Gate
Description . . . . . page 209
List Prices and Dimensions . . . . . pages 210 and 211

Globe and Angle
Description . . . . . page 212
List Prices and Dimensions . . . . . page 213

Stop-Check (Non-Return Valves)
Description . . . . . page 214
List Prices and Dimensions . . . . . page 215
Selecting the Proper Size . . . . . pages 216 and 217
Determining Pressure Drop . . . . . pages 216 and 217

Pressure-Seal Line Joints . . . . . page 220

Lip-Seal Bonnet Valves
Globe and Angle
Ratings and Tests . . . . . page 218
Description and Dimensions . . . . . pages 218 and 219

Crane Pressure-Seal Bonnet Valves have revolutionized the design and construction of valves intended for high-pressure, high-temperature steam and general service in modern power, industrial, and chemical plants. Utilization of the internal fluid pressure to seal the bonnet joint is the principal feature, but each type—gate, globe, angle, and stop-check—has individual requirements that contribute to greater efficiency.

New records for valve performance have been set, not only in the United States but also in many foreign countries. Backed by the tremendous facilities for research, engineering, and production which are Crane's, the line has grown rapidly.

The valves are now a part of the large family of "regular" Crane manufactured product. In addition, patterns and equipment for many other types and sizes are available, and the pressure-seal bonnet principle has been successfully applied to scores of special valves for unusual operating requirements. Inquiries for non-listed items in conventional sizes and types of valves, or for special designs for unique flow control problems, are given prompt attention.

Crane Lip-Seal Bonnet Globe and Angle Valves mark the introduction of a new, superior design for small size steel valves. Developed by the same Crane resources which have made Pressure-Seal Bonnet Valves so outstanding in their field, thoroughly tested in rigorous experimental demands, and proved in actual installation service, they fulfill the need for small size valves required in high-pressure, high-temperature steam service.

The exclusive Crane Lip-Seal design has made it possible to produce a compact, relatively lightweight valve without sacrificing strength and without resorting to reduced seat area. Absolute tightness, freedom from bonnet joint maintenance, and easy installation are only a few of the features. See pages 218 and 219.

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Crane Pressure-Seal Bonnet

Steel Gate, Globe, Angle, and Stop-Check Valves

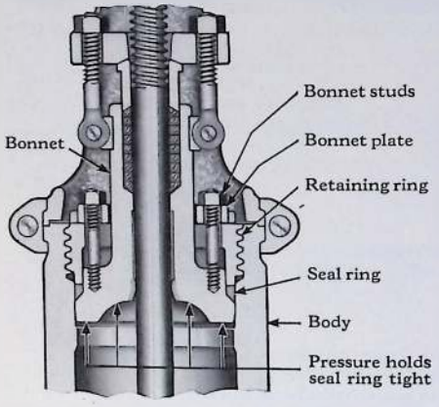
(Patented and Patents Pending)

General Description

Crane Pressure-Seal Bonnet Valves herald a new era in valve engineering. Their design is unique in many respects and has eliminated the major problems attending the control of high pressure-temperature steam and water in modern power plant operation.

Announced a few years ago after extensive research and experimentation backed by exhaustive laboratory and field testing, they are rapidly being approved and preferred by leading power engineers throughout the country. Eagerly accepted for steam and boiler feed service in large central station installations, these valves are now receiving growing approval as standard equipment on high-pressure high-temperature services in the power stations of public utilities, oil refineries, and industrial and chemical plants, and for much process piping.

Their all-around superiority over conventional designs for power services is already well known.



Section of typical Crane Pressure-Seal Bonnet as used on the larger sizes of Gate Valves.

Pressure-Seal Bonnet: Although each type of valve in this new Crane line embodies many features of design that contribute to high efficiency and outstanding serviceability, each has in common the Crane Pressure-Seal Bonnet. The Pressure-Seal joint, being wholly contained within the valve body, utilizes the pressure inside the valve to seal the joint. Once the joint is initially made tight, it automatically remains so without further attention; no bolts or threads are relied upon to retain pressure.

Depending on the style and size of valve, several minor modifications in mechanical structure are employed to assemble the body, the bonnet, the yoke, and the seal ring, but the principle of design is alike in all of them. The illustration at the left shows a typical Crane Pressure-Seal Bonnet, as used on larger sizes of gate valves.

The bonnet fits into the body, followed by the wedge-shaped seal ring. The retaining ring is then screwed into the body, the bonnet plate added, and the assembly drawn together by the bonnet studs. Neither the threaded body and retaining ring connection nor the studs are expected to retain high pressure; they merely position the assembly and hold the parts firmly and snugly together.

Internal fluid pressure acting upon the entire underside of the bonnet reacts upon the smaller contacting area of the wedge-shaped ring, sealing the joint. Because of the design, the sealing pressure is always many times greater than the pressure of the fluid in the line; leakage is impossible. The higher the internal pressure, the greater is the sealing pressure.

Maintenance of the joint is eliminated, and yet the assembly can be dismantled and reassembled in a fraction of the time required to open or close any other type of bonnet joint.

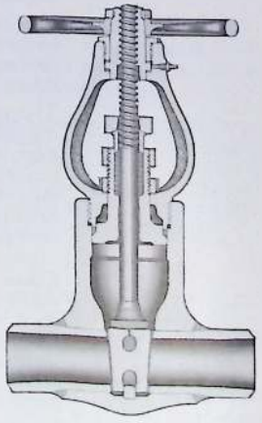
Wherever necessary, all mating parts are properly lubricated or plated to prevent corrosion or galling, and to eliminate "freezing" when subjected to high temperatures for long periods.

Saving in weight and space: Crane Pressure-Seal Bonnet Valves have liberal strength and a high factor of safety, but no unnecessary weight. The light weight of the parts of the Pressure-Seal Bonnet, the use of ample metal sections but without the extra thickness usually added for corrosion allowance on valves also recommended for oil refining services, and the unique compactness of design, make a surprising reduction in weight.

These valves are lighter in weight than corresponding sizes and types of conventional valves—as much as 60 per cent on the larger sizes in the 1500-Pound class. Less weight makes the valves easier to handle during erection and in maintenance. Savings in supporting structures or in the suspension of piping are thereby possible.

The end to end dimensions are as short as practicable, commensurate with good design. Close nesting of welding end valves is possible where necessary, without interference from overhanging flanges as is the case in conventional bolted bonnet valves.

(Continued on next page.)



Section of a 4-inch Crane 1500-Pound Pressure-Seal Bonnet Gate Valve. The smaller sizes, as illustrated here, have an integral yoke and retaining ring, which screws into the body.

Crane Pressure-Seal Bonnet

General Description (Continued)

In addition, the over-all compactness of Crane Pressure-Seal Bonnet Valves substantially reduces the distance from the center to the top of the valve, thus requiring less head room.

Illustrated at the right is an 8-inch 1500-Pound Pressure-Seal Bonnet Gate Valve with an 8-inch bolted bonnet valve silhouetted in the background. This comparison typifies the compactness and the space-saving advantages that are characteristic of the new valves.

Designed for efficiency: Pressure-Seal Bonnet Valves are built especially for the exacting requirements of high pressure-temperature steam and power piping systems. Each type of valve has in common, in addition to the new bonnet, other features of design and construction that contribute to efficient operation and long life.

Streamlined body: The bodies have smooth flowing contours without abrupt changes in metal thickness. On butt-welding end valves, starting with pipe wall thickness at the ends, the metal sections increase gradually to the full body thickness, eliminating areas where acute stresses might otherwise concentrate.

Easy to insulate: The application of insulation is made easier due to the streamlined body. Less insulating material and labor are required, and neater, more effective results are obtained.

Direct yoke-body mounting: The yoke is mounted on the body instead of the bonnet. It transmits the forces required to operate the valve directly from the yoke sleeve or bushing to the valve body, without going through the bonnet. The yoke is rugged and is accurately centered; true alignment is maintained in relation to the stem.



Crane 8-inch 1500-Pound Pressure-Seal Bonnet Gate Valve compared with an 8-inch bolted bonnet valve. This illustrates the compactness of the new line and is suggestive of the saving in weight.

In smaller sizes, the yoke and retaining ring are integral, and screw into the body. In larger size valves, the yoke sets on top of the body, positioned by a male and female joint, and held rigidly in place by a simple circular clamp; this latter construction is especially desirable on large sizes which may be ordered geared or motor operated, since the yoke can be turned if necessary, providing an unlimited choice of positions for the operating unit.

Liberal stuffing box: The stuffing box has generous space for stem packing. All valves have a bolted gland, equipped with swinging gland eye bolts.



Crane 900-Pound Pressure-Seal Bonnet Y-Pattern Globe Stop-Check Valve.

The streamlined contour of the body, as shown here, is typical of all of these valves.

Stellited seating surfaces: To assure extra long life on high pressure-temperature steam, boiler feed, and similar services, all Crane Pressure-Seal Bonnet Valves are regularly made with Stellited seating surfaces. All body seat rings are a new design, accurately fitted into the body and welded in place; they cannot loosen in service.

Body and bonnet materials: Depending upon the service, Crane Pressure-Seal Bonnet Valves have the body and bonnet made either of Crane No. 4 Carbon-Molybdenum Alloy Steel or Crane No. 7 Chrome-Molybdenum Alloy Steel. The former are recommended for a maximum temperature of 850° F.; valves made of No. 7 Steel are recommended for maximum temperatures of 950° F. with flanged ends and 1045° F. with welding ends.

These valves can be made to order of Crane No. 9 Chrome-Molybdenum Alloy Steel for steam temperatures up to 1050° F.

Scope of line: The Crane Pressure-Seal Bonnet line includes, in the full range of most commonly used sizes, 600, 900, and 1500-Pound Gate Valves, 1500-Pound Globe and Angle Valves, and 900 and 1500-Pound Stop-Check Valves.

Complete information on sizes, types, and pressure classes not listed in this section will be furnished on application.

List prices and dimensions ..... *pages 210 to 215*
Pressure-temperature ratings ..... *page 208*
Description of materials ..... *pages 1 to 9*

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Steel Pressure-Seal Bonnet Valves

Flanged, Butt-Welding, and Socket-Welding Ends

Ratings, Tests, and Service Recommendations

Service recommendations: Crane Steel Pressure-Seal Bonnet Valves are primarily intended for the high pressure-temperature steam and hot water services encountered in modern steam generating stations and for similar services in large industrial and chemical plants. Equipped with Stellite faced seating surfaces and an Exelloy stem, they also are well suited for air, gas, high hydraulic systems using water or low viscosity oil, and for other fluids where the service does not involve a major problem of corrosion, erosion, or coking.

Valves having the catalog number suffixed with the designation "U4" are made with Crane No. 4 Carbon-Molybdenum Alloy Steel body and bonnet and are recommended for a maximum temperature of 850° F.

Valves having the catalog number suffixed with the designation "U7" or "U" have the body and bonnet made of No. 7 Chrome-Molybdenum Steel and are recommended for maximum temperatures of 950° F. with flanged ends and 1045° F. with socket-welding or butt-welding ends. No. 7 Steel is a new material alloyed especially for welding end valves used on steam service at temperatures from 850° F. to 1045° F. It exhibits much greater stability against graphitization at these temperatures than does carbon-molybdenum steel; see page 7 for description.

PRESSURE-TEMPERATURE RATINGS

	Temp.	Maximum Non-Shock Working Pressures Pounds per Square Inch				
		Flanged		Butt-Welding and Socket-Welding		
		Male Face	Ring Joint Face			
	Deg. Fahr.	600 Pound	600 Pound	600 Pound	900 Pound	1500 Pound
"U4" valves are limited to 850° F. maximum	100	1200	1440	1440	2160	3600
	150	1180	1420	1420	2130	3550
	200	1160	1400	1400	2100	3500
	250	1140	1380	1380	2070	3450
	300	1120	1365	1365	2050	3415
	350	1095	1350	1350	2025	3375
	400	1075	1330	1330	2000	3330
	450	1050	1320	1320	1975	3295
"U7" and "U" valves are limited to 1045° F. maximum	500	1000	1250	1250	1875	3125
	550	950	1180	1180	1775	2955
	600	890	1110	1110	1660	2770
	650	830	1030	1030	1550	2580
	700	760	940	940	1410	2350
	750	720	850	850	1275	2125
	800	680	750	750	1125	1875
	850	640	700	700	1050	1750
	900	**600**	650	650	975	1625
	950		**600**	**600**	**900**	**1500**
	1000			550	820	1370
	1010			530	795	1325
	1020			500	750	1250
	1030			460	690	1150
	1040			420	630	1050
	1045			400	600	1000

Subject to the foregoing temperature limitations, Crane Pressure-Seal Bonnet Valves are recommended for the pressures shown in the upper table.

Standards: Pressure-temperature ratings for Crane Pressure-Seal Bonnet Valves for temperatures up to and including 950° F. agree with those in Supplement No. 1 (ASA B16c6-1949) to American Standard ASA B16c-1939. Steam ratings for welding end valves at 1000° F. and higher are based on the permissible stresses defined in the ASME Boiler Code for the chrome-molybdenum steel to which Crane No. 7 Steel corresponds.

Test pressures: These valves, except Stop-Check, are regularly given a hydrostatic shell and seat test and an air-under-water test at the seat, as indicated in the table. For tests on Stop-Check Valves, see page 215.

Hydrostatic Test Pressures

Pressure Class	Shell test	Seat test
600-Pound	2175 pounds	1550 pounds
900-Pound	3250 pounds	2250 pounds
1500-Pound	5400 pounds	3700 pounds

Seat tested 100 pounds air-under-water.

The larger sizes of butt-welding end valves have the ends of the body shaped to permit the use of a testing clamp; the smaller sizes are plain, being tested without the use of such a clamp.

Higher Temperature Valves

For steam service at 1050° F. temperature and where greater strength and resistance to steam corrosion are desired at temperatures over 1000° F., 1500-Pound Pressure-Seal Bonnet Butt-Welding End Valves made of Crane No. 9 Chrome-Molybdenum Alloy Steel are recommended. They are made to order only; see page 7 for description.

Crane 1500-Pound Pressure-Seal Bonnet Valves With Butt-Welding Ends

Made of Crane No. 9 Chrome-Molybdenum Alloy Steel

Service Temperature	Maximum Steam Working Pressure
1000° F.	1500 pounds
1010° F.	1430 pounds
1020° F.	1360 pounds
1030° F.	1290 pounds
1040° F.	1220 pounds
1050° F.	1150 pounds

Pressure-temperature ratings shown at the left are based on allowable stresses defined by the ASME Boiler Code for this type of material. For temperatures of 950° F. and lower, the ratings are the same as those for 1500-Pound Valves made of No. 4 or No. 7 Steel; refer to the "1500-Pound Valve" column in the large table above.

Pressure-Seal Bonnet

Cast Steel Wedge Gate Valves

(Patented and Patent Pending)

The sectional views at the right are typical of the larger size Crane Pressure-Seal Bonnet Gate Valves.

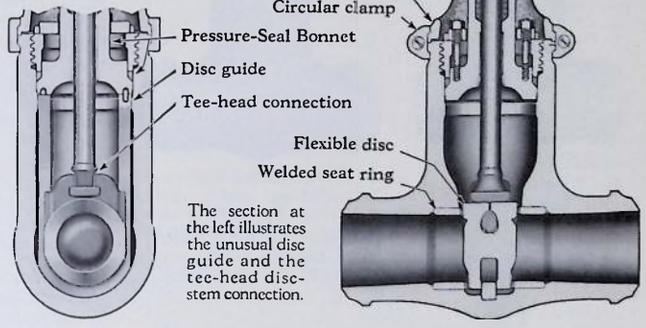
Body: The body is made without abrupt change in metal section, providing protection against a concentration of stresses produced by pressure, temperature differences, and pipe line strains. The valves have a slightly reduced seat area to improve flow characteristics, and there are no pockets between the end of the body and the seat to cause turbulence or friction.

Body seat rings: The body seat rings are Stellite faced. Accurately made to precision fit, they are slipped in parallel to the run of the valve and are seal-welded in place. In 900 and 1500-Pound Valves sizes 5-inch and smaller, the seat rings extend through the body to form the welding ends of the valve, and the body is welded to the rings.

600-Pound Flanged Ends

600, 900, and 1500-Pound Butt-Welding Ends

Sections showing typical construction of the larger size Pressure-Seal Bonnet Gate Valves



The section at the left illustrates the unusual disc guide and the tee-head disc-stem connection.

Disc: These valves have a wedge disc with Stellited seating faces. In sizes 3-inch and smaller, the disc is solid. In sizes 4-inch and larger, a one-piece flexible disc, solid through the center section but not around the outer portion, provides enough flexibility to eliminate sticking, thus requiring less torque to open the valve when cold after having been closed while hot. In addition, the disc seating faces adjust themselves to any slight variations in alignment caused by body contraction or pipe line strains.

Disc guide: Sizes 2½-inch and larger have an improved full length, separate "U" shaped disc guide extending along the sides of the body and fitted into a specially machined groove around the bottom of the body. Full disc guiding, even near the point of seating where the maximum force is exerted against the disc by the fluid flow, is assured by this design. The groove in the body for the disc guide and the machining for the body seat rings are made with the same machine setting to maintain proper alignment between the disc, guide, and body seat rings. Sizes 2-inch and smaller have the disc guides integral with the disc, and the body is slotted.

Disc-stem connection: The valves have a sturdy tee-head disc-stem connection. Ample clearance between the head on the stem and the slot in the disc prevents side strains on the stem. The stem is only required to move the disc up and down; it is not forced to also serve as a guide for the disc.

Other features: These valves have the other features common to all of the valves in this line, such as Pressure-Seal Bonnet, direct-mounted yoke, deep stuffing box, and two-piece bolted gland. In addition, 600-Pound Valves 8-inch and larger and 900 and 1500-Pound Valves 6-inch and larger are regularly supplied with a ball-bearing yoke sleeve; sizes 1½-inch and larger have a grease fitting to permit proper lubrication of the yoke sleeve.

In sizes 5-inch and smaller (in all three pressure classes), the yoke and the retaining ring are integral and screw into the body to hold the seal ring. Larger sizes have the separate yoke and retaining ring, with the yoke held to the body by the circular clamp. The lower end of the stem hole in the bonnet is Stellite faced on sizes 2½-inch and larger, assuring a better back-seat and guide for the stem.

1500-Pound Socket-Welding Ends

The Crane line of Pressure-Seal Bonnet Gate Valves also includes 1500-Pound Valves with socket-welding ends in sizes 1, 1¼, 1½, and 2-inch. These valves are similar in construction to the smaller sizes of the butt-welding end described above. The body seat rings are long and are fillet welded into the body, the welded end of the ring forming the end of the socket in the body.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)

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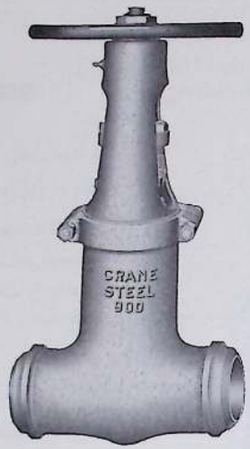
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Pressure-Seal Bonnet
Cast Steel Wedge Gate Valves

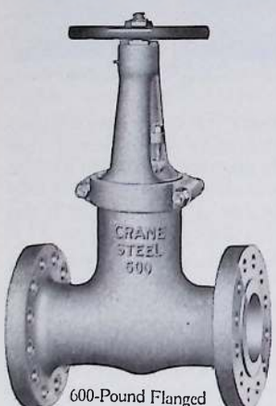


600-Pound Butt-Welding
No. 776-U4, 850° F. max.
No. 776-U7, 1045° F. max.



900-Pound Butt-Welding
No. 783-U4, 850° F. max.
No. 783-U7, 1045° F. max.

1500-Pound Butt-Welding
No. 787-U4, 850° F. max.
No. 787-U7, 1045° F. max.



600-Pound Flanged
No. 676-U4, 850° F. max.
No. 676-U7, 950° F. max.



1500-Pound Socket-Welding
No. 7811 U, 1045° F. max.

For description, ratings, and recommendations, see pages 206 to 209.

Materials: The body seat rings, welded in place, and the disc are made of the same material as the body and bonnet and have the seating surfaces faced with Stellite. The stem is made of Exelloy.

"U4" suffixed catalog numbers indicate valves have a Crane No. 4 Steel body and bonnet; such valves are recommended for a maximum temperature of 850° F.

"U7" or "U" suffixed catalog numbers indicate valves have a Crane No. 7 Chrome-Molybdenum Alloy Steel body and bonnet; such valves are recommended for a maximum temperature of 950° F. with flanged ends and 1045° F. with welding ends.

Flanged valves: End flanges conform to the 600-Pound American Standard (B16e-1939). They have a large male face ¼-inch high, with a serrated finish (approximately 32 concentric grooves per inch). When so ordered, flanged valves can be furnished with ring joint facing; see the Crane Discount Sheet for prices.

Prices include drilling to the 600-Pound American Standard, and spot facing; no deduction is made if valves are ordered faced only.

Face to face: Flanged valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged Valves (No. B16.10-1939).

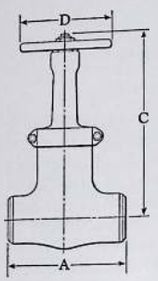
Ordering butt-welding valves: Orders for butt-welding valves must specify the inside diameter of the pipe with which they are to be used, or its wall thickness, so that the valve ends can be bored to match.

List Prices, Each

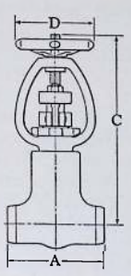
Size	Flanged F. D. & S. F.	Butt-Welding			Socket-Welding
	600-Pound	600-Pound	900-Pound	1500-Pound	1500-Pound
Inches	Nos. 676-U4 676-U7	Nos. 776-U4 776-U7	Nos. 783-U4 783-U7	Nos. 787-U4 787-U7	No. 7811 U
1			Use 1500-Pound Valves	405.00	324.00
1¼				445.00	356.00
1½				490.00	392.00
2				610.00	488.00
2½	430.00	430.00		770.00	
3	525.00	525.00	815.00	1015.00	
4	805.00	805.00	1065.00	1395.00	
5	1205.00	1205.00	1435.00	2185.00	
6	1565.00	1565.00	1930.00	2845.00	
8	2245.00	2245.00	2870.00	4360.00	
10	3285.00	3285.00	4030.00	6715.00	
12	4325.00	4325.00	5465.00	9690.00	
14		5745.00	7725.00*	14100.00*	
16		7420.00	9680.00*	On request*	
18		9265.00	13300.00*		
20		13830.00			
24		22555.00			

*900 and 1500-Pound Butt-Welding Valves having the catalog number suffixed with the designation "U4" are not made in sizes 14-inch and larger.

Pressure-Seal Bonnet
Cast Steel Wedge Gate Valves



600, 900, and 1500-Pound Butt-Welding

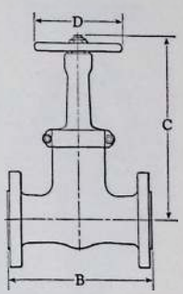


1500-Pound Socket-Welding

High in strength yet light in weight, Crane Pressure-Seal Bonnet Gate Valves offer unusual compactness and durability. Streamlined design permits close nesting of welding end valves —and installation in minimum space. Center to top dimensions, too, are noticeably smaller than usual, making less headroom necessary.

Face to face dimensions of flanged valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939. End to end dimensions of welding end valves, in almost all instances, are shorter than specified in this Standard.

Unless ring joint facing is specified, flanged valves will have ¼-inch high large male faces.



600-Pound Flanged

Dimensions, in Inches

Class	Size	Butt-Welding or Socket-Welding Valves			Flanged Valves							
		A	C open	D	B*	C open	D	Diameter of flange	Thickness of flange (*)	Diameter of male face	Diameter of bolt circle	No. & diameter of bolt-studs
600 Pound	2½	8½	19¼	8	13	19¼	8	7½	1⅛	4⅛	5⅞	8-¾
	3	10	21	9	14	21	9	8¼	1¼	5	6⅝	8-¾
	4	12	25¾	10	17	25¾	10	10¾	1½	6 3/16	8½	8-⅞
	5	15	30½	12	20	30½	12	13	1¾	7 5/16	10½	8-1
	6	18	33½	14	22	33½	14	14	1⅞	8½	11½	12-1
	8	23	43⅜	20	26	43⅜	20	16½	2 3/16	10⅝	13¾	12-1⅛
	10	28	51½	24	31	51½	24	20	2½	12¾	17	16-1¼
	12	32	59⅛	24	33	59⅛	24	22	2⅝	15	19¼	20-1¼
	14	35	65⅛	27								
	16	39	72	30								
	18	On application										
	20											
	24											
900 Pound	3	12	23	10								
	4	14	27¾	14								
	5	17	33½	16								
	6	20	39½	20								
	8	26	47	24								
	10	31	52½	24								
	12	36	61½	27								
	14	39	67	30								
	16	43	73½	36								
	18	On application										
1500 Pound	1	5½†	13	5								
	1¼	6½†	13¾	5								
	1½	7†	17¼	8								
	2	8½†	18½	8								
	2½	10	20	9								
	3	12	23	10								
	4	16	27¾	14								
	5	19	33½	16								
	6	22	39	20								
	8	28	46½	24								
	10	34	52¾	27								
	12	39	61¼	30								
	14	42	66	36								
	16	47	75¼	36								

***Flanged Valve** face to face dimensions (B) include the ¼" male face; thickness of flange dimensions do not.
†**Socket-Welding Valves** 1½-inch and smaller have a ½" socket depth; the 2-inch size has a ⅝" socket depth.

By-passes: When specified, 600-Pound Valves 5-inch and larger and 900 and 1500-Pound Valves 4-inch and larger can be furnished with a by-pass for steam and general service.

An extra charge is made for the by-pass; prices and dimensions are furnished on request. The size of the by-pass will be as shown below.

The by-passes are rugged and durable, and have the necessary flexibility to compensate for expansion strains resulting from unequal temperatures or fluctuating operating conditions. Seamless Chrome-Molybdenum Alloy Steel pipe is used; all piping connections are welded. The by-pass valve is the full equivalent of the main valve insofar as ratings and service recommendations are concerned.

Unless otherwise ordered, the by-pass is attached to the main valve at an angle of 30° from the center line of the main valve stem; it is positioned as close as practicable to the side of the main valve body. The by-pass valve is mounted so that its stem is approximately 30° from vertical.

Motor operation: Valves installed in inaccessible locations, or used for emergency or other unusual purposes, are frequently required equipped with an electric, air, or gas motor unit; see pages 126 to 129 for complete description.

Gearing: To facilitate operation, valves in the larger sizes can be made to order with spur or bevel gearing, and with extension stems if they are to be installed in inaccessible locations; prices on request.

By-Passes for 600, 900, and 1500-Pound Valves

Size of Main Valve	Size of By-Pass
‡4"	¾"
5	
6	
8	
10	1
12	
14	1¼
16	
18	1½
20	
24	2

‡900 and 1500-Pound only.

For ratings, tests, recommendations, and general description of the pressure-seal bonnet and the Pressure-Seal Bonnet Gate Valves, refer to pages 206 to 209.

Templates for drilling . . . page 462 *Flange Facings . . . pages 469 and 470*

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Pressure-Seal Bonnet
Cast Steel Globe and Angle Valves

(Patented and Patent Pending)



Cross section of a 3-inch 1500-Pound Pressure-Seal Y-Pattern Globe Valve With Butt-Welding Ends

1500-Pound Globe Butt-Welding Ends

The illustration above shows the typical construction of the larger size Crane 1500-Pound Pressure-Seal Bonnet Globe Valves. Like the gate valves described on the preceding pages, the globe valve line features many advantages.

The Pressure-Seal Bonnet assures freedom from bonnet joint leakage and maintenance. Valves are compact, light in weight, and save space. Because of the shape of the interior, pressure drop is low.

For general description, see pages 206 and 207.

Body: The body is "Y" pattern; it has unusually smooth contours with only gradual changes in metal thickness. The area above the seat is considerably enlarged, and the low side of the seat is practically on the centerline of the body. The design of the seat and disc in combination with the special shape of the interior of the body produces minimum turbulence and offers little resistance to flow. Pressure drop through these valves is surprisingly low for globe type construction.

Body seating surface: The body seating surface is integral with the body casting, consisting of a wide layer of Stellite facing.

Stellite faced disc: The valves feature a newly designed, improved, swivel plug type disc faced with Stellite. In the 2-inch size, the disc stem ring is screwed onto the disc and tack welded in place, as shown in the illustration of the socket-welding end valve below. In sizes 2½-inch and larger, the disc is piston guided; the disc stem ring is screwed in, pinned, and tack welded to the disc as shown in the illustration at the left.

Rising, turning stem: The stem is the rising, turning type and operates through a threaded yoke bushing screwed into and pinned to the yoke. The stem is fully guided by long engagement with the yoke bushing and the lower end of the bonnet.

Bonnet and yoke: The valves have the Crane Pressure-Seal Bonnet, the yoke and retaining ring being integral. The wide yoke arms permit easy accessibility to the stuffing box.

Stuffing box and gland: The stuffing box is large and deep; it is filled with high grade packing. The two-piece gland consists of a gland and gland flange held in place by swinging gland eye bolts; the bolts will not loosen in service.

Handwheel: Sizes 2 and 2½-inch have a conventional style malleable iron wheel; sizes 3 and 4-inch have a cast steel hammer-blow wheel.



Cross section of a 1500-Pound Pressure-Seal Bonnet Y-Pattern Globe Valve with Socket-Welding Ends

1500-Pound Globe and Angle Socket-Welding Ends

Socket-welding end 1500-Pound Globe and Angle Valves in sizes 1, 1¼, 1½, and 2-inch also are included in the Crane Pressure-Seal Bonnet line. They are similar in construction to the 2-inch butt-welding end Globe Valves described above, except for the end connections; they are also made in the angle pattern.

The globe valve is the Y-pattern design, having an integral Stellite faced seat. The angle valves have a low seat, with a separate Stellite faced seat ring welded into the body. Both valves have unusually good flow characteristics, assuring low pressure drop.

The Stellite faced disc is the improved Crane swivel plug type with a new disc stem ring connection and a long vertical fit between the bore of the disc and the pilot end of the stem. The characteristics of this construction assure the maximum in rigidity, while still permitting the disc to swivel.

General description . . . . pages 206 and 207 *List prices and dimensions . . . . page 213*

Pressure-Seal Bonnet
Cast Steel Globe and Angle Valves

List Prices, Each

Size	1500-Pound Socket-Welding End		1500-Pound Butt-Welding End	
Inches	No. 7852 U Globe	No. 7853 U Angle	No. 7189-U4 Globe	No. 7189-U7 Globe
1	121.00	121.00		
1¼	176.00	176.00		
1½	239.00	239.00		
2	322.00	322.00	550.00	550.00
2½			800.00	800.00
3			1060.00	1060.00
4			1500.00	1500.00

For additional description, see the preceding page.



Globe, 1500-Pound Socket-Welding
No. 7852 U
1045° F. max.



Angle, 1500-Pound Socket-Welding
No. 7853 U
1045° F. max.



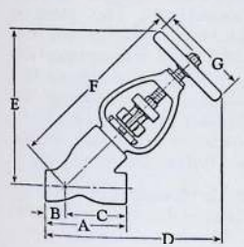
Globe, 1500-Pound Butt-Welding
No. 7189-U4
850° F. max.
No. 7189-U7
1045° F. max.

Materials: Valves having the catalog number suffixed with the designation "U4" are furnished with a Crane No. 4 Carbon-Molybdenum Alloy Steel body, bonnet, and disc with Stellited face.

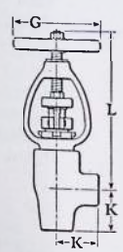
Valves having the catalog number suffixed with the designation "U7" or "U" are furnished with a Crane No. 7 Chrome-Molybdenum Alloy Steel body, bonnet, and disc with Stellited face.

All valves have an Exelloy stem, Crane No. 7 Chrome-Molybdenum disc stem ring, cast carbon steel yoke, and Cast Manganese Bronze yoke bushing. Handwheels are malleable iron conventional type on sizes 2½-inch and smaller and cast steel hammer-blow type on the 3 and 4-inch sizes.

Recommendations: Crane No. 4 Carbon-Molybdenum Alloy Steel Globe Valves, designated as "U4", are suitable for a maximum temperature of 850° F. Crane No. 7 Chrome-Molybdenum Alloy Steel Globe and Angle Valves, designated as "U" or "U7", are suitable for a maximum temperature of 1045° F. See page 208 for pressure-temperature ratings and test pressures.



Globe



Angle

Ordering butt-welding end valves: Orders for butt-welding end valves must always specify the inside diameter of the pipe with which they are to be used, or its wall thickness, so that the ends of the valve can be bored to match.

Smaller size and higher pressure valves: If smaller size or higher pressure valves are desired, use the new Crane Lip-Seal Bonnet Globe and Angle Valves shown on pages 218 and 219. They are made in sizes ⅛ to 2-inch with screwed and socket-welding ends and in the 1500 and 2500-Pound pressure classes.

Dimensions, in Inches

Type of Valve	Size	A	B	C	D open	E open	F open	G	K	L open	Depth of socket
Socket-Weld Globe and Angle	1	5½	1⅜	4⅛	12⅝	11¼	13⅝	5½	2¾	12⅛	½
	1¼	6½	1⅝	4⅞	16	13⅜	16⅛	7	3¼	14	½
	1½	7	2	5	17½	15½	18⅞	8	3½	16¼	½
	2	8½	2 7/16	6 1/16	19¾	17¼	20⅝	10	4¼	17½	⅝
Butt-Weld Globe Only	2	8½	2 7/16	6 1/16	20	17½	20½	10			
	2½	10	2⅞	7⅛	24⅝	21¾	25	14			
	3	12	3⅜	8⅝	28⅜	25	26	20			
	4	16	4½	11½	33¾	29¼	32½	20			

General description of Pressure-Seal Bonnet . . . . pages 206 and 207
Ratings, tests, and service recommendations . . . . . page 208

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Pressure-Seal Bonnet
Cast Steel Stop-Check Valves

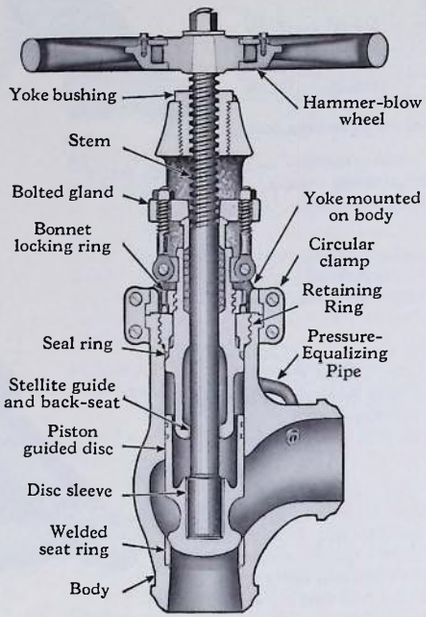
(Patented and Patent Pending)

900 and 1500-Pound Butt-Welding Ends

Freedom from bonnet joint leakage and maintenance, savings in space and weight, long service life, unusually low pressure drop—these and other benefits accrue to the user of Crane Pressure-Seal Bonnet Stop-Check Valves.

Body: The body of these valves—Y-pattern in the Globe type—has streamlined contours with liberal internal area above the seat. Combined with the special shape of the seat and disc, this design offers minimum resistance to flow. Pressure drop through the valve is lower than is usually accepted as good performance for non-return or stop-check valve service.

The body is equipped with a specially designed external pressure-equalizing pipe, welded in place, connecting the chamber above the disc with the outlet end of the body. The pipe is so assembled to the body that the end on the outlet protrudes into the path of flow. Under high flow conditions, an aspirator effect is produced by the pipe, assuring lower pressure above the disc than beneath the disc and permitting high disc lift; should the flow reverse, the pipe admits the higher pressure to the top of the disc chamber, thereby forcing the disc to close quickly.



Cross section of a 6-inch 900-Pound Pressure-Seal Bonnet Angle Stop-Check Valve

Body seat ring: The body seat ring is of special design; it is slipped into an accurately machined recess in the body and is seal-welded in place. It will not loosen in service. The seating surface is Stellite faced.

Disc: The disc, also Stellite faced, is of piston guided construction, and is equipped with two piston rings. It fits snugly in the body, and is additionally guided by the long shoulder on the end of the stem. This shoulder operates in a sleeve fastened in the disc; to prevent galling and scoring, the sleeve and the washer between the stem end and the disc are made of a steel having extreme hardness.

Stem: The stem is of liberal diameter, amply strong, and well guided. It has a long thread engagement with the yoke bushing.

The stem hole in the lower end of the bonnet is Stellite faced to provide a good bearing and back-seat for the stem.

Pressure-Seal Bonnet: These valves have the Crane Pressure-Seal Bonnet described on pages 206 and 207. On the 6 and 8-inch sizes, the retaining ring and bonnet are drawn together by a threaded bonnet locking ring as shown on the cross section at the left.

10 and 12-inch sizes have a bonnet plate with bonnet studs, similar to the construction illustrated on page 206.

Direct yoke-body mounting: The yoke is mounted directly on the body, and the connection is secured by a simple but efficient circular clamp, using two Triplex Steel Bolt-Studs on each side of the two halves of the clamp.

Handwheel: The handwheel is steel and is mounted on the stem end. It is of hammer-blow construction to enable closing the valve under unbalanced pressure conditions or against boiler test pressure.

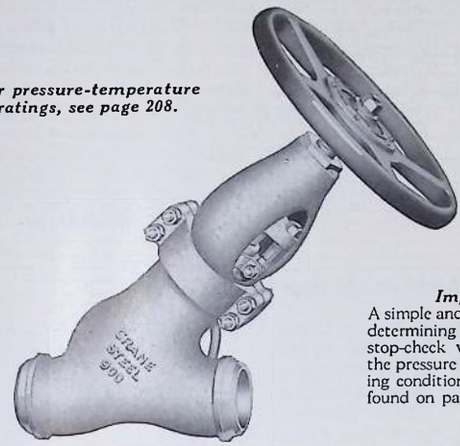
Stuffing box: A tight stem seal is provided by the large and deep stuffing box, which is filled with high grade packing.

The valves have a two-piece ball-type gland, consisting of a gland and gland flange. This construction maintains an even load on the packing and prevents the gland from binding on the stem. The swinging gland eye bolts move out of the way when the stuffing box is being repacked.

List prices and dimensions ..... *page 215*
Pressure-temperature ratings ..... *page 208*
Description of Pressure-Seal Bonnet ... *pages 206 and 207*

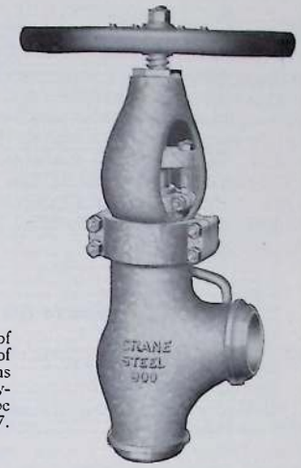
Pressure-Seal Bonnet
Cast Steel Stop-Check Valves

For pressure-temperature ratings, see page 208.



Globe Y-Pattern
Butt-Welding, 1045° F. max.
900-Pound—No. 7186 U
1500-Pound—No. 7192 U

Important
A simple and direct method of determining the best size of stop-check valve, as well as the pressure drop under varying conditions of flow will be found on pages 216 and 217.



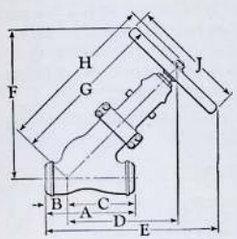
Angle
Butt-Welding, 1045° F. max.
900-Pound—No. 7188 U
1500-Pound—No. 7194 U

Materials: These valves have Crane No. 7 Chrome-Molybdenum Alloy Steel body seat ring and disc, the seating surfaces being faced with Stellite; the seat ring is seal-welded in the body. The stem, strong and durable, is made of Crane Exelloy.

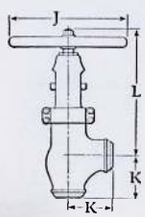
The body and bonnet also are made of Crane No. 7 Chrome-Molybdenum Alloy Steel, and the valves are recommended for 1045° F. maximum temperature.

List Prices, Each

Size Inches	900-Pound No. 7186 U Globe	900-Pound No. 7188 U Angle	1500-Pound No. 7192 U Globe	1500-Pound No. 7194 U Angle
6	2830.00	2830.00		
8	4410.00	4410.00	6190.00	6190.00
10	7030.00	7030.00	9450.00	9450.00
12	9450.00	9450.00	13280.00	13280.00



Globe Y-Pattern



Angle

Test pressures: 900-Pound Valves are given a 3250 pound shell test; 1500-Pound Valves are given a 5400 pound shell test. The valves are also given a 100 pound air-under-water seat test. They are suitable for boiler test conditions one and one-half times the nominal ratings to comply with the ASME Boiler Code.

The valves are equipped with a hammer-blow handwheel and can be manually closed against boiler test pressure. They can also be equipped with toggle operators, gears, or motor operators at a special price.

Ordering butt-welding end valves: These valves are made with butt-welding ends. Orders must specify the inside diameter of the pipe with which they are to be used, or its wall thickness, so that the ends of the valve can be bored to match.

Dimensions, in Inches

Pressure Class	Size	A	B	C	D open	E open	F open	G open	H open	J	K	L open
900-Pound	6	20	5	15	26⅞	41⅛	36⅛	38	39¾	26	10	32
	8	26	6¾	19¼	32½	49⅞	43¼	46	47¾	30	13	37⅝
	10	31	7¾	23¼	37½	57½	49⅞	52¾	54¾	36	15½	42¾
	12	36	9 5/16	26 11/16	44¾	66⅜	57	63¼	65¼	36	18	50⅝
1500-Pound	8	28	7¾	20¼	32½	50⅞	43⅛	46	47¾	30	14	37⅝
	10	34	9	25	37½	58¾	49⅞	52¾	54¾	36	17	42¾
	12	39	11 5/16	27 11/16	44¾	68⅜	57	63¼	65¼	36	19½	50⅝

General description of Pressure-Seal Bonnet .... *pages 206 and 207*

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Crane Pressure-Seal Bonnet Stop-Check Valves
Selecting the Proper Size—Determining Pressure Drop

A problem confronting the power piping designer is the selection of the best size of stop-check valve for his service conditions. This type valve has a floating disc member, hence it is important the valve be sized to provide full disc lift under conditions prevailing during the major portion of the service life of the installation. If the valve is too large, the disc will float in a partially open position; this may result in fluttering of the disc and rapid wear of valve parts. Conversely, if the valve is too small, pressure drop will be excessive.

Crane has conducted numerous tests both in the laboratory and in the field over a period of many years to establish the flow characteristics of Crane Stop-Check Valves. As a result, Crane Engineers have developed the chart shown on the opposite page. The chart is a graphical solution of the flow formula and incorporates the valve flow factors which were determined by test. Its use offers a simple and direct method of determining the best size of stop-check valve, as well as the pressure drop under varying conditions of flow, without any computation.

How to Use the Chart Shown on the Opposite Page

Given: Steam Pressure.....1,000 pounds per sq. in., gauge
Steam Temperature..850° F.
Flow Rate.....200,000 pounds per hour, maximum

Find: The catalog number of the valve and the best size for the above installation.

Solution: Reference to the pressure-temperature ratings on page 208 indicates a stop-check valve of the 900-pound pressure class will be required: thus, either of the following may be used:

No. 7186 U, Globe
No. 7188 U, Angle

The choice between the globe or angle depends, of course, upon the piping arrangement. The flow characteristics of Crane Pressure-Seal Bonnet Stop-Check Valves are identical for both globe and angle types. *Now, follow the text below and proceed as indicated by the arrows on the chart.*

1. Enter the chart at the lower left at a temperature of 850° F. Move vertically upward to the curved line for 1000 psi gauge pressure, then horizontally to the right to establish a point on the specific volume line. From this point, draw a diagonal line through the flow rate being investigated (200,000 pounds per hour) and establish a point on Index 1.

2. From the point on Index 1, draw another diagonal line through any assumed size of the No. 7186 U or No. 7188 U (for example, the 6-inch size) and establish a point on Index 2. Move horizontally to the diagonal line in the right side of the chart and read the pressure drop at the intersection as 12 psi.

Chart solutions resulting in a point on Index 2 that falls below Line A-A indicate the valve disc will not be fully lifted under the flow conditions used. Operation under such conditions is not recommended, but at times, must be tolerated for short periods during the low load portion of the operating cycle.

3. Enter the chart where Line A-A intersects Index 2. Move diagonally upward through the size being investigated (6-inch) and establish a second point on Index 1. From this point, extend a line to the specific volume established in Step 1, and at its intersection with the flow rate line, read 74,000 pounds per hour as the minimum flow rate at which the disc will be in the fully lifted position. The pressure drop at this flow rate is 2 psi. At all flow rates less than 74,000 pounds per hour through 6-inch valves, the pressure drop may be expressed as "less than 2 psi".

4. Repeat Steps 2 and 3 for all other probable sizes and determine the pressure drop and minimum flow rate for the wide open position. Results are shown at the right.

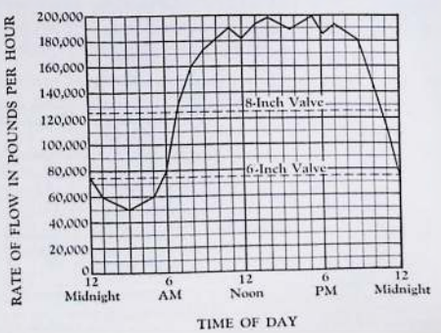
Valve Size, Inches	Pressure Drop at Maximum Flow Rate of 200,000 lbs. per hour (In Psi)	Minimum Flow Rate for Wide Open Valve Lbs. per hour
6	12	74,000
8	4.8	125,000
10	2.2	190,000
12	Less than two	280,000

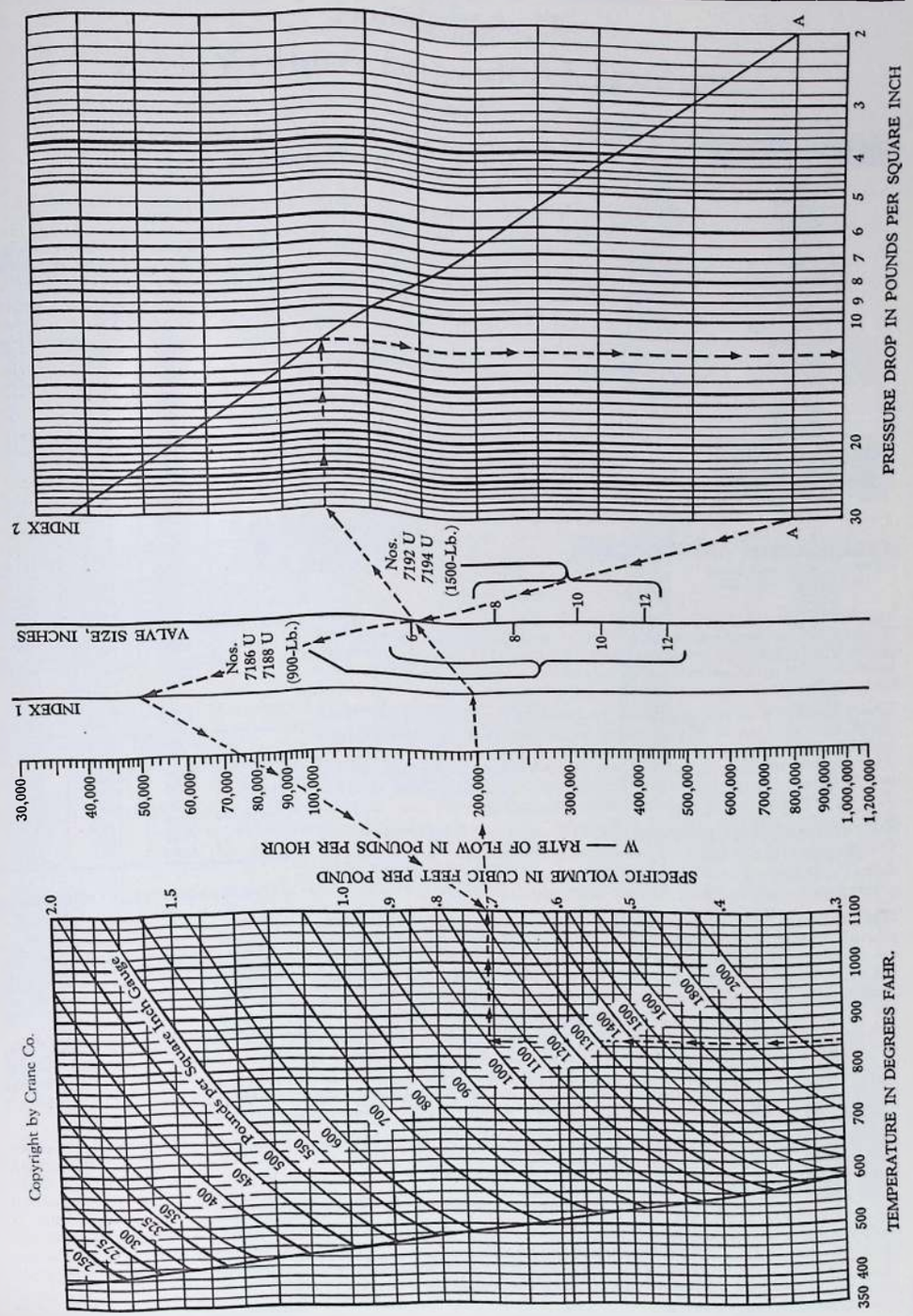
5. Since the flow rate of 200,000 pounds per hour is designated as maximum, it may be assumed the boiler will frequently be operated at lower flow rates. On this basis, it is obvious both the 10 and 12-inch sizes would be too large. The choice between the 6 and 8-inch size depends upon the load-demand curve, and the final selection rests with the piping designer.

6. A typical daily load-demand curve, as shown in the chart below, indicates the advisable size is 8-inch. Minimum flow rates for a fully lifted disc for both 6 and 8-inch sizes are shown in the chart. The disc will not be fully lifted for about 6 hours in the 6-inch valve and for about 8 hours in the 8-inch valve. However, since the pressure drop for the 8-inch is so much lower during high-load operation, it appears to be a better choice than the 6-inch.

Pressure drop for any intermediate flow condition can be determined as outlined in Steps 1 and 2.

Typical Daily Load-Demand Curve



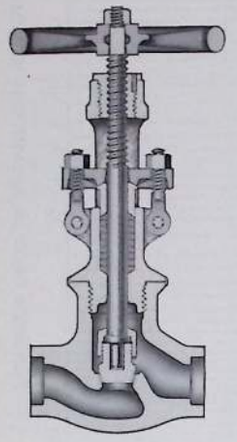


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Lip-Seal Bonnet
Cast Steel Globe and Angle Valves

(Patented)



Typical Cross Section
Lip-Seal Bonnet Globe Valve
Outside Screw and Yoke
Socket-Welding Ends

New, Small Size 1500 and 2500-Pound Valves
For High-Pressure, High-Temperature Power Service

Crane Cast Steel Globe and Angle Valves with the new, patented Lip-Seal Bonnet Joint are a marked advancement in small steel valve construction. The Crane Lip-Seal design has made possible the production of compact, relatively light-weight valves without sacrificing strength or durability. Absolute tightness, full seating area, freedom from bonnet joint maintenance, minimum weight and bulk, and easy dismantling and reassembly are a few of the advantages.

Made in both 1500 and 2500-Pound pressure classes, the valves are especially recommended for use in modern power, industrial, and chemical plants on main steam, auxiliary steam, boiler feed, and miscellaneous piping, as well as for drips, drains, by-pass, blowdown, and similar service. Sizes ½ to 2-inch inclusive with screwed or socket-welding ends are available.

PRESSURE-TEMPERATURE RATINGS

Crane Alloy Steel	Temp. Deg. Fahr.	Maximum Pounds Per Square Inch, Non-Shock: 1500-Lb. Valves	2500-Lb. Valves
No. 7 Chrome-Moly.	100	3600	6000
	150	3550	5915
	200	3500	5830
	250	3450	5750
	300	3415	5690
	350	3375	5625
	400	3330	5550
	450	3295	5490
	500	3125	5210
	550	2955	4925
	600	2770	4620
	650	2580	4300
	700	2350	3920
	750	2125	3550
	800	1875	3125
	850	1750	2925
	900	1625	2700
	950	**1500**	**2500**
	1000	1370	2285
	1010	1325	2205
	1020	1250	2085
	1030	1150	1915
	1040	1050	1750
	1045	1000	1665
No. 9 Chrome-Moly. (Made to order)	At 950° F. and lower, ratings are same as for No. 7 Steel.		
	1000	**1500**	**2500**
	1010	1430	2383
	1020	1360	2266
	1030	1290	2149
	1040	1220	2032
	1050	1150	1915

HYDROSTATIC TEST PRESSURES

Valve	1500-Lb. Valves	2500-Lb. Valves
Shell	5400 pounds	9000 pounds
Seat	3700 pounds	6100 pounds

Seat tested 100 pounds air-under-water.

Lip-Seal Bonnet Joint: The Crane Lip-Seal design features an extremely simple construction. The body and bonnet are screwed together until a firm metal-to-metal contact is made between the smoothly machined flat surfaces on the shoulder of the bonnet and the top of the body. The small lips around the periphery are then seal welded.

The welded seal is not subjected to bending moments which might break the seal, nor is it ever required to carry the mechanical load exerted upon the body-bonnet joint by pressure and stem thrust. Threaded members—plated to resist corrosion and to prevent galling or seizure—carry the entire mechanical load at relatively low stresses. The welded seal simply guards against any leakage.

Easy dismantling and reassembly: Dismantling the valves is easy. Simply grind off the seal weld and unscrew the bonnet. With ordinary care, the seal weld may be repeatedly ground off for dismantling and welded upon reassembling, without damaging the valve.

Disc and seat: The plug type disc and seat, ideal for rigorous service, provide a wide seating contact not easily affected by foreign matter or wiredrawing. The seating surfaces are faced with Stellite, a material that withstands corrosion and erosion unusually well and displays excellent resistance to wear, seizure, galling, and abrasion.



Rigid, swivel type disc-stem connection with disc tapered to permit close regulation of flow when throttling.

Disc-stem connection: An improved disc-stem connection holds all clearances to a minimum and places the seating load closer to the actual seating surface of the valve. In assembly, the disc stem ring is screwed down hand tight, axially forming a continuous metal-to-metal contact between the disc and stem. The disc stem ring is then locked to the disc by a tack weld. The stem is fully guided by a yoke bushing and by long engagement with the lower end of the bonnet.

Minimum radial clearance, the long vertical fit between the pilot end of the stem and the bore in the disc, and no axial clearance produce maximum rigidity while permitting the disc to swivel.

Yoke and yoke bushing. The yoke has heavy metal sections and is cast integral with the bonnet. The yoke bushing, screwed into the yoke and firmly locked in place by a Groov-Pin, will not loosen in service.

Stuffing box and gland: The stuffing box, of liberal proportions and filled with the finest quality packing, provides a tight seal around the stem. The two-piece ball type gland, consisting of a gland and a gland flange maintains an even load on the packing and prevents binding of the stem. The gland flange is held in place by swinging eye bolts.

(continued on the next page)

Lip-Seal Bonnet
Cast Steel Globe and Angle Valves

(Patented)

(continued from the preceding page)

Materials: Crane 1500 and 2500-Pound Lip-Seal Bonnet Globe and Angle Valves are regularly furnished with the body and bonnet made of Crane No. 7 Chrome-Molybdenum Alloy Steel. This steel exhibits a high resistance to steam corrosion and excellent strength retention at elevated temperatures. Valves made of No. 7 Steel are recommended for temperatures up to 1045° F.

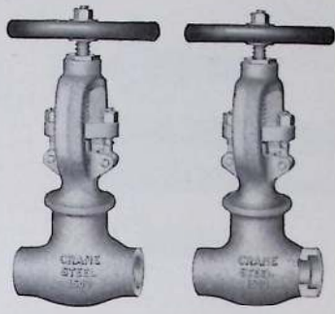
Where somewhat greater strength and better resistance to steam corrosion are desired at extremely high temperatures, the valves can be made to order of Crane No. 9 Chrome-Molybdenum Alloy Steel; prices will be furnished on application.

All valves have an Exelloy stem. The yoke bushing is made of Cast Manganese Bronze. The gland is Cast Manganese Bronze on sizes 1-inch and smaller and Ihrigized steel on the larger sizes. The gland flange is forged steel.

Standards: The pressure-temperature ratings for Crane 1500 and 2500-Pound Lip-Seal Bonnet Globe and Angle Valves are shown in the table on the opposite page. The ratings, at temperatures up to and including 950° F., agree with those in Supplement No. 1 (B16e6-1949) to American Standard B16e-1939. The ratings at higher temperatures are based on the permissible stresses defined in the A.S.M.E. Boiler Code for the chrome-molybdenum steels to which Crane No. 7 and No. 9 Steels correspond.

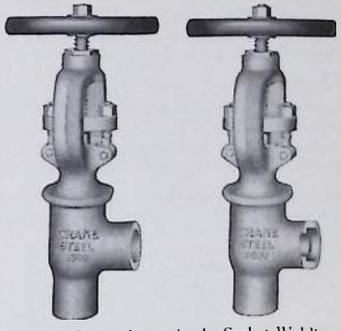
Full seating area: The diameter of the seat opening in these valves is the same as the port diameter, being at least equivalent to the inside diameter of Schedule 160 pipe on 1500-Pound Valves and to Double Extra Strong pipe on 2500-Pound Valves.

Repacking: These valves can be repacked while under pressure. When wide open, the top of the disc stem ring meets the underside of the bonnet in an angle-to-ball seat, forming a tight, line bearing contact.



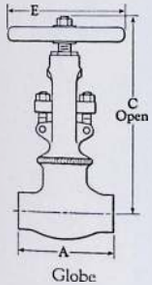
Globe, Screwed
No. 3860 U
1500-Pound
No. 3960 U
2500-Pound

Globe, Socket-Welding
No. 3862 U
1500-Pound
No. 3962 U
2500-Pound

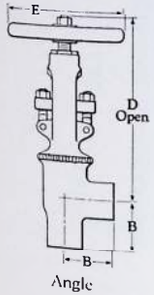


Angle, Screwed
No. 3861 U
1500-Pound
No. 3961 U
2500-Pound

Angle, Socket-Welding
No. 3863 U
1500-Pound
No. 3963 U
2500-Pound



Globe



Angle

List Prices and Dimensions

Class	Valve Type and Catalog No. Screwed End: Globe	Screwed End: Angle	Socket-Welding End: Globe	Socket-Welding End: Angle	Size Inches	List Prices Each	Dimensions, in Inches: A	B	C	D	E*	Dia. of port and seat opening	Depth of socket
1500 Pound Valves	No. 3860 U	No. 3861 U	No. 3862 U	No. 3863 U	½	Prices on request	4	2	9	8½	4⅛	½	⅜
					¾		4¾	2⅜	11¼	10¾	6	⅝	½
					1		5½	2¾	11¾	11⅛	7	13/16	½
					1¼		6½	3¼	14	13⅛	8	15/32	½
					1½		7	3½	16	15	10	111/32	½
					2		8½	4¼	18¼	17⅛	12	111/16	⅝
2500 Pound Valves	No. 3960 U	No. 3961 U	No. 3962 U	No. 3963 U	½	Prices on request	4	2	8⅞	8⅜	4⅛	⅜	⅜
					¾		4¾	2⅜	11⅝	113/16	6	½	½
					1		5½	2¾	12⅛	11⅝	7	⅝	½
					1¼		6½	3¼	14	135/16	8	⅞	½
					1½		7	3½	163/16	15⅜	10	15/32	½
					2		8½	4¼	18¾	17¾	12	1½	⅝

*Dimension "E" indicates the length of the handle or the diameter of the wheel. ½ and ¾-inch valves have a Style S Tee Handle (not illustrated); larger sizes have a Style D Wheel.

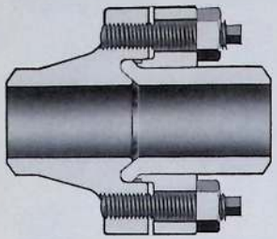
Materials . . . pages 1 to 9 *Pressure-Seal Bonnet Valves . . . . pages 206 to 215*

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Pressure-Seal Line Joints

Butt-Welding Ends

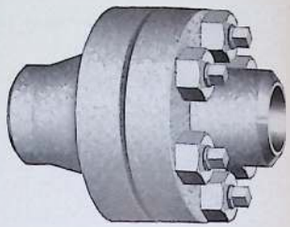
(Patented)



Cross Section
1500-Pound Line Joint

Crane Pressure-Seal Line Joints are designed for use on high-pressure high-temperature steam service in welded piping where access to equipment may be desired without necessitating torch-cutting of a line and where conventional flanged joints are susceptible to leakage or require constant maintenance.

Prices and dimensions are furnished on application.



1500-Pound
Pressure-Seal Line Joint

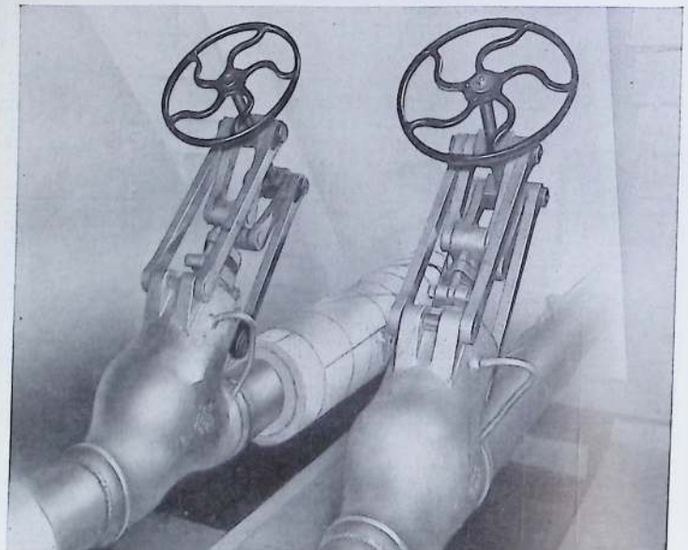
Construction: These joints are considerably smaller and lighter in weight than regular bolted joints of corresponding size made with American Standard flanges. They utilize the internal fluid pressure to assist in forcing the seal ring and mating parts together; the seal ring loading increases as the pressure increases, thus maintaining tightness. All Pressure-Seal Line Joints have butt-welding ends.

The smaller sizes are made with a screwed union ring, a stub end, a seal ring, and a socket end. Larger sizes are semi-flanged, as illustrated above; they are made with a stub end, a ring flange, a seal ring, a socket flange with welding end, and studs and nuts.

Pressure classes and sizes: Pressure-Seal Line Joints are made to order in the 600, 900, and 1500-Pound pressure classes, in sizes 1 to 16-inch, with the ends bored for any schedule of pipe.

Material: These joints can be made of a variety of alloy steels to meet specific requirements, or of a combination of alloys, one for each half of the joint. In the latter case, they provide an ideal means of joining dissimilar metals in a piping system, where the welding together of those metals might present an extremely difficult problem.

Inquiries and orders: Inquiries and orders should specify: quantity; size; service conditions in terms of fluid, pressure, and temperature; materials required on each or both ends; schedule number or the outside and inside diameter of the pipe or tubing being used.



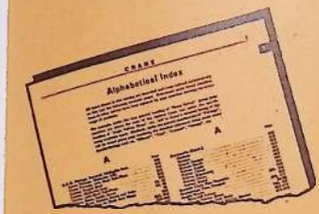
Special 12-inch 1500-Pound Crane Pressure-Seal Bonnet Globe Y-Pattern Stop Check Valves installed in the main steam lines of a central station operating at 900 pounds, 900° F.

3 Easy Ways to Find What You Want in This Catalog



1. THE CONDENSED SECTION INDEX — on the inside pages of this colored paper insert — shows everything in the No. 53 Catalog, classified under condensed section headings and section numbers. The marginal section number markers — with the help of your thumb — take you to the section you want. There, on the first page is a concise table of contents for the section. This page also gives cross-references to semi-related equipment listed in other sections.

Regular users of the No. 53 Catalog — those more or less familiar with the Crane Line — will find the Section Index a real time-saver.



2. THE 20-PAGE ALPHABETICAL INDEX — starting on page 1 of section one — is perhaps the most complete and thoroughly cross-indexed listing of piping materials ever cataloged. This is the index to use if you're looking for something by name — if you need something new or unusual — or if you want to see all the varieties of one type of equipment available from Crane.



3. THE NUMERICAL INDEX — which immediately follows the alphabetical index in section one — is always popular with users who have learned to know Crane products by catalog number. Every product with a catalog number is listed here, giving the page number on which it's described. Storeroom and purchasing department personnel, specification and price checkers, etc., will also appreciate this index.

MANY OTHER PRACTICAL FEATURES OF THE CRANE NO. 53 CATALOG

Section Index in Center of Catalog



Commonly used Brass, Bronze, Iron, and Steel Goods are Grouped in Front Part of Catalog.

Less Frequently Used Items are Grouped in Back Part.

More Compact Cataloging — Less Turning of Pages
Items of Common Usage are Grouped Together
Standard Page Style Saves Needless Reading
Clear Cross-Section Cuts Appear Throughout
All Data is Concise — in Clear, Easy-to-Read Type
All Tables are Ruled for Convenient Use
Full Dimensional Data are Given with Drawings
Catalog Numbers are Prominently Shown
Handy Engineering Data Section is Included

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INDEX TO SECTIONS

If the item you are looking for does not readily fall into any of the classifications shown, you will find it in the complete Alphabetical Index in Section One. If you know the catalog number of the product, refer to the Numerical Index, Section One.

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Helpful Literature for Piping Users and Specifiers Available Free from CRANE

From time to time, Crane publishes literature of practical value to all people concerned with usage and installation of piping materials. Coming from Crane, such literature is of high authority, and well worth having. Below are typical publications currently available, without cost or obligation. Choose the ones most useful to you and request copies through your local Crane Branch, or the Crane general office. See front of this catalog — third printed page following cover — for addresses.

1

"COMBATING CORROSION IN INDUSTRIAL PROCESS PIPING"
An illustrated study of more than 100 pages giving basic technical information for dealing with problems of corrosion in industrial process piping. Based on extensive experimentation in Crane Research Laboratories, and on wide field experience, this scientific report is highly dependable and helpful in its entire content.



2

"FLOW OF FLUIDS THROUGH VALVES, FITTINGS, AND PIPE"
One of the most popular Crane Technical Papers — this 92-page handbook on the theory of flow, with formulas and procedures for solving flow control problems. Contains an abundance of data, presented in chart form for quick graphical calculation with a minimum of reading matter. Deals with flow of steam, water, oil, liquids other than water, air, gases, and vapors.



3

"PIPE COILS"—CIRCULAR NO. 318
Keep this circular handy for its complete descriptions, specifications, and catalog information on all types of pipe coils and coil materials for most applications. Also covers the theory of heat transfer through pipe walls, and gives newest findings on subjects such as heating water with steam, etc. Includes much useful pipe and engineering data pertaining to coil applications. Ask for Circular 318.



4

"AIDS TO SELECTION OF CORROSION-RESISTANT PIPING MATERIALS"
All specifiers and buyers of piping equipment in the process industries will appreciate this up-to-date condensed visual guide showing the relative efficiency of commercial alloys on more than 150 commonly used corrosive fluids. Includes an illustrated "Question and Answer" discussion of the main factors influencing the choice of materials for such services.



5

"PIPING POINTERS"—FOR PRACTICAL PIPING MEN
Here are 32 pages of basic information for piping men . . . a manual for beginners . . . a refresher piping course for veterans. One of the most popular and helpful Crane services for piping maintenance men — everyone in your plant should have a copy.



Cast Steel Wedge Gate Valves

(And Cast Steel Pipe-Line Valves)

Crane Steel Wedge Gate Valves can be classified into two general groups. The first group covers valves 2-inch and smaller; these are frequently considered general utility valves and are used in a wide variety of services, often at pressures and temperatures lower than the recommended maximum. The second group covers valves ranging in size as large as 24-inch, all made similar in design and available in each of the American Standard pressure classes; the sizes range below 2-inch in some of the pressure classes.

Cast Steel Valves, Sizes 2-Inch and Smaller
600-Pound, with Union Bonnet....page 223
600-Pound, with Bolted Bonnet....pages 224 and 225

Cast Steel Valves, 150, 300, 400, 600, 900, and 1500-Pound
Pressure-Temperature Ratings....page 226
Service Recommendations....page 226
Description and Specification of Materials....pages 227 and 228
List Prices....page 229
Dimensions....page 230
By-Passes....page 231
Gearing....page 234
2500-Pound....page 234

Cast Steel Pipe-Line Valves
Class 600....pages 232 and 233

For Pressure-Seal Bonnet Valves, see Section 21.

For Crane-Paul Venturi Ball Valves, see pages 392 and 393.

The Steel Valves listed above comprise only a part of the complete line of Crane Steel products.

Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

Steel Globe and Angle Valves....pages 235 to 248
Steel Check Valves....pages 249 to 256
Steel Stop-Check Valves
Pressure-Seal Bonnet....pages 214 to 217
Bolted Bonnet....pages 301 to 307

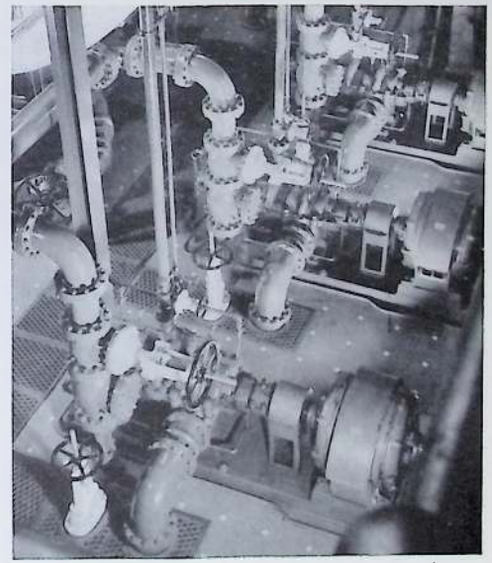
Steel Safety Valves....page 324
Steel Relief Valves....pages 333 and 334
Steel Sediment Separators....page 356

Steel Flanged Fittings....pages 267 to 274
Steel Welding Fittings....pages 275 to 290
Steel Flanges....pages 291 to 298
Steel Screwed Fittings....pages 257 to 262

Forged Steel Unions....pages 263 and 264
Forged Steel Flange Unions....pages 182 and 265

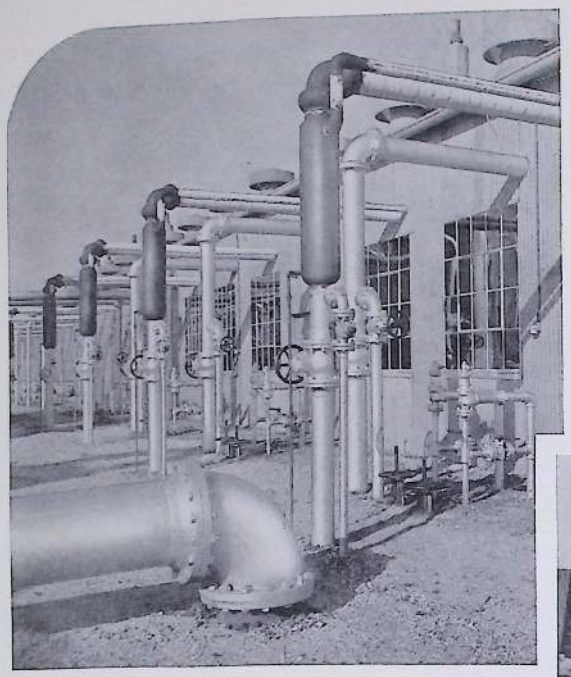
Corrosion-Resistant Alloy Products....pages 375 to 396

Fabricated Piping . . . pages 497 to 522



Condensate and feed water piping in an electric power plant. Crane valves and fittings assure safe, efficient operation.

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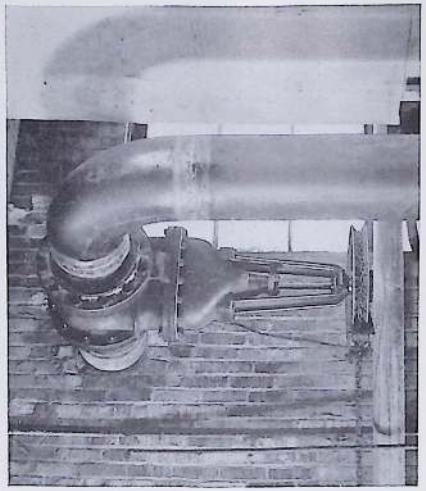
Crane Products For Every Service

At the left

Flanged fittings, flanges, and valves made by Crane in lines between compressors and distillation unit in a natural gasoline plant.

Below

Crane welding ell and chain wheel operated valve on exhaust steam in a rubber plant.



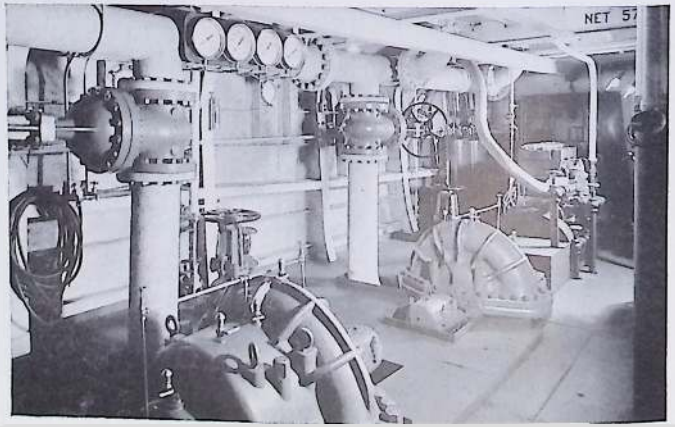


Above

Crane welding fittings, flanges and double disc gate valves in natural gas pipe line.

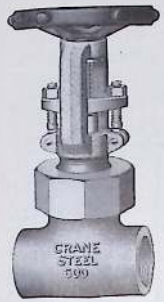
At the right

A municipal fire boat with Crane steel gate valves in water pumping lines, and other Crane marine equipment.

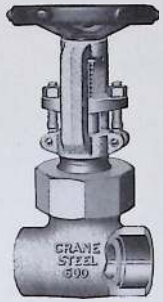


600-Pound Cast Steel Wedge Gate Valves

Union Bonnet—Outside Screw and Yoke



Gate
Screwed
No. 3602 X
No. 3602 XW
No. 3602 L



Gate
Socket-Welding
No. 3603 X
No. 3603 XW
No. 3603 L

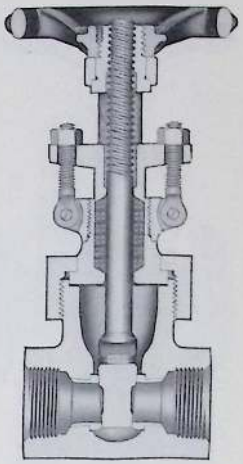
For additional information on working pressures, refer to paragraph on "Service Recommendations" shown below.

WORKING PRESSURES

Temperature Degrees F.	Pounds Non-Shock
100	2000
150	1910
200	1820
250	1730
300	1640
350	1550
400	1460
450	1370
500	1280
550	1190
600	1110
650	1030
700	940
750	850
*800	780
*850	700
*900	600
*950	530
*1000	380

TEST PRESSURES

Shell—2175 pounds hydrostatic
Seat—2100 pounds hydrostatic
Seat tested 100 pounds air-under-water



Cross Section
Gate

List Prices and Dimensions

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 3602 X, XW, or L, Screwed		Each	20.00	20.00	23.50	28.50	34.00	44.00	55.00	75.00
No. 3603 X, XW, or L, Socket-Welding		Each	20.00	20.00	23.50	28.50	34.00	44.00	55.00	75.00
Dimensions, in Inches	End to end		2½	2½	3	3½	3⅞	4¼	4½	5¼
	Depth of Socket		7/16	9/16	⅝	11/16	¾	13/16	⅞	1
	Center to top, open		5⅝	5⅝	6⅜	7	8	9⅝	10½	12⅛
	Diameter of wheel		2½	2½	3	3½	4	5	5	6

***Service recommendations:** These valves are made with three types of trim: Class "X" (Exelloy seats, disc, and stem) for oil or oil vapor up to 1000° F.; Class "XW" (Crane Hardened Stainless Steel disc and Exelloy seats and stem) for steam (850° F. maximum), water, gas, or air; and Class "L" (18-8 Mo Alloy seats, disc, and stem) for liquids and gases (not steam), up to 750° F. temperature, that may be corrosive to Exelloy but not 18-8 Mo Alloy.

For more details on "X" and "XW" trim, see "Service Recommendations" on page 226 (Class "XW" is recommended for the same services as defined there for "XR" trim).

The valves find wide application in oil refineries, oil and gas fields, power stations, and industrial plants. Low in price, unusually compact, and light in weight yet amply strong, these union bonnet valves are well suited for many services which do not require the bolted bonnet valves shown on the following two pages.

Body, bonnet, and yoke: The body, bonnet, and yoke are high quality carbon steel. The valves have the bonnet and yoke made in separate pieces and joined by long, fine threads; they are held to the body by a heavy steel union ring.

Bonnet joint: Bonnet joints are fitted with a soft iron gasket, assuring tightness and ease of maintenance. The male and female joint between body and bonnet eliminates possibility of a gasket blowout.

Body seat rings: Body seat rings have heavy sections. They seat against a square shoulder. Being securely rolled into place, there is no danger of leakage around the ring, and they will not loosen in service.

Disc: Long machined guide ribs on each side of the disc operate in channels in the valve body. With the disc closely guided throughout its entire travel, seating surfaces are protected against unnecessary wear.

Stem: The stem is finished with a tapered shoulder for back-seating in the bonnet. The lower end has an integral tee-head which fits into a slot in the disc.

Bolted gland: A bolted gland avoids threading, and thereby weakening, the yoke legs. Steel swinging type eye bolts, hinged to the yoke, hold a steel one-piece gland and gland flange rigidly in place; the bolts will not come off in service.

Stuffing box: A wide and deep stuffing box provides liberal packing space for a tight seal. It is filled with high quality packing. These valves, when wide open, can be repacked while under pressure.

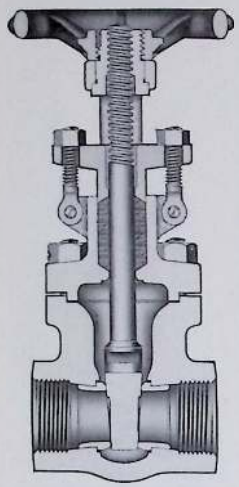
Small 600-Pound Bolted Bonnet Valves . . . pages 224 and 225

Description of materials . . . pages 1 to 9

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600-Pound Cast Steel Wedge Gate Valves

Bolted Bonnet — Outside Screw and Yoke



Cross Section
Wedge Gate—Bolted Bonnet
Outside Screw and Yoke

For list prices, dimensions, and recommendations, see the opposite page.

This Crane line answers the need for high quality, compact, light but strong, small steel gate valves. Unusually rugged and durable, their design includes features heretofore found only in larger size or more expensive valves.

The valves are made with a bolted bonnet, and screwed, flanged, or socket-welding ends in the ½ to 2-inch sizes. For union bonnet valves in sizes ¼ to 2-inch, see the preceding page.

Body, bonnet, and yoke: The body and one-piece bonnet and yoke are cast from high quality carbon steel.

The valves have a larger port than is usual for valves of this type; the seat opening diameter is approximately the same as the nominal valve size.

Bonnet joint: Bonnet joints are fitted with a soft iron gasket, assuring tightness and ease of maintenance. The male and female joint eliminates any possibility of a gasket blowout.

The bonnet joint has generous strength and can be quickly and easily dismantled and reassembled. For greater compactness, the valves are fitted with studs, made of Triplex Steel.

Disc and body seat rings: In "X" trimmed valves, for oil or oil vapor, the disc and body seat rings are Exelloy; in "XW" trimmed valves for steam or water, the body seat rings are Exelloy and the disc is Crane Hardened Stainless Steel (surface of seating area hardened to 500 Brinell). Body seat rings have heavy sections. They seat against a square shoulder. Being securely rolled into place, there is no danger of leakage around the rings, and they will not loosen in service.

Disc guides: Full length machined guide ribs on each side of the disc operate in channels in the valve body. With the disc closely guided throughout its entire travel, seating surfaces are protected against unnecessary wear.

Stem: The stem is Exelloy. Of liberal diameter, the lower end has an integral tee-head and is finished with a tapered shoulder for back-seating in the bonnet.

Accurately cut threads on the upper end provide positive control with minimum friction; being outside of the valve, they are easily lubricated.

Disc-stem connection: These valves have a tee-head disc-stem connection, providing a safe, rugged, but flexible coupling between the stem and disc. The tee-head on the stem slips into a machined slot of corresponding shape in the disc. The connection is exceptionally strong, yet it cannot distort the stem; binding of parts is avoided.



Long Disc Guides

Bolted gland: The bolted gland avoids threading, and thereby weakening, the yoke legs. Steel swinging type eye bolts, hinged to the bonnet, hold the steel one-piece gland and gland flange rigidly in place; the bolts will not come off in service. The packing load can be easily adjusted.

Stuffing box: A wide and deep stuffing box provides liberal packing space for a tight seal. It is filled with high quality cut ring packing.

Yoke sleeve: The yoke sleeve has excellent bearing qualities, strength, and a high melting point.

Handwheel: Wheels are malleable iron; those for 1¼-inch valves and smaller are of the dished design with gripping knobs around the outer edge. They are locked to the yoke sleeve by means of a setscrew.

Repacking: These valves, when wide open, can be repacked while under pressure.

WORKING PRESSURES

Temp. Deg. F.	Pounds, Non-Shock: Screwed or Socket-Welding Valves	Flanged Valves: *With ¼-inch Male Facing	Flanged Valves: With Ring Joint Facing
Class "XW", for Steam or Water Class "X", for Oil or Oil Vapor			
100	2000	1200	1440
150	1910	1180	1420
200	1820	1160	1400
250	1730	1140	1380
300	1640	1120	1365
350	1550	1095	1350
400	1460	1075	1330
450	1370	1050	1320
500	1280	1000	1250
550	1190	950	1180
600	1110	890	1110
650	1030	830	1030
700	940	760	940
750	850	680	850
800	780	600	730
850	700	490	600
Class "X", for Oil or Oil Vapor			
900	600	420	420
950	530	330	330
1000	380	240	240

*When an all-metal gasket (corrugated or flat) is used with large male and female facings, these ratings will apply only when the contact area of the gasket is not greater than that of a large tongue and groove gasket.

TEST PRESSURES

Valve	Pounds Hydrostatic: Screwed or Socket-Welding Valves	Flanged Valves: With ¼-inch Male Facing	Flanged Valves: With Ring Joint Facing
Shell	2175	1800	2175
Seat	2100	1550	1550

Seat tested 100 pounds air-under-water.

600-Pound Cast Steel Wedge Gate Valves

Bolted Bonnet — Outside Screw and Yoke

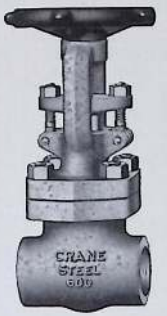
Service recommendations: These valves are ideal for a wide variety of services in oil refineries, oil and gas fields, central power stations, and industrial plants, on high pressure hydraulic lines and on high pressure-temperature steam or oil lines.

Valves with "XW" trim are particularly satisfactory for steam, water, air, gas, and other non-lubricating and relatively non-corrosive fluids such as gasoline, fuel oil, etc.; also for oil having low viscosity such as used in hydraulic systems, esspecially where seating loads are extremely high. They are recommended for maximum temperatures of 850° F. on steam and 500° F. on all other services.

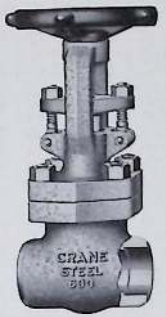
Valves with "X" trim should always be used for oil or oil vapor service at temperatures over 500° F. up to 1000° F., and for most corrosive and unrefined oils regardless of temperature.

For lubricating oils up to 500° F., either "X" or "XW" trim should give equal satisfaction.

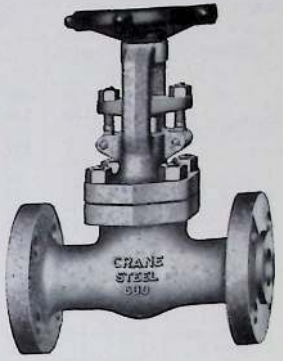
These are high quality valves, having large area seat opening and full size, rugged construction throughout. Their bolted bonnet makes it easy to dismantle even the larger sizes with a small wrench.



Gate
Screwed
No. 3607 X
No. 3607 XW



Gate
Socket-Welding
No. 3611 X
No. 3611 XW



Gate
Flanged
No. 3615 X
No. 3615 XW

For working pressures and general description, see the preceding page.

List Prices, Each, and Dimensions

Size	Inches	½	¾	1	1¼	1½	2
No. 3607 X or XW, Screwed		28.20	34.20	40.80	52.80	66.00	90.00
No. 3611 X or XW, Socket-Welding		28.20	34.20	40.80	52.80	66.00	90.00
No. 3615 X or XW, Flanged, F.D. & S.F.		48.00	56.00	69.00	85.00	106.00	136.00
Dimensions in Inches	End to end, Screwed	3	3½	4⅛	4¼	4½	5¼
	End to end, Socket-Welding	3½	4	4⅛	4¼	4½	5¼
	Depth of socket	⅝	11/16	¾	13/16	⅞	1
	*Face to face, Flanged	6½	7½	8½	9	9½	11½
	Center to top, open	6⅜	713/16	9⅜16	10⅝16	12	14½
	Diameter of wheel	3½	4	5	5	6	7
	Diameter of flange	3¾	4⅝	4⅞	5¼	6⅛	6½
	*Thickness of flange	9/16	⅝	11/16	13/16	⅞	1
	Diameter of male face	1⅜	111/16	2	2½	2⅞	3⅝
	Diameter of bolt circle	2⅝	3¼	3½	3⅞	4½	5
	Number of bolts	4	4	4	4	4	8
	Diameter of bolts	½	⅝	⅝	⅝	¾	⅝

*Face to face dimensions include the ¼" male face; thickness of flange dimensions do not.

Face to face: Face to face dimensions of the flanged valves, sizes 1-inch and larger, conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged Valves (No. B16.10-1939). This Standard does not include sizes ½ and ¾-inch.

Flange dimensions, facing, and drilling: End flanges on flanged valves conform to the 600-Pound American Standard (B16e-1939). They have a male face ¼-inch high (large male), finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

When so ordered, flanged valves can be furnished with ring joint, female, tongue, or groove facing; see the Crane Discount Sheet for prices.

List prices include drilling to the 600-Pound American Standard (B16e-1939), and spot facing. No deduction is made if valves are ordered faced only.

Valves with 150-Pound flanges: Flanged valves having end flanges conforming to the 150-Pound American Steel Flange Standard can be made to order; prices will be furnished on application.

Monel trimmed valves: Monel trimmed steel gate and globe valves for corrosion-resistant service are listed on page 387.

Union bonnet valves: Crane also manufactures a complete line of 600-Pound Cast Steel Wedge Gate Valves with Union Bonnet; see page 223.

Description of materials . . . pages 1 to 9 *Templates for drilling . . . page 462*
For dimensions of ring joint and special facings, see pages 469 to 471.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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22

Cast Steel Wedge Gate Valves

Working Pressures, Pounds per Square Inch, Non-Shock
For Valves Shown on pages 227 to 231 and 234

[3]Fluid	Temp. Deg. Fahr.	[1]Flanged Valves with Standard Facings Other Than Ring Joint: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	Flanged Valves with Ring Joint Facing, Butt-Welding[2] and Screwed End Valves: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Steam, Water, Air, or Gas *Class XR*	100	230	600	800	1200	1800	3000	5000	275	720	960	1440	2160	3600	6000
	150	220	590	785	1180	1770	2950	4915	255	710	945	1420	2130	3550	5915
	200	210	580	770	1160	1740	2900	4830	240	700	930	1400	2100	3500	5830
	250	200	570	760	1140	1710	2850	4750	225	690	920	1380	2070	3450	5750
	300	190	560	740	1120	1680	2800	4660	210	680	910	1365	2050	3415	5690
	350	180	550	725	1095	1645	2740	4565	195	675	900	1350	2025	3375	5625
	400	170	540	710	1075	1615	2690	4475	180	665	890	1330	2000	3330	5550
	450	160	525	700	1050	1580	2630	4380	165	660	875	1320	1975	3295	5490
	500	**150**	500	665	1000	1500	2500	4165	**150**	625	835	1250	1875	3125	5210
	550	140	475	630	950	1420	2370	3950	140	590	790	1180	1775	2955	4925
	600	130	445	590	890	1330	2220	3700	130	555	740	1110	1660	2770	4620
Oil or Oil Vapor *Class X*	650	120	415	550	830	1240	2070	3450	120	515	690	1030	1550	2580	4300
	700	110	380	500	760	1140	1900	3160	110	470	635	940	1410	2350	3920
	750	100	360	475	720	1080	1800	2995	100	425	575	850	1275	2125	3550
	800	92[5]	340	450	680	1020	1700	2830	92[5]	375	500	750	1125	1875	3125
	850	82[5]	320	425	640	960	1600	2665	82[5]	350	475	700	1050	1750	2925
Steam *Class U*	900	[4]70[5]	**300**	**400**	**600**	**900**	**1500**	**2500**	[4]70[5]	325	425	650	975	1625	2700
	950	[4]55[5]	[4]265	[4]350	[4]530	[4]795	[4]1325	[4]2205	[4]55[5]	**300**	**400**	**600**	**900**	**1500**	**2500**
Oil Vapor, Oil, *Class X*	1000	[4]40[5]	[4]190	[4]250	[4]380	[4]570	[4] 950	[4]1580	[4]40[5]	[4]230	[4]310	[4]470	[4]700	[4]1170	[4]1950
	1050									[4]135	[4]180	[4]270	[4]405	[4] 675	[4]1125
	1100									[4] 90	[4]120	[4]180	[4]270	[4] 450	[4] 750

Flanged No. 5 Chrome-Molybdenum Alloy Steel Valves (Made to order)

		[1]Facings Other Than Ring Joint						Ring Joint Facing					
Oil or Oil Vapor only *Class X*	100 to 750	For temperatures up to 900° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves shown above.						For temperatures up to 800° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves shown above.					
	800							400	525	800	1200	2000	3325
	850							375	500	750	1125	1875	3125
	900	310	410	620	930	1550	2580	350	475	700	1050	1750	2925
	950	**300**	**400**	**600**	**900**	**1500**	**2500**	325	425	650	975	1625	2700
	1000	200	275	400	600	1000	1675	**300**	**400**	**600**	**900**	**1500**	**2500**
	1050	135	180	270	405	675	1125	225	275	425	650	1075	1775
	1100	90	120	180	270	450	750	150	200	275	425	700	1175

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]When welding end valves are used at temperatures over 850° F. in services where graphitization may be a problem, valves made of Crane No. 7 or No. 9 Chrome-Molybdenum Steel are recommended.

[3]**Service recommendations:** Valves with **"XR"** trim are particularly satisfactory for steam, water, air, gas, and other non-lubricating and relatively non-corrosive fluids such as gasoline, fuel oil, etc.; also for oil having low viscosity such as used in hydraulic systems, especially where seating loads are extremely high. They are recommended for maximum temperatures of 850° F. on steam and 500° F. on all other services.

Valves with **"X"** trim should always be used for oil or oil vapor service at temperatures over 500° F. and for most corrosive and unrefined oils regardless of temperature. Maximum recommended temperatures are: 1000° F. on 150-Pound, and 1100° F. on 300 to 2500-Pound Valves.

For lubricating oils up to 500° F., either **"X"** or **"XR"** should give equal satisfaction.

"U" trim is provided primarily for high temperature (up to 950° F.) steam lines.

[4]These ratings apply only to oil or oil vapor service.

[5]Ratings for 150-Pound Valves for 800° F. and higher apply to sizes 12-inch and smaller only.

Cold service: For temperatures between 0° and 100° F., the ratings for 100° F. apply. For sub-zero service, materials with suitable impact resistance must be used; recommendations on request.

Flange facings: Unless otherwise ordered, flanged end 150 and 300-Pound Valves regularly are furnished with 1/16-inch raised faces, and 400-Pound and higher pressure valves, with 1/4-inch male faces.

Standards: Crane pressure-temperature ratings agree with those in Supplement No. 1 (ASA B16e6-1949) to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939 and those in the American Petroleum Institute (API) Standard No. 600, Second Edition, 1951.

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Cast Steel Wedge Gate Valves

Crane Cast Steel Outside Screw and Yoke Wedge Gate Valves are exceptionally sturdy, rugged, and durable. Carefully selected materials of superior quality combined with designs of outstanding merit assure the highest utility. The valves are particularly well suited for high-pressure, high-temperature services and have a wide application in long-distance pipe lines, in modern industrial plants and central power stations, and in oil refineries.

The Crane line is complete and includes valves in a wide range of sizes, in seven pressure classes (150, 300, 400, 600, 900, 1500, and 2500-Pound), and with flanged, screwed or butt-welding ends. Made of carbon or alloy steels, the valves are furnished with trim materials especially suited for the recommended services, assuring maximum valve performance. The general design of Crane Cast Steel Wedge Gate Valves is described on the next page and material specifications are shown in the table below.

List prices and dimensions are shown on pages 229 and 230 (prices and dimensions of 2500-Pound Valves are furnished on application).

HYDROSTATIC TEST PRESSURES, IN POUNDS

Pressure Class	Flanged Valves With Facing Other Than Ring Joint: Shell	Seat	Flanged Valves With Ring Joint Face Screwed and Butt-Welding Valves: Shell	Seat
150-Pound	350	350	425	350
300-Pound	900	775	1100	775
400-Pound	1200	1000	1450	1000
600-Pound	1800	1550	2175	1550
900-Pound	2700	2250	3250	2250
1500-Pound	4500	3700	5400	3700

Valve seats are tested 100 pounds air-under-water.

For working pressures, see opposite page.

Specification of Materials

150-Pound Valves are regularly made of Crane Carbon Steel. 300, 400, 600, 900, 1500, and 2500-Pound Valves are regularly made of Crane No. 4 Carbon-Molybdenum Alloy Steel.

The valves are furnished with a variety of trim materials as indicated below.

Orders should specify both catalog number and letter suffix; catalog numbers are listed on page 229.

For extremely severe oil or oil vapor services, valves can be made of Crane No. 5 Chrome-Molybdenum Alloy Steel. They are made to order only; see the Crane Discount Sheet for prices.

Kind of Trim	Names of Parts		150 Pound Valves	300 Pound Valves	400 Pound Valves	600 Pound Valves	900 Pound Valves	1500 Pound Valves	2500 Pound Valves
*Class "X" Oil or Oil Vapor 1100° F. Max.	Body and Bonnet		Carbon Steel	No. 4 Carbon-Molybdenum Steel					
	Disc	6" and smaller						Exelloy	Exelloy or Exelloy-Faced Alloy Steel
		8" and smaller				Exelloy			
		12" and smaller	Exelloy						
		Larger sizes	Exelloy-Faced Carbon Steel	Exelloy-Faced Alloy Steel					
	Body Seat Rings		Exelloy						
	Stem		Exelloy						
	Bonnet Gasket		Corrugated Soft Iron	Soft Steel Ring Joint Gasket					
	Bonnet Bolt-Studs		Triplex Steel						
*Class "XR" Steam or Water 850° F. Max.	Body and Bonnet		Carbon Steel	No. 4 Carbon-Molybdenum Steel					
	Disc	6" and smaller						Exelloy	2500-Pound Valves with "XR" trim are not regularly furnished.
		8" and smaller				Exelloy			
		12" and smaller	Exelloy						
		Larger sizes	Exelloy-Faced Carbon Steel	Exelloy-Faced Alloy Steel					
	Body Seat Ring		No. 49 Nickel Alloy						
	Stem		Exelloy						
	Bonnet Gasket		Corrugated Soft Iron	Soft Steel Ring Joint Gasket					
	Bonnet Bolt-Studs		Triplex Steel						
*Class "U" Steam or Water 950° F. Max.	Body and Bonnet		150-Pound Valves with "U" trim are not listed.	No. 4 Carbon-Molybdenum Steel					
	Disc			Stellite-Faced Alloy Steel					
	Body Seat Rings			Stellite-Faced Alloy Steel					
	Stem			Exelloy					
	Bonnet Gasket			†Soft Iron	Soft Steel Ring Joint Gasket				
	Bonnet Bolt-Studs			Temploy Steel					

*For detailed service recommendations, see the opposite page. †Corrugated Soft Iron.

List prices . . . page 229 *Description of materials . . . pages 1 to 9* *Dimensions . . . page 230*

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Cast Steel Wedge Gate Valves

Body and bonnet: The body and bonnet are unusually rugged, having heavy metal sections and ample reinforcement at points subjected to greatest stress. The body has straight-through ports without recess except between the seats, assuring minimum turbulence, erosion, and resistance to flow. The bonnet is equipped with a bonnet bushing.

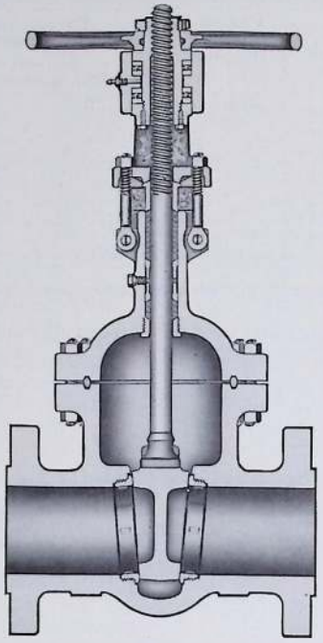
Bonnet joint: The bonnet joint of 150-Pound Valves is plain faced, accurately machined, and fitted with a gasket. 300-Pound Valves have a self-centering male and female joint equipped with a gasket. All other valves have a ring-type joint.

Triplex or Templex Steel through bolt-studs produce a tight, strong bonnet joint.

Ball-bearing yoke: The following valves are regularly equipped with a ball-bearing yoke to facilitate operation:

400-Pound.....8-inch and larger
600 and 900-Pound..6-inch and larger
1500 and 2500-Pound.5-inch and larger

300-Pound Valves 14-inch and larger can be equipped with a ball-bearing yoke when orders so specify; prices on application.



Outside Screw and Yoke
Wedge Gate Valve
(With Ball-Bearing Yoke)

Body seat rings: All valves have shoulder-type body seat rings. In "X" and "XR" trimmed valves, the seat rings are screwed into the body. In "U" trimmed valves, they are either screwed into the body or slipped in and welded, depending on the valve size.

Disc and stem: The disc is of the solid web type, with long close-fitting guides to maintain accurate seating and to reduce wear. A tee-head disc-stem connection prevents lateral strains on the stem. The stem is of liberal diameter with long and accurately cut threads, and has ample engagement with the yoke sleeve.

Stuffing box: The stuffing box on all valves is deep, assuring tightness and long packing life. The stuffing box is the lantern type on all except the 150-Pound Valves. The valves, when wide open, can be repacked while under pressure.

Gland: All valves have a two-piece ball-type gland and gland flange which exert an even pressure on the packing without binding the stem.

Flange facings: The 150 and 300-Pound Flanged Valves are regularly furnished with an American Standard 1/16-inch raised face on the end flanges; the 400, 600, 900, 1500, and 2500-Pound Flanged Valves regularly have a 1/4-inch male face (large male). When so ordered, valves can be furnished with other types of facing, such as ring joint, female, tongue, groove, etc.; see the Crane Discount Sheet for prices.

Finish of flange faces: The 1/16-inch raised faces and the 1/4-inch male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish can be furnished on the raised or male faces, when specified; see the Crane Discount Sheet for prices.

By-passes: Valves can be furnished with a by-pass. See page 231 for prices and description.

Gearing: Larger size valves can be made with gears to facilitate operation; prices on application. See page 234 for information and description.

Motor or cylinder operation: These valves can be equipped with an electric, air, or gas motor, or an operating cylinder; prices on application. See pages 124 to 129 for description.

Standards: In design and materials Crane Cast Steel Gate Valves exceed the requirements of Standards issued by the American Standards Association and the American Petroleum Institute.

End flanges on flanged valves conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

All flanged and butt-welding valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939, for their respective pressure class. (This Standard does not include 3½-inch 600-Pound Valves, or butt-welding valves larger than 8-inch.)

All flanged and butt-welding end valves, with Exelloy ("X") trimmings, conform to the API Standard for Flanged and Welding End Steel Wedge Gate Valves for Refinery Use, No. 600, Second Edition, 1951. (This Standard does not include sizes 3½ and 5-inch.)

150, 300, 400, and 600-Pound Flanged and 300, 400, and 600-Pound Butt-Welding End Valves, with Exelloy ("X") trimmings, conform also to the API Standard for Pipe Line Valves, No. 6-D, Sixth Edition, May, 1949. (This Standard does not include sizes 1½, 3½, and 5-inch, nor 150-Pound Butt-Welding End Valves.)

Pressure-temperature ratings ..... page 226
Service recommendations ..... page 226
Material specifications ..... page 227

Cast Steel Wedge Gate Valves

DRILLING

Unless otherwise ordered, flanged valves of each pressure class are furnished with end flanges faced, drilled, and spot faced (F. D. & S. F.).

Prices include drilling to the corresponding pressure class of the American Standard; no deduction is made if valves are ordered faced only.

BUTT-WELDING VALVES

Unless otherwise ordered, 150 and 300-Pound Butt-Welding Valves sizes 12-inch and smaller are bored to match the inside diameter of Standard pipe (heaviest weight on 8, 10, or 12-inch size).

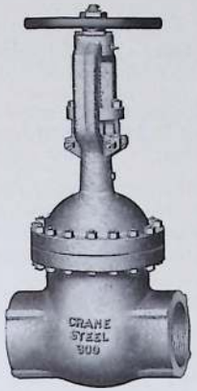
For 150 and 300-Pound Valves larger than 12-inch and for all sizes of 400, 600, 900, 1500, and 2500-Pound Valves, orders must specify the diameter of bore (I.D. of pipe).

Dimensions, page 230

2500-Pound Valves, page 234

By-passes, page 231

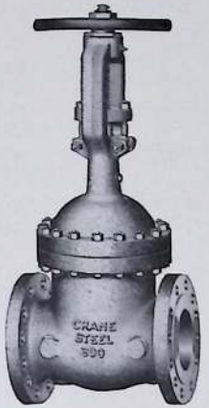
Special facings, pages 468 to 471



Outside Screw and Yoke
Screwed

For Oil or Oil Vapor
No. 46 X, 150-Pound
No. 32 X, 300-Pound

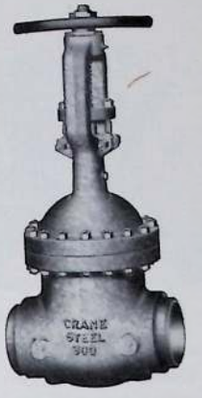
For Steam or Water
No. 46 XR, 150-Pound
No. 32 XR, 300-Pound



Outside Screw and Yoke
Flanged

For Oil or Oil Vapor
No. 47 X, 150-Pound
No. 33 X, 300-Pound
No. 61 X, 400-Pound
No. 76 X, 600-Pound
No. 83 X, 900-Pound
No. 87 X, 1500-Pound

For Steam or Water
No. 47 XR, 150-Pound
Nos. 33 XR or U, 300-Pound
Nos. 61 XR or U, 400-Pound
Nos. 76 XR or U, 600-Pound
Nos. 83 XR or U, 900-Pound
Nos. 87 XR or U, 1500-Pound



Outside Screw and Yoke
Butt-Welding

For Oil or Oil Vapor
No. 47½ X, 150-Pound
No. 33½ X, 300-Pound
No. 76½ X, 600-Pound
No. 83½ X, 900-Pound
No. 87½ X, 1500-Pound

For Steam or Water
No. 47½ XR, 150-Pound
Nos. 33½ XR or U, 300-Pound
Nos. 61½ XR or U, 400-Pound
Nos. 76½ XR or U, 600-Pound
Nos. 83½ XR or U, 900-Pound
Nos. 87½ XR or U, 1500-Pound

When ordering, specify the catalog number and suffix.

See page 227 for specification of materials.

List Prices, Each

Size	Screwed End Valves		Flanged End Valves, F.D. & S.F., or Butt-Welding End Valves					
Inches	150 Pound	300 Pound	150 Pound	300 Pound	400 Pound	600 Pound	900 Pound	1500 Pound
1							Use 1500 Pound Valves	347.00
1¼								385.00
1½				†194.00				430.00
2	153.00	209.00	160.00	221.00	Use 600 Pound Valves	298.00		550.00
2½	173.00	247.00	180.00	261.00		358.00		695.00
*3	194.00	280.00	200.00	*294.00		*437.00	726.00	928.00
‡3½			‡236.00	‡348.00		‡510.00		
4	264.00	361.00	278.00	381.00	570.00	690.00	947.00	1280.00
5			368.00	548.00	755.00	1060.00	1288.00	2040.00
6			437.00	675.00	940.00	1390.00	1755.00	2670.00
8			604.00	996.00	1500.00	2015.00	2640.00	4130.00
10			820.00	1390.00	2055.00	2995.00	3740.00	6425.00
12			1096.00	1872.00	2715.00	3975.00	5115.00	9340.00
14			1582.00	2662.00	3580.00	5340.00	7320.00	13685.00
16			2116.00	3410.00	4740.00	6955.00	9215.00	
18			2850.00	4427.00	6890.00	8745.00	12780.00	
20			3566.00	5798.00	9440.00	13250.00		
24			5480.00	8527.00	13910.00	21860.00		

For smaller sizes, use the Cast Steel Valves shown on pages 223 to 225.

*When 3" 300 and 600-Pound Flanged Valves with ring joint facing are to be bolted to Cranelap joints, orders must specify. A groove of special pitch diameter is required; see page 470 for dimensions.

†This price applies only to No. 33 X and No. 33 XR Valves; 300-Pound Butt-Welding End or "U" trimmed valves in the 1½-inch size are special, prices on application.

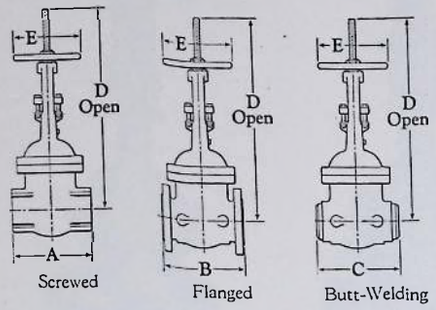
‡Butt-welding end valves are not made in the 3½-inch size; these prices apply only to flanged end.

Service recommendations and ratings .... page 226

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Cast Steel Wedge Gate Valves

Dimensions, in Inches



Screwed — Flanged — Butt-Welding

Face to face: 150 and 300-Pound Flanged Valves are regularly furnished with a 1/16-inch raised face, and 400, 600, 900, 1500, and 2500-Pound Flanged Valves are regularly furnished with 1/4-inch high large male facing; face to face dimensions include these facings.

All flanged and butt-welding valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939, for their respective pressure class. This Standard does not include 3 1/2-inch 600-Pound Valves or butt-welding valves larger than 8-inch.

Class	Size of Valve	A	B	C	D	E
150-Pound	2	6 1/4	7	7	16 1/2	8
	2 1/2	7	7 1/2	7 1/2	18	8
	3	7 3/8	8	8	20 3/4	9
	3 1/2		8 1/2		23	9
	4	8	9	9	25 3/4	10
	5		10	10	30 1/2	12
	6		10 1/2	10 1/2	35 1/4	14
	8		11 1/2	11 1/2	43	14
	10		13	13	52 1/2	18
	12		14	14	60 1/2	18
	14		15	15	70 1/4	22
	16		16	16	79 3/4	24
	18		17	17	89	27
	20		18	18	97 1/4	30
	24		20	20	112 3/4	30
300-Pound	1 1/2		7 1/2		17 1/2	8
	2	7	8 1/2	8 1/2	18 1/2	8
	2 1/2	8	9 1/2	9 1/2	20 1/4	8
	3	9	11 1/8	11 1/8	23 1/4	9
	3 1/2		11 7/8		25 1/4	9
	4	11	12	12	28 1/4	10
	5		15	15	33 1/2	12
	6		15 7/8	15 7/8	38 1/2	14
	8		16 1/2	16 1/2	47	16
	10		18	18	56 1/2	20
	12		19 3/4	19 3/4	64 1/4	20
	14		30	30	74 3/4	27
	16		33	33	80 1/2	27
	18		36	36	91	30
	20		39	39	100 1/2	36
	24		45	45	120 1/2	36
400-Pound	4		16	16	31 1/2	12
	5		18	18	35	14
	6		19 1/2	19 1/2	40 1/4	16
	8		23 1/2	23 1/2	50 1/2	20
	10		26 1/2	26 1/2	59 3/4	24
	12		30	30	67 3/4	24
	14		32 1/2	32 1/2	74 3/4	27
	16		35 1/2	35 1/2	80 3/4	27
	18		38 1/2	38 1/2	91 1/4	30
	20		41 1/2	41 1/2	100 1/2	36
	24		48 1/2	48 1/2	120 3/4	36

Class	Size of Valve	B	C	D	E
600-Pound	2	11 1/2	11 1/2	18 1/4	8
	2 1/2	13	13	22 1/4	9
	3	14	14	25 3/4	10
	3 1/2	15		32	14
	4	17	17	32	14
	5	20	20	36 3/4	16
	6	22	22	42 3/4	20
	8	26	26	52 1/4	24
	10	31	31	62 1/4	27
	12	33	33	70	27
	14	35	35	77 1/4	30
	16	39	39	83 3/4	30
	18	43	43	93 3/4	36
	20	47	47	104 1/2	36
	24	55	55	126	42
900-Pound	3	15	15	28 1/2	12
	4	18	18	32	14
	5	22	22	36 3/4	16
	6	24	24	42 3/4	20
	8	29	29	52 1/2	24
	10	33	33	62 1/4	27
	12	38	38	73 1/2	30
	14	40 1/2	40 1/2	77 1/4	30
	16	44 1/2	44 1/2	85 3/4	36
	18	48	48	97 3/4	36
1500-Pound	1	10	10	16	8
	1 1/4	11	11	16 1/2	8
	1 1/2	12	12	20	9
	2	14 1/2	14 1/2	23 1/4	10
	2 1/2	16 1/2	16 1/2	27 1/2	12
	3	18 1/2	18 1/2	29	14
	4	21 1/2	21 1/2	34	16
	5	26 1/2	26 1/2	38 3/4	20
	6	27 3/4	27 3/4	47	24
	8	32 3/4	32 3/4	55	27
	10	39	39	65	36
	12	44 1/2	44 1/2	78 3/4	36
	14	49 1/2	49 1/2	82 3/4	36
2500-Pound	Dimensions of 2500-Pound Valves are furnished on application.				

Description . . . pages 226 to 229 *Taps and drains for valves . . . page 579* *Location of by-passes . . . page 579*
Templates for drilling and flange dimensions . . . pages 461 to 463 *Clearance dimensions of by-pass . . . page 231*

By-Passes for Cast Steel Wedge Gate Valves

When so ordered, Crane Cast Steel Wedge Gate Valves can be furnished with a Built-Up By-Pass, suitable for "warming up" on steam line service or for equalizing the pressure around main control valves used on steam or other fluids.

Construction: The Crane Built-Up By-Pass is designed to provide maximum strength, durability, and flexibility with a minimum of additional weight on the main valve.

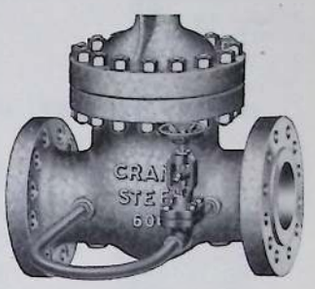
The by-pass is furnished with a steel bolted bonnet outside screw and yoke socket-welding end globe valve. All connections in the by-pass are socket-welded to assure a permanently tight and strong assembly.

Pipe bends are used on all pressure classes to provide the necessary flexibility and to compensate for expansion strains resulting from unequal temperatures or fluctuating operating conditions.

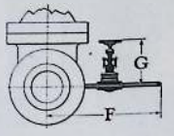
Materials: The materials used in the by-pass piping and in the by-pass valve are of high quality. The pipe bend is seamless steel. The pipe and by-pass valves are of ample weight to withstand the pressures and temperatures for which the main valve is recommended, and the by-pass valve is trimmed with materials that are suitable for the same services as the main valves.

List prices: Extra list prices, shown below, include the Built-Up By-Pass completely assembled and attached to either of the sides or to the bottom of the main valve. Unless otherwise specified, by-passes will be attached to the side of the main valve, with the stems of the main valve and the by-pass valve parallel and pointing vertically upward.

Special by-passes: By-passes of other designs or specifications can be made to order; prices on application. Inquiries should be accompanied by complete description, drawings, or specifications.



Typical Built-Up By-Pass



By-Pass for Gate Valves
(Side Mounting illustrated)

Clearance dimensions
F and G are
identical for bottom mounting.

Extra List Prices and Dimensions for Built-Up By-Passes

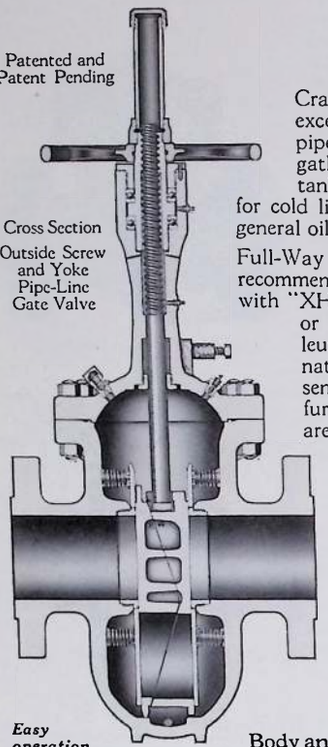
Main Valve Class of Trim	Main Valve Size of Valve	Size of By-Pass Used	Built-Up By-Passes for Use with Main Valves Of Pressure Classes Specified Below — Extra List Prices Per By-Pass 150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	Approximate Clearance Dimensions, in Inches — F 150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	G (Open) 150 to 600-Lb.	900 or 1500-Lb.
	Inches	Inches														
"XR" Trim	4	3/4					400.00	400.00					21 1/4	21 3/4		9 1/8
	5	3/4		210.00	278.00	278.00	400.00	400.00		19 3/4	20 1/8	20 1/4	22 5/8	22 7/8	8 7/8	9 1/8
	6	3/4		210.00	278.00	278.00	400.00	400.00		20 1/4	21 1/4	21 1/2	23 1/8	23 7/8	8 7/8	9 1/8
	8	3/4		210.00	278.00	278.00	400.00	400.00		22 1/4	22 3/4	22 7/8	25	26 5/8	8 7/8	9 1/8
	10	1		235.00	310.00	310.00	475.00	475.00		25	26 1/4	26 5/8	28 7/8	30 7/8	9 3/8	10 3/4
	12	1	215.00	235.00	310.00	310.00	475.00	475.00	25 3/8	26 1/2	28 1/8	28 1/2	30 5/8	32 3/4	9 3/8	10 3/4
	14	1 1/4	255.00	280.00	370.00	370.00	545.00	545.00	27 1/2	30	30 1/4	30 3/4	33 5/8	35 7/8	11	13
	16	1 1/4	255.00	280.00	370.00	370.00	545.00		29 3/8	31 3/4	31 7/8	32 1/2	35 1/4		11	13
	18	1 1/2	310.00	340.00	450.00	450.00	660.00		32	35 1/2	35 1/2	35 3/4	38 1/4		12	13 5/8
	20	1 1/2	310.00	340.00	450.00	450.00			33 1/4	36 5/8	36 7/8	37 1/8			12	
	24	2	380.00	420.00	550.00	550.00			38 3/4	44	44 3/8	45 3/8			14	
"U" Trim	4	3/4					400.00	400.00					21 1/4	21 3/4		9 1/8
	5	3/4		265.00	333.00	333.00	400.00	400.00		20 5/8	21 1/8	21 1/4	22 5/8	22 7/8		9 1/8
	6	3/4		265.00	333.00	333.00	400.00	400.00		21 1/4	22 1/4	22 1/2	23 1/8	23 7/8		9 1/8
	8	3/4		265.00	333.00	333.00	400.00	400.00		23 1/4	23 3/4	23 7/8	25	26 5/8		9 1/8
	10	1		295.00	370.00	370.00	475.00	475.00		26 1/2	27	27 3/8	28 7/8	30 7/8		10 3/4
	12	1		295.00	370.00	370.00	475.00	475.00		28	28 7/8	29 1/4	30 5/8	32 3/4		10 3/4
	14	1 1/4		377.00	467.00	467.00	545.00	545.00		31 5/8	31 7/8	32 3/8	33 5/8	35 7/8		13
	16	1 1/4		377.00	467.00	467.00	545.00			33 3/8	33 1/2	34 1/8	35 1/4			13
	18	1 1/2		477.00	587.00	587.00	660.00			37 1/8	37 1/8	37 7/8	38 1/4			13 5/8
	20	1 1/2		477.00	587.00	587.00				38 1/4	38 1/2	39 1/4				13 5/8
	24	2		610.00	740.00	740.00				47 3/4	48 1/8	48 5/8				16 1/2

Taps and drains for valves . . . page 579 *Location of by-passes . . . page 579*

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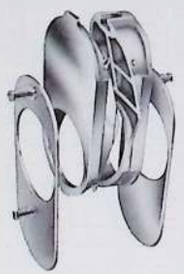
Class 600 Cast Steel Pipe-Line Gate Valves

Double-Seating, Grease-Packed Valves Designed for Petroleum and Gas Industries



Easy operation

Note in illustration above, only the outlet or "stem" half of the disc is connected to the stem. The inlet or "floating" half is held loosely to this half by four assembly links (see below). Contact between the halves is in the form of finished flat surfaces disposed at two angles—one provides tight seating when the valve is closed; the other, tight seating when the valve is open.



Disc and Plate Assembly

For ratings, prices, and dimensions, see the next page.

Crane Pipe-Line Gate Valves are excellently suited for oil or gas pipe lines and pump houses, for gathering lines in the field, for tank farms and storage stations, for cold lines in the refinery, and for general oil and gas service.

Full-Way Valves with "X" trim are recommended for crude oil service, and with "XH" trim, for use in gas piping or lines carrying refined petroleum products of a non-corrosive nature, such as gasoline, kerosene, fuel oil, etc. Venturi Valves, furnished with "XH" trim only, are recommended for gas service.

Materials: The body and bonnet are carbon cast steel. The stem is Exelloy. The disc halves, Exelloy in "X" trimmed and steel in "XH" trimmed valves, have chromium-plated faces. The screwed-in shoulder type body seat rings, made of steel, are faced with Stellite in "X" trimmed valves and with aluminum bronze in "XH" trimmed valves.

Body and bonnet: The body and bonnet chambers are filled with high grade grease which thoroughly lubricates internal parts, assuring easier operation and providing a tight seal throughout.

Triplex Steel bolt-studs, drawn up only enough to form a rubber "O" ring gasket into a wedge-shaped groove in the face of the body flange, join body and bonnet into a firm, metal-to-metal contact. Internal pressure against the gasket insures permanent tightness.

Double-seating disc: The disc consists of two, parallel face, expanding gates, each with a circular "conduit" extension at the bottom. The disc wedges tightly against the seats in both the open and closed positions. Flow through the wide open valve is smooth and continuous. There is no erosion or turbulence, nor are there pockets to accumulate dirt.

Spring-actuated plates, closely fitted around the body rings, press firmly against each side of the disc at all times to retain lubricant in the body. Pressure of these plates on the disc faces also permits the unwedged disc to ride freely between the seats during opening and closing operations.

Stem and yoke sleeve: The valves have a loose fitting, tee-head, disc-stem connection. Stem threads are well lubricated. Above the yoke sleeve, the stem is enclosed in a capped protector. For easier operation, Full-Way Valves 6-inch and larger and Venturi Valves 8 x 6-inch and larger have a ball-bearing yoke sleeve.

Packing chamber: To maintain a tight, durable stem seal, these valves utilize a special plastic packing contained between V-type end rings. The packing is easily replenished through a ball-check injector fitting in the bonnet.

Relief valve: As a safeguard against excessive pressure build-up due to high outside temperatures expanding the grease in the lubricating chambers, valves handling oil or refined products are equipped with a spring-loaded relief valve in the bonnet.

Gearing: To facilitate operation of large size and/or high pressure valves when used at or near their maximum rating, the use of ball bearings, gearing, or other means of reducing operating torque should be considered.

When specified, these valves can be furnished with bevel or spur gearing in an enclosed case; it is particularly recommended that Full-Way Valves 10-inch and larger and Venturi Valves 16 x 12-inch and larger be so equipped. Prices on application.

Indicator: The valves can be equipped with an indicator when so ordered; prices on application.

Standards: End flanges on flanged valves conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for the 600-Pound pressure class.

Face to face dimensions of flanged valves and end to end dimensions of butt-welding valves conform to the American Standard (ASA) for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939, and to the American Petroleum Institute (API) Standard for Pipe Line Valves, No. 6D, Sixth Edition, May, 1949 for the 600-Pound pressure class.

The above Standards do not include 22, 26, and 30-inch sizes; nor does American Standard B16.10-1939 include butt-welding valves larger than 8-inch.

Class 600 Cast Steel Pipe-Line Gate Valves

WORKING PRESSURES

For Cold Oil or Gas	Flanged Valves		Butt-Welding Valves
	With Facings Other Than Ring Joint	With Ring Joint Facing	
	1200 pounds	1440 pounds	1440 pounds

HYDROSTATIC TEST PRESSURES

Shell—2175 pounds Seat—1550 pounds

Valve seat tested 100 pounds air-under-water.

Flange facings: Flanged valves are regularly furnished with a ¼-inch male face (large male); the faces are finished with concentric grooves, approximately 32 per inch, known as a "serrated" finish.

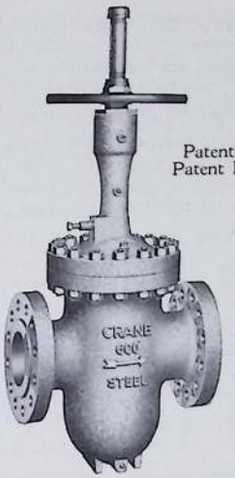
Male faced valves with a smooth finish, and flanged valves with other types of facings such as ring joint, female, tongue, groove, etc., can be made to order when so specified, at an extra charge.

Drilling: Unless otherwise ordered, flanged valves are furnished faced, drilled, and spot faced. Prices include drilling to the 600-Pound American Standard. No deduction is made for valves ordered faced only.

Butt-welding valves: Ends of butt-welding valves are bored to match the inside diameter of the pipe to be used; orders must specify the diameter of bore.

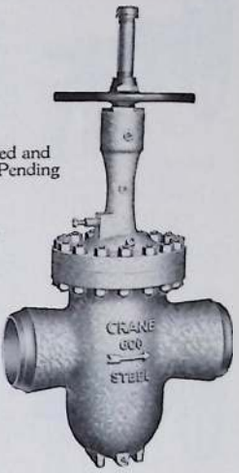
Flanged valves: Flanged valves, in sizes included in the 400-Pound American Standard, can be furnished with end flanges and face to face dimensions conforming to that Standard; prices on request.

Full-Way



Patented and Patent Pending

Venturi

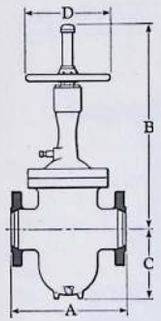


For Crude Oil
No. 1660 X, Flanged
*No. 1661 X, Butt-Welding

For Finished Products or Gas
No. 1660 XH, Flanged
*No. 1661 XH, Butt-Welding

For Gas
*No. 1664 XH, Flanged
No. 1665 XH, Butt-Welding

Asterisk indicates valves which are not illustrated.



All Valves

Notes

aSizes for Venturi Valves indicate the valve ends first, and then the seat.

bDimension "A" (for flanged valves) includes the ¼" male faces; the flange thickness does not.

†Full-Way "XH" trimmed valves are not made in sizes larger than 20-inch.

‡Dimensions apply to flanged end valves only; butt-welding on request.

List Prices and Dimensions

Valve Type and Catalog Number	Size (See Note a) Inches	List Prices Each	Dimensions, in Inches: A (See Note b)	B	C	D	End Flanges: Diameter	Thickness (See Note b)	Dia. of male face	Dia. of bolt circle	No. & dia. of bolts	Inside Diameter: Ends	Seats
FULL-WAY No. 1660 X No. 1660 XH Flanged, F. D. & S. F. No. 1661 X No. 1661 XH Butt-Welding	2	Prices on request	11½	18½	5¾	8	6½	1	3⅝	5	8-⅝	2⅛	
	2½		13	20¼	6⅝	9	7½	1⅛	4⅛	5⅞	8-¾	2½	
	3		14	23½	7½	10	8¼	1¼	5	6⅝	8-¾	3⅛	
	4		17	28½	9¾	12	10¾	1½	6⅜	8½	8-⅞	4⅛	
	6		22	38	12⅞	16	14	1⅞	8½	11½	12-1	6⅛	
	8		26	47¼	16¼	20	16½	2⅜	10⅝	13¾	12-1⅛	8⅛	
	10		31	56¾	20	24	20	2½	12¾	17	16-1¼	10	
	12		33	63	23¼	24	22	2⅝	15	19¼	20-1¼	12	
	14		35	71	26	27	23¾	2¾	16¼	20¾	20-1⅜	13¼	
	16		39	78	29½	27	27	3	18½	23¾	20-1½	15¼	
	18		43	87	32¾	30	29¼	3¼	21	25¾	20-1⅝	17	
	20		47	95	36¾	36	32	3½	23	28½	24-1⅝	19	
	22†		51	106	40	36	34¼	3¾	25¼	30⅝	24-1¾	21	
	24†		55	113	43¼	36	37	4	27¼	33	24-1⅞	23	
	26†		57‡	123	47½	On	40	4¼	29½	36	28-1⅞	25	
	30†		64‡	142	54	app.	44½	4½	33¾	40¼	28-2	29	
VENTURI No. 1664 XH Flanged, F. D. & S. F. No. 1665 XH Butt-Welding	8 x 6	Prices on request	26	38	12⅞	16	16½	2⅜	10⅝	13¾	12-1⅛	8⅛	6⅛
	10 x 8		31	47¼	16¼	20	20	2½	12¾	17	16-1¼	10	8⅛
	12 x 8		33	47¼	16¼	20	22	2⅝	15	19¼	20-1¼	12	8⅛
	16 x 12		39	63	23¼	24	27	3	18½	23¾	20-1½	15¼	12
	20 x 16		47	78	29½	27	32	3½	23	28½	24-1⅝	19	15¼
	24 x 16		55	78	29½	27	37	4	27¼	33	24-1⅞	23	15¼
	26 x 16		57‡	78	29½	27	40	4¼	29½	36	28-1⅞	25	15¼

Added description . . . page 232

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Gearing for Cast Steel Wedge Gate Valves

Prices and dimensions on application.



Style N
Bevel Gearing
For O.S. & Y.
Gate Valves

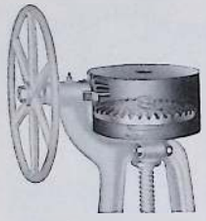
Larger sizes of gate valves or gate valves used for unusually high pressures frequently require gearing in order to facilitate operation. Under other conditions, where valves are inaccessibly installed, gearing can be used effectively to provide for more convenient operation. Prices are furnished on application.



Style P
Spur Gearing
For O.S. & Y. Gate Valves

Bevel gearing: On orders for gate valves with bevel gearing, Style "N", with the pinion shaft extending at right angles to the run of the valve will be supplied unless otherwise specified.

When so ordered, gate valves with bevel gearing, having the pinion shaft extending parallel to the run of the valve, can be furnished. In this position the bevel gearing will be known as Style "O".



Gear Covers
For Spur or Bevel
Geared Steel O.S. & Y.
Wedge Gate Valves

When bevel gearing is ordered separately for use on circular bonnet valves (300-Pound or heavier), Style "N" gearing will regularly be supplied. For assembly on the valve in positions other than with the pinion shaft at right angles to the run, the bonnet of the valve must be unbolted and turned to suit the condition desired.

Spur gearing: Style "P" spur gearing is regularly mounted with the pinion shaft at one side of the valve and the handwheel above the gearing.

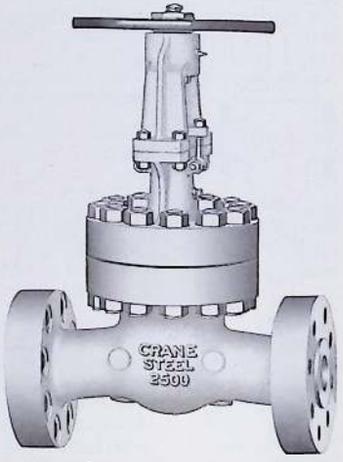
Gear covers: Gear covers can be supplied for geared steel valves, to prevent obstruction of or damage to the gears and also to guard against injury of the operator.

Ordering: Orders for geared gate valves must specify the Style of gearing (and on bevel gearing, the position of the pinion shaft). When ordering gearing separately, also indicate the size, catalog number, and complete marking of the valve.

2500-Pound Alloy Cast Steel Wedge Gate Valves

Prices and dimensions on application.

Crane 2500-Pound Alloy Cast Steel Outside Screw and Yoke Wedge Gate Valves are available in the 1½, 2, 2½, 3, 4, 5, 6, 8, 10, and 12-inch sizes, with either flanged or butt-welding ends. In these valves are many outstanding features of design necessary for safe, reliable service under the severe operating conditions of the high pressures and elevated temperatures for which they are recommended.



Some of the more important developments in the Crane 2500-Pound Valves are: straight-through port design—eliminates excessive turbulence; shoulder-type body seat rings—provide tightness and security at this point; long, machined disc guides—assure accurate seating with minimum wear; tee-head disc-stem connection—prevents lateral strains on the stem; ring-type bonnet joint with high tensile bolting—makes the joint strong and tight; ball-bearing yoke sleeve on sizes 5-inch and larger—facilitates operation; and deep, lantern-type stuffing box with ball-type gland—assures tightness with minimum wear.

It is recommended that 2500-Pound Alloy Steel Gate Valves be equipped with a by-pass on sizes 4-inch and larger; sizes 8-inch and larger should have gearing.

Working pressures ..... *page 226*
General description .... *pages 227 and 228*
Specifications of Materials ..... *page 227*
Description of Materials ..... *pages 1 to 9*

For Crane Pressure-Seal Bonnet Valves, see Section 21

Cast and Forged Steel Globe and Angle Valves

The Crane line of Steel Globe and Angle Valves can be classified into two general groups. The first group covers valves 2-inch and smaller, of forged steel, cast steel, or bar stock; these are frequently considered general utility valves and are used in a wide variety of services, often at pressures and temperatures lower than the recommended maximum. The second group covers cast steel valves ranging in size as large as 8-inch, all made similar in design and available in each of the American Standard pressure classes.

Cast and Forged Steel Valves
Sizes 2-Inch and Smaller

Bar Stock Valves ..... page 236
600-Pound Cast Steel, for Locomotive Service ..... page 240
600-Pound Forged Steel, Inside Screw ..... page 237
600-Pound Forged Steel, O.S. & Y. ..... pages 238 and 239
1500-Pound Cast Steel, O. S. & Y. ..... page 241
6000-Pound Hydraulic Forged Steel ..... page 242

Cast Steel Valves
150, 300, 400, 600, 900, and 1500-Pound

Pressure-Temperature Ratings ..... page 243
Description and Specification of Materials ..... pages 244 and 245
List Prices ..... page 246
Dimensions ..... page 247
Service Recommendations ..... page 243

Gearing ..... page 248
2500-Pound ..... page 248

For Pressure-Seal and Lip-Seal Bonnet Valves, see Section 21, pages 205 to 220.

The Cast and Forged Steel Globe and Angle Valves listed above comprise only a part of the complete line of Crane steel products.

Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

Steel Globe and Angle for Chlorine Service ..... page 386
Steel Gate Valves ..... pages 221 to 234
Steel Check Valves ..... pages 249 to 256
Steel Stop-Check Valves
Pressure-Seal Bonnet ..... pages 214 to 217
Bolted Bonnet ..... pages 301 to 307

Steel Safety Valves ..... page 324
Steel Relief Valves ..... pages 333 and 334
Steel Sediment Separators ..... page 356

Steel Flanged Fittings ..... pages 267 to 274
Steel Welding Fittings ..... pages 275 to 290
Steel Flanges ..... pages 291 to 298
Steel Screwed Fittings ..... pages 257 to 262
Steel Bushings ..... page 260
Steel Plugs ..... page 260

Corrosion-Resistant Products ..... pages 375 to 396
Wrought Steel Nipples ..... pages 168 and 169
Forged Steel Unions ..... pages 263 and 264
Forged Steel Flange Unions ..... pages 182 and 265
Fabricated Piping ..... pages 497 to 522

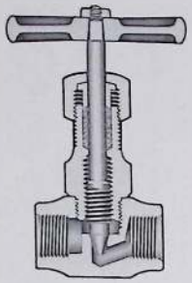


A Crane-equipped piping system meets the rigid requirements of high pressure-temperature installations.

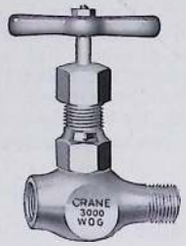
Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 139 of 314
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asbestosclaims.law/library/21276/139

High Pressure
Steel, Exelloy, or 18-8 Mo Bar Stock Valves

WORKING PRESSURE
3000 pounds cold water, oil, or gas, non-shock
Air Tested


Cross Section
Globe
Female
Steel, Exelloy, or 18-8 Mo


Globe
Female
No. 222 H, Steel
No. 222 X, Exelloy
No. 222 SS, 18-8 Mo


Globe
Male and Female
No. 222½ H, Steel
No. 222½ X, Exelloy
No. 222½ SS, 18-8 Mo


Angle
Female
No. 223 H, Steel
No. 223 X, Exelloy
No. 223 SS, 18-8 Mo


Angle
Male and Female
No. 223½ H, Steel
No. 223½ X, Exelloy
No. 223½ SS, 18-8 Mo

List Prices, Each

Size		Inches	⅛	¼	⅜	½	¾	1
Steel Valves	Globe	No. 222 H, Female	6.50	6.50	7.70	10.20	28.00	39.00
		No. 222½ H, Male and Female	7.80	7.80	9.30	12.20	33.70	
	Angle	No. 223 H, Female	6.50	6.50	7.70	10.20	28.00	39.00
		No. 223½ H, Male and Female	11.00	11.00	13.00	17.00	40.50	
Exelloy Valves	Globe	No. 222 X, Female	10.60	10.60	12.20	16.30	55.00	77.00
		No. 222½ X, Male and Female	13.00	13.00	15.40	20.30	69.00	
	Angle	No. 223 X, Female	10.60	10.60	12.20	16.30	55.00	77.00
		No. 223½ X, Male and Female	18.30	18.30	21.50	28.50	83.00	
18-8 Mo Valves	Globe	No. 222 SS, Female	14.20	14.20	16.30	22.00	61.00	87.00
		No. 222½ SS, Male and Female	18.00	18.00	20.30	27.00	76.00	
	Angle	No. 223 SS, Female	14.20	14.20	16.30	22.00	61.00	87.00
		No. 223½ SS, Male and Female	24.00	24.00	27.60	36.60	91.00	

Service recommendations: Made of three different metals with female or male and female ends, these neat, small, rugged valves find wide application in almost every industry. They are ideal for use on orifice meters, regulator leads, by-passes, gauges, and many similar services.

The Exelloy Valves are particularly suitable for handling oil or gas containing sulphur compounds, or for installations where steel valves do not have sufficient resistance to atmospheric corrosion.

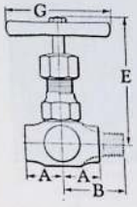
The 18-8 Mo Alloy Valves are especially suited for oil containing hydrogen sulphide and sulphur dioxide when moisture is apt to be present.

Construction: The body and bonnet are made from solid bar stock. The thread chambers are extra long. The plug type disc is exceptionally resistant to wear and to foreign matter, and permits accurate flow regulation. The disc is integral with the stem.

The stuffing box is deep, has a gland, and is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Materials: Steel Valves have a steel body, bonnet, packing nut, and gland, and a chromium plated steel stem. In the Exelloy Valves, all of these parts are made of Exelloy; and in the 18-8 Mo Alloy Valves, of Crane 18-8 Mo Chrome-Nickel-Molybdenum Alloy Steel. All valves have a malleable iron tee handle.

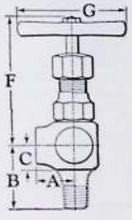
Exelloy is a specially heat-treated chromium iron having a chromium content of about 12 per cent. Crane 18-8 Mo Alloy is a steel having a minimum content of 18 per cent chromium and 10 per cent nickel, with 2.5 to 3 per cent molybdenum.



Dimensions, in Inches

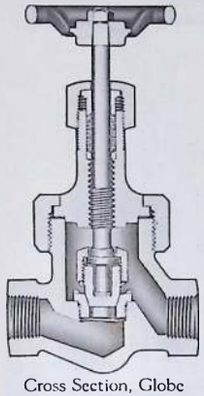
Size	⅛	¼	⅜	½	¾	1
A	31/32	31/32	1 3/32	1 1/4	1 5/8	2 1/8
B	1 1/2	1 5/8	1 7/8	2 1/8	2 5/8	
C	9/16	9/16	11/16	13/16	1	1 1/4
E or F — Open	3 7/16	3 7/16	3 15/16	4 7/8	6 3/8	7 5/8
G	2 9/16	2 9/16	2 9/16	3 9/16	4 3/4	4 3/4
Diameter of seat opening	3/16	3/16	1/4	5/16	7/16	9/16

The opening in the male end on male and female valves leads to the underside of the disc.



600-Pound Forged Steel Globe and Angle Valves
Inside Screw

Union Bonnet


Cross Section, Globe



No. 3620 X
Globe, Screwed



No. 3621 X
Angle, Screwed

SERVICE RECOMMENDATIONS

These small, rugged, Inside Screw Globe and Angle Valves are made with a plug type disc and seat. They can be used wherever durable inside screw valves are wanted. The valves are recommended for cold oil and for hot oil and oil vapor on temperatures up to 800° F.

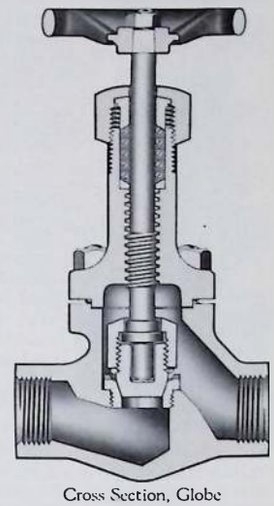
Body and bonnet: The body and bonnet are forged carbon steel. Heavy metal sections assure liberal safety.

WORKING PRESSURES

	Temp. Deg. F.	Pounds Non-Shock
Class "X" For Oil or Oil Vapor only	100	2000
	150	1910
	200	1820
	250	1730
	300	1640
	350	1550
	400	1460
	450	1370
	500	1280
	550	1190
	600	1110
	650	1030
	700	940
	750	850
	800	780

HYDROSTATIC TEST PRESSURES
Shell — 2175 pounds
Seat — 2100 pounds
Valve seat tested
100 pounds air-under-water

Bolted Bonnet


Cross Section, Globe

Bonnet joint: Bonnet joints are fitted with a corrugated soft iron gasket. Sizes ¼ to ¾-inch have a union bonnet, the ring being forged steel; sizes 1 to 2-inch have a compact bolted bonnet, male and female type, equipped with Triplex Steel studs. Both types are strong and can be easily taken apart and reassembled.

Disc, seat, and stem: The plug type disc and seat, ideal for throttling services, are made of Exelloy. Their wide, carefully finished seating surfaces are unusually resistant to foreign matter and to wiredrawing. The body seat ring is screwed into the body.

The valves feature a new, improved swivel disc-stem construction, as illustrated. Clearances are held to a minimum, and the seating load, exerted by the end of the stem on the disc, is much closer to the actual seating surfaces of the valves. The stem, made of Exelloy, is of generous diameter with long thread engagement in the bonnet. The disc stem ring is locked to the disc by tack welding and will not loosen in service.



No. 3624 X
Globe, Screwed



No. 3625 X
Angle, Screwed

Stuffing box; repacking: The stuffing box is exceptionally wide and deep; it is equipped with a gland and filled with cut ring packing. The valves, when wide open, can be repacked while under pressure.

Handwheel: Wheels are malleable iron. For easier handling, valves 1¼-inch and smaller have a dished design wheel, made with small gripping knobs on the outer edge.

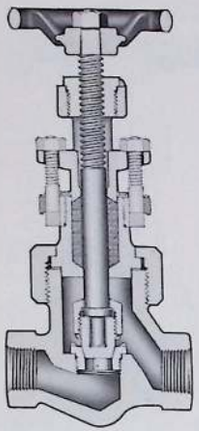
List Prices and Dimensions

Union Bonnet Valves							Bolted Bonnet Valves					
Size		Inches	¼	⅜	½	¾	Size		Inches	1	1¼	1½	2
No. 3620 X, Globe		Each	16.50	16.50	19.70	22.80	No. 3624 X, Globe		Each	29.00	40.20	59.00	80.40
No. 3621 X, Angle		Each	16.50	16.50	19.70	22.80	No. 3625 X, Angle		Each	29.00	40.20	59.00	80.40
Dimensions, in Inches	Center to end		1¼	1½	1¾	2¼	Dimensions, in Inches	Center to end		2 9/16	3⅛	3½	4 3/16
	Center to top, open	Globe	4¾	5 3/16	6 7/16	7 13/16		Center to top, open	Globe	8¾	10¾	10 5/16	12 9/16
		Angle	4¾	5 1/16	6¼	7½			Angle	7⅝	9 5/16	9⅛	10⅞
	Diameter of wheel		2½	2½	3	3½		Diameter of wheel		4	5	6	7

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600-Pound Forged Steel Globe and Angle Valves

Outside Screw and Yoke



Cross Section, Globe Union Bonnet

Low in cost and high in quality, these small Crane 600-Pound Forged Steel Outside Screw and Yoke Valves are compact, rugged, and durable.

The line includes union bonnet valves with screwed ends in sizes ¼ to ¾-inch or socket-welding ends in sizes ¼ and ⅜-inch; and bolted bonnet valves with screwed, socket-welding, or flanged ends in sizes ½ to 2-inch.

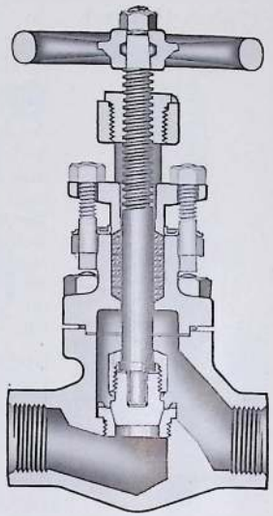
Service recommendations: These valves are ideal for a wide variety of services in oil refineries, oil and gas fields, central power stations, and industrial plants, on high pressure hydraulic lines and on high pressure-temperature steam or oil lines.

Two classes of trim are available: Class "X", for oil or oil vapor up to 1000° F., and Class "W", for steam (850° F. max.), water, air, or gas. For details, see "Service Recommendations" on page 243 ("W" trim is recommended for the same services as defined there for "XR").

WORKING PRESSURES

Temp. Deg. F.	Pounds, Non-Shock: Screwed or Socket Welding Valves	Flanged Valves: *With ¼-inch Male Facing	Flanged Valves: With Ring Joint Facing
Class "X", for Oil or Oil Vapor Class "W", for Steam or Water			
100	2000	1200	1440
150	1910	1180	1420
200	1820	1160	1400
250	1730	1140	1380
300	1640	1120	1365
350	1550	1095	1350
400	1460	1075	1330
450	1370	1050	1320
500	1280	1000	1250
550	1190	950	1180
600	1110	890	1110
650	1030	830	1030
700	940	760	940
750	850	680	850
800	780	600	730
850	700	490	600
Class "X", for Oil or Oil Vapor			
900	600	420	420
950	530	330	330
1000	380	240	240

*When an all-metal gasket (corrugated or flat) is used with large male and female facings, these ratings apply only if the contact area of the gasket is the same as in large tongue and groove joints.



Section, Globe, Bolted Bonnet

TEST PRESSURES

Valve	Pounds Hydrostatic: Screwed or Socket-Welding Valves	Flanged Valves: With ¼" Male	Flanged Valves: With Ring Joint
Shell	2175	1800	2175
Seat	2100	1550	1550

Valve seat tested 100 pounds air-under-water

Body, bonnet, and yoke: The body, bonnet, and yoke are forged carbon steel; heavy metal sections assure generous strength. On union bonnet valves the bonnet and yoke are separate pieces, joined by long, fine threads. On bolted bonnet valves the bonnet and yoke are forged integral.

Bonnet joint: The bonnet joint is equipped with a corrugated soft iron gasket, assuring tightness and ease of maintenance. Union bonnet valves have a forged steel union ring. Bolted bonnet valves have a male and female joint fitted with Triplex Steel studs. Both types of joints are unusually strong and can be easily dismantled and reassembled.

Plug type disc and seat: These valves have a Crane plug type disc and seat, well known for ability to maintain tightness and for effectiveness on throttling services. The wide, tapered seating surfaces offer excellent resistance to foreign matter and to wiredrawing. In "X" trimmed valves, the disc and seat are Exelloy; in "W" trimmed valves, the seat and disc are made of Crane Nitri-Hard, a stainless steel having an extremely hard surface. The body seat ring has heavy metal sections, with a long thread engagement in the body.

Stem: The Exelloy stem has precision cut lifting threads to assure smooth operation.

Disc-stem connection: These valves feature an improved swivel disc-stem connection. The new design holds all clearances to a minimum and places the seating load closer to the actual seating surface of the valve. The disc stem ring is locked to the disc by tack welding and will not loosen in service.

Yoke bushing: The heavy yoke bushing, long with liberal stem-thread engagement, is screwed into the yoke and tack welded; it is sturdy and secure.

Bolted gland: The bolted gland eliminates the danger of weakening—by threading—the yoke legs. Steel tee-head bolts hold the forged steel one-piece gland and gland flange rigidly in place. The packing load is easily adjusted; bolts are quickly removed when necessary. A steel gland bolt retainer anchors the bolts; the bolts will not come off in service.

Stuffing box: An unusually wide and deep stuffing box provides liberal packing space for a tight seal. It is filled with high quality cut ring packing.

Handwheel: Wheels are tough malleable iron. For easier handling, valves ¼ to 1-inch have a dished design wheel, with small rounded gripping knobs.

Repacking: These valves, when wide open, can be repacked while under pressure.

Prices and dimensions . . . page 239

Description of materials . . . pages 1 to 9

600-Pound Forged Steel Globe and Angle Valves

Outside Screw and Yoke

Union Bonnet Valves

List Prices, Each, and Dimensions

Size			Inches: ¼	⅜	½	¾
Globe	No. 3640 X or W, Screwed		22.30	22.30	26.40	30.80
	No. 3648 X or W, Socket-Welding		22.30	22.30		
Angle	No. 3641 X or W, Screwed		22.30	22.30	26.40	30.80
	No. 3649 X or W, Socket-Welding		22.30	22.30		
Dimensions, in Inches	Center to end		1½	1½	1¾	2¼
	Center to top, open	Globe	6½	6½	7 5/16	9
		Angle	6⅜	6⅜	7	8½
	Depth of socket		7/16	9/16		
	Diameter of wheel		3	3	3½	4



Angle, Screwed (Not illustrated)
No. 3641 X
No. 3641 W

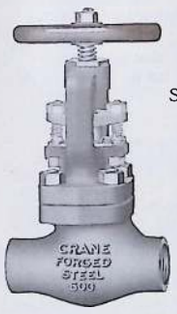
Angle, Socket-Welding
No. 3649 X
No. 3649 W

Globe, Screwed
No. 3640 X
No. 3640 W

Globe, Socket-Welding (Not illustrated)
No. 3648 X
No. 3648 W



Bolted Bonnet Valves



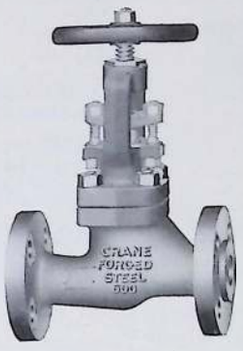
Globe
Screwed
No. 3644 X
No. 3644 W

Socket-Welding
No. 3652 X
No. 3652 W

Angle
Screwed
No. 3645 X
No. 3645 W

Socket-Welding
No. 3653 X
No. 3653 W





Globe, Flanged
No. 3656 X or 3656 W



Angle, Flanged
No. 3657 X or 3657 W

Globe valves with socket-welding ends and angle valves with screwed ends are not illustrated.

Flanged valves: End flanges conform to the 600-Pound American Standard (B16e-1939). They have a large male face ¼-inch high with a serrated finish (approximately 32 concentric grooves per inch). Prices include drilling and spot facing; no deduction if ordered faced only.

Valves with 150-Pound end flanges are made to order; prices on request.

Face to face: 600-Pound flanged valves have American Standard B16.10-1939 face-to-face dimensions; the ½-inch size is not included in the Standard.

List Prices, Each, and Dimensions

Size				Inches: ½	¾	1	1¼	1½	2
Globe	No. 3644 X or W, Screwed			29.50	34.40	40.70	58.50	80.40	108.00
	No. 3652 X or W, Socket-Welding			29.50	34.40	40.70	58.50	80.40	108.00
	No. 3656 X or W, Flanged, F.D. & S. F.			56.30	68.00	80.50	98.50	123.00	155.00
Angle	No. 3645 X or W, Screwed			29.50	34.40	40.70	58.50	80.40	108.00
	No. 3653 X or W, Socket-Welding			29.50	34.40	40.70	58.50	80.40	108.00
	No. 3657 X or W, Flanged, F.D. & S.F.			56.30	68.00	80.50	98.50	123.00	155.00
Dimensions, in Inches	Screwed or Socket-Welding Valves	Center to end		1 13/16	2 3/16	2 9/16	3⅛	3½	4 3/16
		Center to top, open	Globe	7 5/16	8⅞	9⅜	11	11 15/16	14
			Angle	6¾	8	8¼	9 9/16	10⅛	11 15/16
	Depth of socket			5/8	11/16	¾	13/16	⅞	1
	Flanged Valves	*Center to face		3¼	3¾	4¼	4½	4¾	5¾
		Center to top, open	Globe	7⅜	9	9¾	11 3/16	12 5/16	14 9/16
			Angle	6 11/16	8	8 5/16	9⅝	10 5/16	12 1/16
	Diameter of wheel			3½	4	5	6	7	9
	Diameter of flange			3¾	4 5/8	4⅞	5¼	6⅛	6½
	*Thickness of flange			9/16	5/8	11/16	13/16	⅞	1
	Diameter of male face			1⅜	1 11/16	2	2½	2⅞	3 5/8
	Diameter of bolt circle			2 5/8	3¼	3½	3⅞	4½	5
	No. and dia. of bolts			4—½	4—5/8	4—⅝	4—⅞	4—¾	8—⅝

*The center to face dimension includes the ¼-inch male face; the thickness of flange does not.

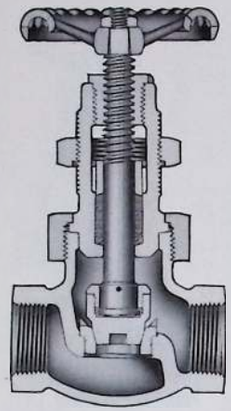
For working pressures and description, see the preceding page.
Dimensions of ring joint and special facings . . . pages 469 to 471

Monel trimmed valves . . . page 387
Templates for drilling . . . page 462

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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ACL Doc 21276 · Page 141 of 314
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600-Pound Alloy Cast Steel Globe Valves

Outside Screw and Yoke

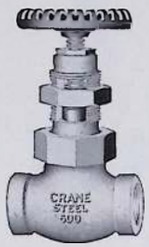


Cross Section
No. 496 P, Globe

WORKING PRESSURE
600 pounds steam, 750° F.

HYDROSTATIC TEST PRESSURES
Body—1500 pounds Seat—1100 pounds

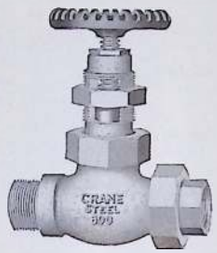
Valves are tested at the seat with 100 pounds air-under-water.



No. 496 P
Globe
Female Inlet
Female Outlet



No. 1880 P
Globe
Female Inlet
Female Union Outlet



No. 1884 P
Globe
Male Inlet
Female Union Outlet

All valves shown on this page are made to order only.

On the No. 496 P and No. 1880 P Valves both ends are the same pipe size.
On the No. 1884 P Valves the male end is one pipe size larger than the female union end.

List Prices

	Size	Inches	½	¾	1	1¼	1½	2
Female Inlet	No. 496 P, Female Outlet	Each	36.00	43.00	50.00	63.50	80.50	94.50
	No. 1880 P, Female Union Outlet	Each	53.00	58.00	65.00	80.50	108.00	149.00
Male Inlet	Size	Inches	¾×½	1×¾	1¼×1	1½×1¼	2×1½	2½×2
	No. 1884 P, Female Union Outlet	Each	57.00	65.50	73.50	88.50	123.00	165.00

These valves, patterned after AAR 300-Pound O. S. & Y. Bronze Valves shown on page 39, are especially recommended for service on railroad locomotives using high pressure superheated steam. They are liberally reinforced and ruggedly constructed.

Materials and construction: The body and bonnet on these valves are well-proportioned and unusually strong. They are made from Crane No. 4 Carbon-Molybdenum Steel, an alloy particularly suitable for service on elevated pressures and temperatures. The stem is made of Exelloy. Stem threads, long and accurately cut, are on the outside where they do not come in contact with the fluid in the line. They can be easily lubricated when necessary. The valves have a malleable iron handwheel.

Plug type seat and disc: The plug type disc and seat, excellent for throttling services, have wide, carefully finished seating surfaces which are unusually resistant to foreign matter and to wiredrawing.

The disc and body seat ring are Crane Nitri-Hard, a stainless steel offering excellent resistance to erosion, galling, and scoring.

Yoke bushing: The yoke bushing, made of Crane Cast Manganese Bronze, is long and heavy with liberal stem-thread engagement. Screwed into the yoke and tack welded, it is sturdy and secure.

Stuffing box: The stuffing box is deep and is filled with high grade packing. It is equipped with an Ihrigized steel gland.

Repacking: These valves, when wide open, can be repacked while under pressure.

Dimensions, in Inches

Size		Inches	½	¾	1	1¼	1½	2
No. 496 P or No. 1880 P Female Inlet Valves	Center to female end		1 9/16	1 7/8	2 1/4	2 9/16	2 13/16	3 3/8
	Center to union end, No. 1880 P		2 9/16	3	3 7/16	3 15/16	4 5/16	5 1/8
	Center to top, open		5 11/16	6	7 11/16	8 1/8	9 3/4	10 5/8
	Diameter of wheel		3 1/16	3 5/8	4 1/16	4 3/4	5 3/8	6
Size		Inches	¾ x ½	1 x ¾	1¼ x 1	1½ x 1¼	2 x 1½	2½ x 2
No. 1884 P Male Inlet Valves	Center to male end		2 9/16	3 1/8	3 1/2	3 13/16	4 5/16	4 7/8
	Center to union end		2 9/16	3	3 7/16	3 15/16	4 5/16	5 1/8
	Center to top, open		5 11/16	6	7 11/16	8 1/8	9 3/4	10 5/8
	Diameter of wheel		3 1/16	3 5/8	4 1/16	4 3/4	5 3/8	6

1500-Pound Screwed and Socket-Welding

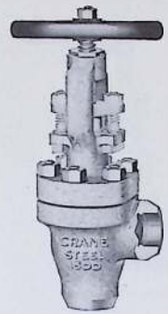
Alloy Cast Steel Globe and Angle Valves

Bolted Bonnet—Outside Screw and Yoke



Globe, Screwed
No. 3844 X
No. 3844 U

Globe, Socket-Welding
(Not illustrated)
No. 3852 X
No. 3852 U



Angle, Screwed
(Not illustrated)
No. 3845 X
No. 3845 U

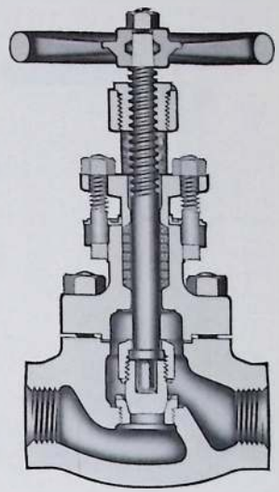
Angle, Socket-Welding
No. 3853 X
No. 3853 U

The valve seat is tested 100 pounds air-under-water.

WORKING PRESSURES

Temperature Deg. F.	Pounds Non-Shock
Class "X" for Oil or Oil Vapor Class "U" for Steam or Water	
100	3600
150	3550
200	3500
250	3450
300	3415
350	3375
400	3330
450	3295
500	3125
550	2955
600	2770
650	2580
700	2350
750	2125
800	1875
850	1750
900	1625
950	1500
Class "X", for Oil or Oil Vapor	
1000	1170

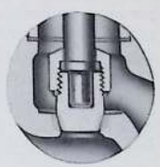
TEST PRESSURES
Shell — 5400 pounds hydrostatic
Seat — 3700 pounds hydrostatic



Cross Section
Globe
Screwed
"X" Trimmed

List Prices and Dimensions

Size		Inches	½	¾	1	1¼	1½	2
Screwed	No. 3844 X or No. 3845 X	Each	71.00	83.00	98.00	141.00	193.00	260.00
	No. 3844 U or No. 3845 U	Each	88.00	106.00	121.00	176.00	239.00	322.00
Socket-Welding	No. 3852 X or No. 3853 X	Each	71.00	83.00	98.00	141.00	193.00	260.00
	No. 3852 U or No. 3853 U	Each	88.00	106.00	121.00	176.00	239.00	322.00
Dimensions, in Inches	Center to end, Screwed		2 1/8	2 3/4	3 1/8	3 5/8	3 3/4	4 3/4
	Center to end, Socket-Welding		2 1/16	2 11/16	3 1/16	3 9/16	3 11/16	4 11/16
	Center to top, open — Globe		9 1/2	9 1/8	10 3/4	13	13 5/8	16 1/2
	Center to top, open — Angle		9 1/4	9 1/4	10 3/8	12 3/8	12 5/8	15 3/8
	Depth of socket		5/8	11/16	3/4	13/16	7/8	1
	Diameter of wheel		4	5	7	8	9	14



Cross Section
Through
Seat of
"U" Trimmed

These small 1500-Pound Valves, except for heavier, more rugged metal sections, are similar to and feature the same swivel plug disc design as the 600-Pound Bolted Bonnet Valves shown on pages 238 and 239.

The valves are exceptionally compact and durable, yet they have many refinements usually found only in larger size high-pressure valves, such as a deep stuffing box and heavy yoke bushing with liberal stem-thread engagement.

Service recommendations: They are ideal for the severe services encountered in oil refineries and modern power plants, on high-pressure hydraulic installations, and on high pressure-temperature steam or oil lines.

There are two classes of trim materials available: Class "X," for oil or oil vapor up to 1000° F., and Class "U" for steam, water, air, gas, and other non-lubricating and relatively non-corrosive fluids such as gasoline, fuel oil, etc., up to 950° F.

Materials: The body and yoke bonnet are cast from Crane No. 4 Carbon-Molybdenum Steel and have a male and female joint with steel gasket to assure tightness and ease of maintenance. The stem is Exelloy. Precision cut stem threads assure smooth operation. The bolted one-piece gland eliminates the danger of weakening—by threading—the yoke legs. The packing load can be adjusted easily, and a gland bolt retainer prevents the tee-head bolts from coming off in service.

The "X" trimmed valves have Triplex steel body studs, and the plug type disc and seat are Exelloy with carefully ground seating surfaces.

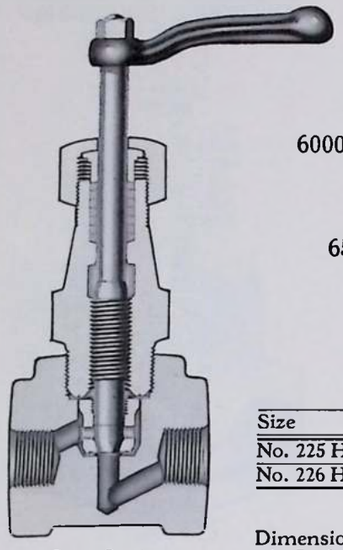
The "U" trimmed valves have Templex steel body studs, the disc is Stellite faced alloy steel, and the body has an integral seat which is Stellite faced, offering excellent resistance to wear.

Repacking: These valves, when wide open, can be repacked while under pressure.

Description of materials . . . . pages 1 to 9

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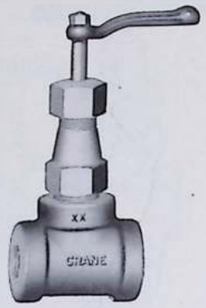
6000-Pound Hydraulic
Forged Steel Globe and Angle Valves
Plug Type Disc



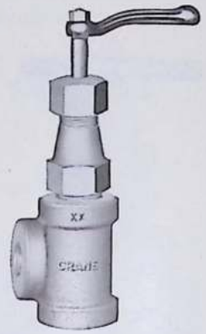
Cross Section
No. 225 H
Globe

WORKING PRESSURE
6000 pounds cold water or oil, non-shock

TEST PRESSURE
6500 pounds hydrostatic



No. 225 H, Globe
Screwed



No. 226 H, Angle
Screwed

List Prices and Dimensions

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2
No. 225 H, Globe		Each	49.00	49.00	54.00	63.00	77.00	105.00	304.00	409.00
No. 226 H, Angle		Each	49.00	49.00	54.00	63.00	77.00	105.00	304.00	409.00
Dimensions, in Inches	End to end, Globe		2⅞	2⅞	3⅝	5	5¼	7	7¾	9
	Center to end, Angle		1 7/16	1 7/16	1 13/16	2½	2⅝	3½	3⅞	4½
	Center to top, open		6¾	6¾	7⅝	9¾	10¾	12⅝	14¼	16
	Center to end of handle		3⅛	3⅛	3½	4¼	5	5¾		
	Diameter of wheel								12	14

Service recommendations: These valves have very heavy metal sections and are exceptionally rugged. They are recommended for severe and extremely high pressure service on hydraulic lines not subject to shock.

Plug type disc and seat: The plug type disc and seat are unusually resistant to wiredrawing and to foreign matter. The wide tapered seating surface permits easy flow regulation when throttling.

The seat bushing is made of Exelloy and can be easily renewed. The disc is made of brass.

Body and bonnet: The body is made from a solid steel forging. On sizes 1-inch and smaller, the bonnet is screwed into the body as illustrated in the cross section. On larger sizes the bonnet and body are bolted together (not illustrated).

The bonnet is brass on sizes 1¼-inch and smaller and cast carbon steel on the larger sizes.

Disc-stem connection: The disc and stem are made in one piece for sizes 1-inch and smaller, as shown in the cross section, and in two pieces with a swivel type connection for sizes 1¼-inch and larger (not illustrated).

The stem in all sizes is made of brass.

Handle or wheel: Sizes 1¼-inch and smaller have a lever handle, as illustrated above; larger sizes are equipped with a wheel.

Stuffing box: These valves have a deep stuffing box, filled with high grade packing.

The stuffing box is equipped with a gland.

Repacking: The valves, when wide open, can be repacked while under pressure.

Seat opening: The diameter of the port opening in these valves is slightly smaller than the inside diameter of Extra Strong Pipe.

Stop Drainage Waste!

When lines or equipment are not fully drained, waste is inevitable. All too frequently accumulation of condensate robs steam of its heat. Excessive heating costs, unsatisfactory operation, and sometimes damaged equipment are the results.



Crane Inverted Open Float Steam Traps provide a complete and efficient method of handling condensate from piping, coils, heaters, and steam heated equipment of many kinds. Low in price and simple in design, they give long and trouble-free service. See pages 345 to 347.

Cast Steel Globe and Angle Valves

Working Pressures, Pounds per Square Inch, Non-Shock
For Valves Shown on pages 244 to 248

[3]Fluid	Temp. Deg. Fahr.	[1]Flanged Valves with Standard Facings Other Than Ring Joint: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	Flanged Valves with Ring Joint Facing, Butt-Welding[2] and Screwed End Valves: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Steam, Water, Air, or Gas *[3]Class XR*	100	230	600	800	1200	1800	3000	5000	275	720	960	1440	2160	3600	6000
	150	220	590	785	1180	1770	2950	4915	255	710	945	1420	2130	3550	5915
	200	210	580	770	1160	1740	2900	4830	240	700	930	1400	2100	3500	5830
	250	200	570	760	1140	1710	2850	4750	225	690	920	1380	2070	3450	5750
	300	190	560	740	1120	1680	2800	4660	210	680	910	1365	2050	3415	5690
	350	180	550	725	1095	1645	2740	4565	195	675	900	1350	2025	3375	5625
	400	170	540	710	1075	1615	2690	4475	180	665	890	1330	2000	3330	5550
	450	160	525	700	1050	1580	2630	4380	165	660	875	1320	1975	3295	5490
	500	**150**	500	665	1000	1500	2500	4165	**150**	625	835	1250	1875	3125	5210
	550	140	475	630	950	1420	2370	3950	140	590	790	1180	1775	2955	4925
Oil or Oil Vapor *Class X*	600	130	445	590	890	1330	2220	3700	130	555	740	1110	1660	2770	4620
	650	120	415	550	830	1240	2070	3450	120	515	690	1030	1550	2580	4300
	700	110	380	500	760	1140	1900	3160	110	470	635	940	1410	2350	3920
	750	100	360	475	720	1080	1800	2995	100	425	575	850	1275	2125	3550
	800	92	340	450	680	1020	1700	2830	92	375	500	750	1125	1875	3125
	850	82	320	425	640	960	1600	2665	82	350	475	700	1050	1750	2925
Steam *Class U*	900	[4]70	**300**	**400**	**600**	**900**	**1500**	**2500**	[4]70	325	425	650	975	1625	2700
	950	[4]55	[4]265	[4]350	[4]530	[4]795	[4]1325	[4]2205	[4]55	**300**	**400**	**600**	**900**	**1500**	**2500**
	1000	[4]40	[4]190	[4]250	[4]380	[4]570	[4] 950	[4]1580	[4]40	[4]230	[4]310	[4]470	[4]700	[4]1170	[4]1950
Oil Vapor, Oil, *Class X*	1050									[4]135	[4]180	[4]270	[4]405	[4] 675	[4]1125
	1100									[4] 90	[4]120	[4]180	[4]270	[4] 450	[4] 750

		Flanged No. 5 Chrome-Molybdenum Alloy Steel Valves (Made to order)												
		[1]Facings Other Than Ring Joint						Ring Joint Facing						
Oil or Oil Vapor only *Class X*	100 to 750	For temperatures up to 900° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves shown above.						For temperatures up to 800° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves shown above.						
	800							400	525	800	1200	2000	3325	
	850							375	500	750	1125	1875	3125	
	900	310	410	620	930	1550	2580	350	475	700	1050	1750	2925	
	950	**300**	**400**	**600**	**900**	**1500**	**2500**	325	425	650	975	1625	2700	
	1000	200	275	400	600	1000	1675	**300**	**400**	**600**	**900**	**1500**	**2500**	
	1050	135	180	270	405	675	1125	225	275	425	650	1075	1775	
	1100	90	120	180	270	450	750	150	200	275	425	700	1175	

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]When welding end valves are used at temperatures over 850° F. in services where graphitization may be a problem, valves made of Crane No. 7 or No. 9 Chrome-Molybdenum Steel are recommended.

[3]**Service recommendations:** Valves with "XR" trim are particularly satisfactory for steam, water, air, gas, and other non-lubricating and relatively non-corrosive fluids such as gasoline, fuel oil, etc.; also for oil having low viscosity such as used in hydraulic systems, especially where seating loads are extremely high. They are recommended for maximum temperatures of 850° F. on steam and 500° F. on all other services.

Valves with "X" trim should always be used for oil or oil vapor service at temperatures over 500° F. and for most corrosive and unrefined oils regardless of temperature. Maximum recommended temperatures are: 1000° F. on 150-Pound, and 1100° F. on 300 to 2500-Pound Valves.

For lubricating oils up to 500° F., either "X" or "XR" should give equal satisfaction.

"U" trim is provided primarily for high temperature (up to 950° F.) steam lines.

[4]These ratings apply only to oil or oil vapor service.

Cold service: For temperatures between 0° and 100° F., the ratings for 100° F. apply. For sub-zero service, materials with suitable impact resistance must be used; recommendations on request.

Flange facings: Unless otherwise ordered, flanged end 150 and 300-Pound Valves regularly are furnished with 1/16-inch raised faces, and 400-Pound and higher pressure valves, with ¼-inch male faces.

Standards: Crane pressure-temperature ratings agree with those in Supplement No. 1 (ASA B16e6-1949) to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939 and those in the American Petroleum Institute (API) Standard No. 600, Second Edition, 1951.

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Cast Steel Globe and Angle Valves

Crane Cast Steel Globe and Angle Valves are rugged and substantial in construction. Made from carefully selected materials and of improved designs, they possess the necessary qualifications to meet the severe demands of modern installations.

Recognizing the service requirements they must satisfy—accurate control and regulation of flow—extreme care has been exercised in their design, particularly in the case of the disc and seat. For steam and general service, the wide bearing of the plug type disc is exceptionally well fitted. Oil services are more efficiently served by a ball-shaped disc contacting a beveled seat in a line bearing.

To avoid the difficulties attending the operation of the larger size or higher pressure valves when used under maximum working pressures, these valves are regularly furnished with gearing. In addition to facilitating operation, the gearing assures accurate regulation of flow.

The valves are available in a wide range of sizes, 150, 300, 400, 600, 900, 1500, and 2500-Pound pressure classes, and with flanged, screwed, or butt-welding ends, as required. Prices and dimensions for 2500-Pound Valves furnished on request.

Made of carbon or alloy steels and supplied with various kinds of trim, the valves are suitable for a variety of services. They are particularly suited for the severe services so common in modern industrial and power plants, and in oil refineries.

HYDROSTATIC TEST PRESSURES, IN POUNDS

Pressure Class	Flanged Valves With Facing Other Than Ring Joint		Flanged Valves With Ring Joint Face Screwed and Butt-Welding Valves	
	Shell	Seat	Shell	Seat
150-Pound	350	350	425	350
300-Pound	900	775	1100	775
400-Pound	1200	1000	1450	1000
600-Pound	1800	1550	2175	1550
900-Pound	2700	2250	3250	2250
1500-Pound	4500	3700	5400	3700

Valve seats are tested 100 pounds air-under-water.

For working pressures, see page 243.

Specification of Materials

150-Pound Valves are regularly made of Crane Carbon Steel; 300, 400, 600, 900, 1500, and 2500-Pound Valves are regularly made of Crane No. 4 Carbon-Molybdenum Steel.

The valves are furnished with a variety of trim materials as indicated below.

Orders should specify both the catalog number and letter suffix; catalog numbers are listed on page 246.

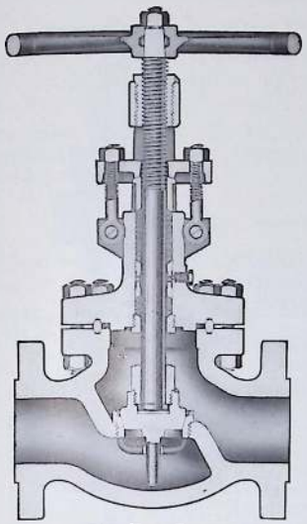
For extremely severe oil or oil vapor services, valves can be made of Crane No. 5 Chrome-Molybdenum Alloy Steel. They are made to order only; see the Crane Discount Sheet for prices.

Trim	Names of Parts	150 Pound Valves	300 Pound Valves	400 Pound Valves	600 Pound Valves	900 Pound Valves	1500 Pound Valves	2500 Pound Valves
*Class "X" Oil or Oil Vapor 1100° F. Max.	Body and Bonnet	Carbon Steel	No. 4 Carbon-Molybdenum Steel					
	Disc	Exelloy						‡Exelloy
	Body Seat Ring	Exelloy						
	Stem	Exelloy						
	Bonnet Gasket	Corrugated Soft Iron	Soft Steel Ring Joint Gasket					
	Bonnet Bolt-Studs	Triplex Steel (150-Pound Valves are furnished with studs.)						
*Class "XR" Steam or Water 850° F. Max.	Body and Bonnet	Carbon Steel	No. 4 Carbon-Molybdenum Steel					2500-Pound Valves with "XR" trim are not regularly furnished.
	Disc	No. 49 Nickel-Alloy						
	Body Seat Ring	Exelloy						
	Stem	Exelloy						
	Bonnet Gasket	Corrugated Soft Iron	Soft Steel Ring Joint Gasket					
	Bonnet Bolt-Studs	Triplex Steel (150-Pound Valves are furnished with studs.)						
*Class "U" Steam or Water 950° F. Max.	Body and Bonnet	Not listed	No. 4 Carbon-Molybdenum Steel					
	Disc		Stellite-Faced Alloy Steel					
	Body Seat Ring		Stellite-Faced Alloy Steel					
	Stem		Exelloy					
	Bonnet Gasket		§Soft Iron	Soft Steel Ring Joint Gasket				
	Bonnet Bolt-Studs		Templex Steel					

*For detailed service recommendations, see page 243. ‡Exelloy or Exelloy-Faced Alloy Steel. §Corrugated Soft Iron.

List prices . . . page 246 *Description of materials . . . pages 1 to 9* *Dimensions . . . page 247*

Cast Steel Globe and Angle Valves



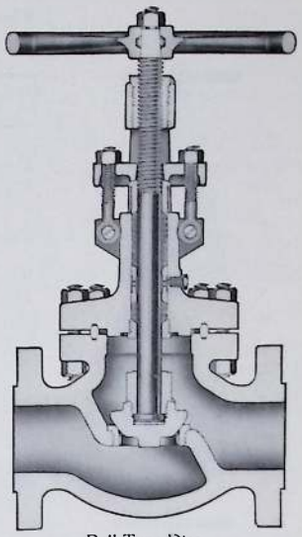
Plug Type Disc

Crane Cast Steel Globe and Angle Valves embody the many refinements in design and materials that are necessary in valves used on severe services.

Disc and seat: "XR" and "U" trimmed valves (for steam, water, or general service) in sizes 6-inch and smaller are furnished with a plug type disc and seat (illustrated at left); the 8-inch size is furnished with a flat disc and seat (not illustrated).

All sizes of "X" trimmed valves (for oil or oil vapor service) are furnished with a 35° taper seat and a ball shaped seating face on the disc (illustrated at right).

Body seat ring: All valves have the shoulder-type screwed-in body seat ring for utmost tightness and security; in "U" trimmed valves, the rings are also seal brazed or seal welded.



Ball Type Disc

Body and bonnet: The body and bonnet have heavy metal sections with liberal reinforcement at points subjected to greatest stress. The bonnet is fitted with a stem hole bushing.

Bonnet joint: A ring-type bonnet joint holds pressure easily on the 400, 600, 900, 1500, and 2500-Pound Valves, assuring tightness and maximum strength. On 150 and 300-Pound Valves, a close-fitting male and female bonnet joint retains the gasket and accurately centers the working parts.

300-Pound and higher pressure valves have through bolt-studs in the bonnet joint. 150-Pound Valves employ studs, threaded into the bonnet flange on the body.

Stuffing box: The stuffing box on all valves is deep, assuring tightness and long packing life. The stuffing box is the lantern-type on all except the 150-Pound Valves. When wide open, the valves can be repacked while under pressure.

Gland: A two-piece ball-type gland and gland flange assures even pressure on the packing without binding on the stem. The gland flange is held in place by swinging eye bolts on 300-Pound and higher pressure valves; 150-Pound Valves use square head bolts for this purpose.

Stem: The stem is of liberal diameter and has unusual strength. Threads are clean and accurately cut and have long engagement with the yoke bushing. The stem and disc are held together by a disc stem ring, which permits the disc to swivel.

Drilling: Flanged valves of each pressure class are furnished with the end flanges faced, drilled, and spot faced (F.D. & S.F.) unless otherwise ordered. List prices include drilling to the corresponding pressure class of the American Standard. No deduction is made if flanged valves are ordered faced only.

Flange facings: The 150 and 300-Pound Flanged Valves are regularly furnished with an American Standard 1/16-inch raised face on the end flanges; the 400, 600, 900, 1500, and 2500-Pound Flanged Valves regularly have a 1/4-inch male face (large male).

When so ordered, valves can be furnished with other types of facings, such as ring joint, female, tongue, groove, etc.; see the Crane Discount Sheet for prices.

Finish of flange faces: The 1/16-inch raised faces and the 1/4-inch male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish can be furnished on the raised or male faces, when specified; see the Crane Discount Sheet for prices.

American Standard: In design and materials, Crane Cast Steel Globe and Angle Valves exceed the requirements of Standards issued by the American Standards Association.

The dimensions and drilling of the end flanges on flanged valves conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

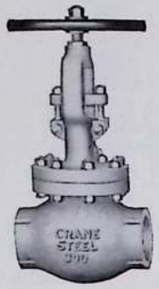
Flanged and butt-welding valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939, for their respective pressure class. This Standard does not include 3 1/2-inch 600-Pound Valves.

Pressure-temperature ratings . . . page 243
Service recommendations . . . page 243
List prices . . . page 246

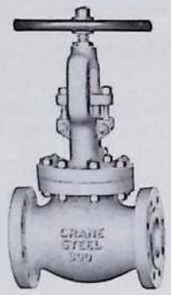
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Cast Steel Globe and Angle Valves

When ordering, specify catalog number and suffix.



Globe, Screwed
For Oil or Oil Vapor
No. 142 X, 150-Pound
No. 150 X, 300-Pound
For Steam or Water
No. 142 XR, 150-Pound
No. 150 XR, 300-Pound



Globe, Flanged
For Oil or Oil Vapor
No. 143 X, 150-Pound
No. 151 X, 300-Pound
No. 161 X, 400-Pound
No. 171 X, 600-Pound
No. 183 X, 900-Pound
No. 189 X, 1500-Pound
For Steam or Water
No. 143 XR, 150-Pound
Nos. 151 XR or U, 300-Pound
Nos. 161 XR or U, 400-Pound
Nos. 171 XR or U, 600-Pound
Nos. 183 XR or U, 900-Pound
Nos. 189 XR or U, 1500-Pound

List Prices, Each, Globe or Angle

Size In.	150 Pound	300 Pound	400 Pound	600 Pound	900 Pound	1500 Pound
Screwed						
2	194.00	221.00				
2½	221.00	254.00				
3	254.00	294.00				
4	334.00	395.00				
Flanged, F.D. & S.F., or Butt-Welding						
2	207.00	234.00	Use 600 Pound Valves	**262.00		610.00
2½	234.00	268.00		319.00		885.00
†3	268.00	†308.00		†387.00	899.00	‡1600.00
*3½	*308.00	*361.00		*455.00		
4	348.00	415.00	592.00	626.00	‡1566.00	‡1983.00
5	468.00	562.00	773.00	‡1251.00	‡1813.00	‡2898.00
6	562.00	695.00	‡1326.00	‡1570.00	‡2538.00	‡3813.00
8	843.00	‡1378.00	‡1931.00			

For valves smaller than those listed, refer to the note at the top of the opposite page.

†When 3-inch 300 and 600-Pound Flanged Valves with ring joint facing are to be bolted to Cranelap joints, orders must so specify. A groove of special pitch diameter is required; see page 470 for dimensions.

*Butt-welding end valves are not made in the 3½-inch size; these prices apply only to the flanged end.

**600-Pound Angle Valves are not made in the 2-inch size; this price applies only to the Globe Valve.

‡Ball-bearing yoke; gearing: Crane Cast Steel Globe and Angle Valves are regularly furnished with a ball-bearing yoke and spur or bevel gears on the following sizes and pressure classes:

300-Pound.....8″ 600-Pound.....5 and 6″
400-Pound.....6 and 8″ 900-Pound.....4, 5, and 6″
1500-Pound....3, 4, 5, and 6″

For description, see page 248. Orders must state whether spur or bevel gears are wanted.

When specified, valves can be furnished without gears (plain bearing yoke); prices on application.

Butt-welding valves: Unless otherwise ordered, 150 and 300-Pound Butt-Welding Valves are bored to match the inside diameter of Standard pipe (the heaviest weight on the 8-inch size). For all other pressure classes, orders must specify the diameter of the bore (I.D. of pipe).

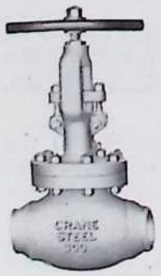


Angle, Screwed
For Oil or Oil Vapor
No. 144 X, 150-Pound
No. 152 X, 300-Pound
For Steam or Water
No. 144 XR, 150-Pound
No. 152 XR, 300-Pound



Angle, Flanged
For Oil or Oil Vapor
No. 145 X, 150-Pound
No. 153 X, 300-Pound
No. 163 X, 400-Pound
No. 173 X, 600-Pound
No. 185 X, 900-Pound
No. 190 X, 1500-Pound
For Steam or Water
No. 145 XR, 150-Pound
Nos. 153 XR or U, 300-Pound
Nos. 163 XR or U, 400-Pound
Nos. 173 XR or U, 600-Pound
Nos. 185 XR or U, 900-Pound
Nos. 190 XR or U, 1500-Pound

Prices of flanged valves include facing, drilling, and spot facing to the corresponding pressure class of the American Standard. No deduction will be made if valves are ordered faced only.



Globe
Butt-Welding

For Oil or Oil Vapor
No. 143½ X, 150-Pound
No. 151½ X, 300-Pound
No. 171½ X, 600-Pound
No. 183½ X, 900-Pound
No. 189½ X, 1500-Pound
For Steam or Water
No. 143½ XR, 150-Pound
Nos. 151½ XR or U, 300-Pound
Nos. 161½ XR or U, 400-Pound
Nos. 171½ XR or U, 600-Pound
Nos. 183½ XR or U, 900-Pound
Nos. 189½ XR or U, 1500-Pound

For service recommendations, see page 243.

For specification of materials, see page 244.



Angle
Butt-Welding

For Oil or Oil Vapor
No. 145½ X, 150-Pound
No. 153½ X, 300-Pound
No. 173½ X, 600-Pound
No. 185½ X, 900-Pound
No. 190½ X, 1500-Pound
For Steam or Water
No. 145½ XR, 150-Pound
Nos. 153½ XR or U, 300-Pound
Nos. 163½ XR or U, 400-Pound
Nos. 173½ XR or U, 600-Pound
Nos. 185½ XR or U, 900-Pound
Nos. 190½ XR or U, 1500-Pound

Cast Steel Globe and Angle Valves

NOTE

For smaller size 600, 900, and 1500-Pound Valves, refer to the following:

600-Pound Valves: For 600-Pound Valves in sizes smaller than those listed on the preceding page, use the forged steel valves shown on pages 238 and 239.

900-Pound Valves: For sizes ½ to 2-inch screwed and socket-welding, use the 1500-Pound Steel Valves shown on page 241.

For sizes 2 and 2½-inch flanged and butt-welding, use the 1500-Pound Alloy Cast Steel Valves shown on the preceding page.

1500-Pound Valves: For sizes smaller than 2-inch screwed and socket-welding, use the steel valves shown on page 241.

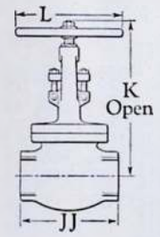
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By-passes: Crane Cast Steel Globe and Angle Valves can be equipped with a by-pass; prices on request.

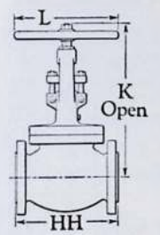
Motor operation: To facilitate operation, the valves can be equipped with an electric, air, or gas motor; prices are furnished on application.

See pages 126 to 129 for complete details.

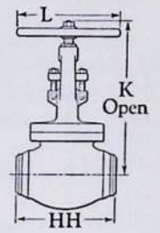
Dimensions, in Inches



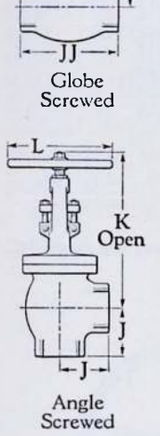
Globe
Screwed



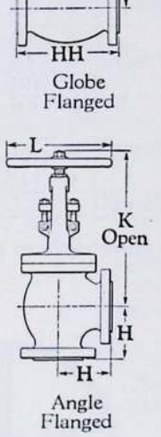
Globe
Flanged



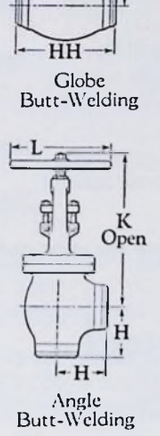
Globe
Butt-Welding



Angle
Screwed



Angle
Flanged



Angle
Butt-Welding

Pressure Class	Size of Valve	HH	JJ	H	J	K Globe	K Angle	L
150 Pound	2	8	8	4	4	13¾	12½	8
	2½	8½	8½	4¼	4¼	14½	13	8
	3	9½	9½	4¾	4¾	16½	15	9
	†3½	10½		5¼		17¼	15½	9
	4	11½	11½	5¾	5¾	19¾	17¾	10
	5	14		7		23	20¾	10
	6	16		8		24½	21¾	12
	8	19½		9¾		26	23½	16
300 Pound	2	10½	9½	5¼	4¾	17¾		9
	2½	11½	10¾	5¾	5⅜	19		10
	3	12½	11¾	6¼	5⅞	20½		10
	†3½	13¼		6⅝		22½		12
	4	14	13	7	6½	24¾		14
	5	15¾		7⅞		26½		16
	6	17½		8¾		29¾		18
	8	22		11		*36½		*24
400 Pound	4	16		8		25¼		14
	5	18		9		28½		18
	6	19½		9¾		*31¼		*20
	8	23½		11¾		*38¼		*27
600 Pound	2	11½				19		10
	2½	13		6½		21¼		12
	3	14		7		23½		12
	†3½	15		7½		25		14
	4	17		8½		27½		18
	5	20		10		*30¾		*20
	6	22		11		*35		*24
900 Pound	3	15		7½		24		12
	4	18		9		*29½		*20
	5	22		11		*34¼		*24
	6	24		12		*37¾		*27
1500 Pound	2	14½		7¼		25⅛	25¼	14
	2½	16½		8¼		28⅛	28¼	18
	3	18½		9¼		*33½		*24
	4	21½		10¾		*37⅝		*27
	5	26½		13¼		*41⅞		*30
	6	27¾		13⅞		*45⅞		*30

*These dimensions apply only to valves without gearing, for dimensions of geared valves, see page 248.

†Butt-welding valves are not made in the 3½-inch size; the dimensions shown for this size apply only to flanged valves.

Center to face: 150 and 300-Pound Flanged Valves are regularly furnished with a 1/16-inch raised face. 400, 600, 900, 1500, and 2500-Pound Flanged Valves are regularly furnished with a ¼-inch high large male face. The center to face and face to face dimensions shown in the table include this facing.

Flanged and butt-welding valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939. The 3½-inch 600-Pound Valves are not included in this Standard.

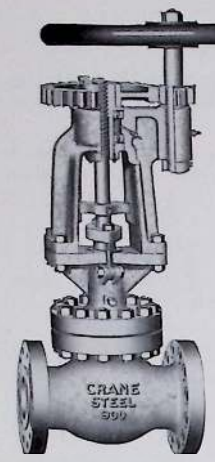
Pressure-temperature ratings ..... ***page 243***
Service recommendations ..... ***page 243***
Specification of materials ..... ***page 244***
List prices ..... ***page 246***
Description of construction ..... ***pages 244 to 246***

Templates for drilling ..... ***pages 461 to 463***
Taps and drains for valves ..... ***page 579***

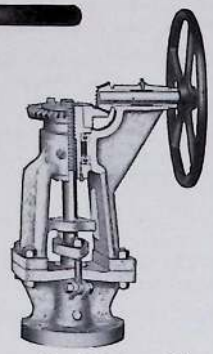
Special facings ..... ***pages 468 to 471***
Gearing ..... ***page 248***

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Gearing for Cast Steel Globe and Angle Valves



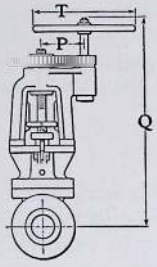
Spur Gearing with Ball-Bearing Yoke Sleeve for Steel Globe and Angle Valves (Gearing, Bonnet, and Yoke are shown turned 90° from position regularly furnished).



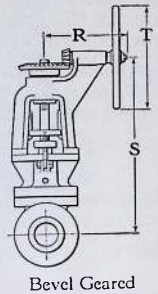
Bevel Gearing with Ball-Bearing Yoke Sleeve for Steel Globe and Angle Valves

To avoid the difficulty encountered in opening or closing large size or high pressure globe and angle valves when used under the maximum recommended working pressures, these valves are regularly equipped with a ball-bearing yoke sleeve and either bevel or spur gearing.

In addition to facilitating operation, the gearing provides closer control of flow under the severest service conditions.



Spur Geared



Bevel Geared

Bevel gearing: Globe and angle valves equipped with bevel gearing will have the pinion shaft extending at right angles to the run of the valve with the handwheel on the left side when facing the port opening from above the valve seat.

Spur gearing: Spur gearing will have the pinion shaft, extending upward, parallel to the main valve stem, with the handwheel above the gearing and on the left side when facing the port opening from above the valve seat.

Ordering: Orders should specify whether bevel or spur gears are wanted. Orders for gearing placed in positions other than those mentioned above must clearly indicate what is wanted.

Dimensions, in Inches

Valve Class	Size	Spur P	Spur Q	Bevel R	Bevel S	T
300-Pound	8	9 3/8	44	15	38	20
400-Pound	6	8 5/8	40 1/4	13 1/4	34 1/2	18
	8	10 3/4	48 1/2	17 1/4	41 3/4	24
600-Pound	5	8 5/8	40 1/2	13 1/4	34 3/4	18
	6	9 3/8	43 1/4	15	37 1/4	20
900-Pound	4	8 5/8	39 3/4	13 1/4	34	18
	5	9 3/8	42 3/4	15	36 3/4	20
	6	10 3/4	47 1/4	17 1/4	40 1/2	24
1500-Pound	3	9 3/8	42 1/2	15	36 1/2	20
	4	10 3/4	47 1/2	17 1/4	40 3/4	24
	5	10 5/8	52 1/2	20 5/8	45 1/2	27
	6	14 1/8	56	24 5/8	48 3/4	27
2500-Pound	On application					

List prices . . . . page 246

Dimensions not shown are the same as for valves without gears; see page 247.

2500-Pound Alloy Cast Steel Globe and Angle Valves

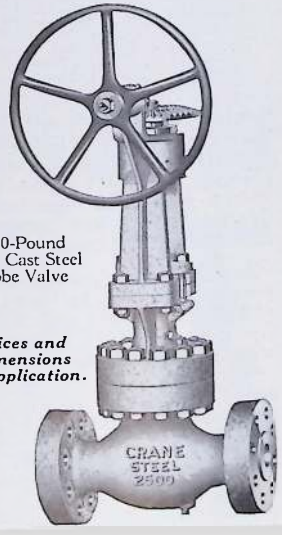
Crane 2500-Pound Alloy Cast Steel Globe and Angle Valves are available in the 1½, 2, 2½, 3, 4, 5, and 6-inch sizes, with either flanged or butt-welding ends. In addition, the Globe Valves are made in the ¾, 1, and 1¼-inch sizes, with either butt or socket-welding ends.

For steam, water, and general services, the globe and angle valves are supplied with Class "U" trimming; the disc is of the plug type. For oil or oil vapor service, Class "X" trimming is recommended, the valves having a 35° taper seat and a ball shaped seating face on the disc.

Globe and angle valves in sizes 3-inch and larger are regularly equipped with a ball-bearing yoke and gearing, to facilitate operation.

Working pressures and service recommendations . . . . . page 243
General description and specifications of materials . pages 244 and 245

For high-pressure high-temperature steam, boiler feed, and similar service in central stations and industrial plants, Crane Pressure-Seal and Lip-Seal Bonnet Valves are available. They embody many excellent features which contribute to long life and efficient operation. Refer to Section 21.



2500-Pound Alloy Cast Steel Globe Valve

Prices and dimensions on application.

Cast and Forged Steel Check Valves

The Crane line of Steel Check Valves can be classified into two general groups. The first group covers lift check valves 2-inch and smaller, of forged or cast steel; these are frequently considered general utility valves and are used in a wide variety of services, often at pressures and temperatures lower than the recommended maximum. The second group covers cast steel swing check valves ranging in size as large as 12-inch, all made similar in design and available in each of the American Standard pressure classes; the sizes range below 2-inch in some of the pressure classes.

Lift Check Valves
Sizes 2-Inch and Smaller

600-Pound Forged Steel, Screwed, Flanged, or Socket-Welding . . pages 250 and 251
600-Pound Cast Steel, Ball, Screwed . . . . . page 251
6000-Pound Hydraulic, Forged Steel, Screwed . . . . . page 256

Cast Steel Swing Check Valves
150, 300, 400, 600, 900, and 1500-Pound

Pressure-Temperature Ratings . . . . . page 252
Description and Specification of Materials . . . . . pages 253 and 254
List Prices . . . . . page 255
Dimensions . . . . . page 255

Lever and Weight . . . . . page 253
2500-Pound . . . . . page 256

The Cast and Forged Steel Check Valves listed above comprise only a part of the complete line of Crane steel products.

Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

Pressure-Seal Bonnet Valves . . . . . pages 205 to 220
Steel Gate Valves . . . . . pages 221 to 234
Steel Globe and Angle Valves . . . . . pages 235 to 248
Steel Stop-Check Valves
Pressure-Seal Bonnet . . . . . pages 214 to 217
Bolted Bonnet . . . . . pages 301 to 307

Steel Safety Valves . . . . . page 324
Steel Relief Valves . . . . . pages 333 and 334
Steel Sediment Separators . . . . . page 356

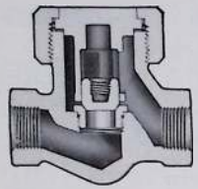
Steel Flanged Fittings . . . . . pages 267 to 274
Steel Welding Fittings . . . . . pages 275 to 290
Steel Flanges . . . . . pages 291 to 298
Steel Screwed Fittings . . . . . pages 257 to 262
Steel Bushings . . . . . page 260
Steel Plugs . . . . . page 260

Corrosion-Resistant Products . . . . . pages 375 to 396
Wrought Steel Nipples . . . . . pages 168 and 169
Forged Steel Unions . . . . . pages 263 and 264
Forged Steel Flange Unions . . . . . pages 182 and 265

Fabricated Piping . . . . . pages 497 to 522

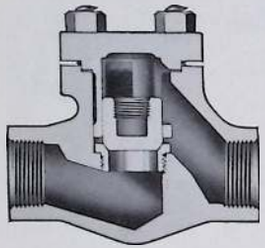
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600-Pound Forged Steel Lift Check Valves



Cross Section
Horizontal Check—Union Cap

List prices and dimensions at the bottom of this page.



Cross Section
Horizontal Check—Bolted Cap

List prices and dimensions at the top of the next page.

Crane 600-Pound Forged Steel Lift Check Valves are made to withstand severe service on high-pressure, high-temperature steam and oil lines.

Rugged and durable, the valves have been carefully designed to assure maximum strength and long life. Their Exelloy seat and disc make them suitable for oil or oil vapor service on temperatures up to 1000° F. and for steam, water, air, gas, and general service on temperatures up to 850° F.

The valves are available with a union cap and screwed ends in sizes ¼ to ¾-inch or socket-welding ends in sizes ¼ and ⅜-inch; and with a bolted cap and screwed, socket-welding, or flanged ends in sizes ½ to 2-inch.

Body: The body is forged carbon steel. Unusual compactness and heavy metal sections provide a high margin of safety.

Cap joint: The cap joint in both the union and bolted cap valves is furnished with a corrugated soft iron gasket; tightness and ease of maintenance are assured.

On union cap valves, a large, strong union ring reinforces the joint. On bolted cap valves, maximum compactness has been secured through the use of studs instead of through-bolts; the studs are made of Triplex Steel, and the joint is the male and female type. Cap joints, even on the larger sizes, can be easily dismantled and reassembled.

Disc and seat: Both the disc and the seat are made of wear-resisting Exelloy, an ideal material for seating surfaces in check valves. The disc has a ball shaped face which seats against a flat, angular shaped face on the body seat ring, forming what is virtually a line bearing seating contact. The disc operates in a specially designed cap, which assures proper guiding and square seating, eliminates chattering, and produces high disc lift with resultant low pressure drop. To facilitate regrinding when necessary, the top of the disc is tapped with pipe threads so that a nipple can be inserted.

The seat ring has long thread engagement with the body. Shoulder-seated and screwed in under machine power, it will not loosen in service.

WORKING PRESSURES

Temp. Deg. F.	Pounds, Non-Shock: Screwed or Socket-Welding Valves	Flanged Valves: *With ¼-inch Male Facing	Flanged Valves: With Ring Joint Facing
Class "X", for Steam, Water, Oil, or Oil Vapor			
100	2000	1200	1440
150	1910	1180	1420
200	1820	1160	1400
250	1730	1140	1380
300	1640	1120	1365
350	1550	1095	1350
400	1460	1075	1330
450	1370	1050	1320
500	1280	1000	1250
550	1190	950	1180
600	1110	890	1110
650	1030	830	1030
700	940	760	940
750	850	680	850
800	780	600	730
850	700	490	600
Class "X", for Oil or Oil Vapor			
900	600	420	420
950	530	330	330
1000	380	240	240

*When an all-metal gasket (corrugated or flat) is used with large male and female facings, these ratings apply only if the contact area of the gasket is the same as in large tongue and groove joints.

TEST PRESSURES

Valve	Pounds Hydrostatic: Screwed or Socket-Welding Valves	Flanged Valves: With ¼-inch Male Facing	Flanged Valves: With Ring Joint Facing
Shell	2175	1800	2175
Seat	2100	1550	1550

Valve seat is also tested hydrostatically at 40 pounds.

For description of materials, see pages 1 to 9.

Union Cap Horizontal Check Valves

Crane 600-Pound Forged Steel Union Cap Check Valves, as described above, are made of high quality materials and are exceptionally strong and rugged. Their compactness and durability fit them for a wide variety of services in oil refineries, oil and gas fields, central power stations, and in general industrial installations.



No. 3670 X
Screwed
Horizontal Check

List Prices and Dimensions

Size	Inches	¼	⅜	½	¾
No. 3670 X, Screwed	Each	16.40	16.40	19.50	22.60
No. 3678 X, Socket-Welding	Each	16.40	16.40		
Dimensions, in Inches: End to end		3	3	3½	4½
Dimensions, in Inches: Center to top		2	2	2⅜	3
Dimensions, in Inches: Depth of socket		7/16	9/16		



No. 3678 X
Socket-Welding
Horizontal Check

600-Pound Forged Steel Lift Check Valves

Bolted Cap Horizontal Check Valves

These Bolted Cap Check Valves, described on the preceding page, are recommended for oil or oil vapor on temperatures up to 1000° F., and for steam or water up to 850° F.

Flanged valves: End flanges conform to the 600-Pound American Standard (B16e-1939). They have a large male face ¼-inch high with a serrated finish (approximately 32 concentric grooves per inch). Prices include drilling and spot facing; no deduction if ordered faced only.

When so ordered, flanged valves can be furnished with ring joint, female, tongue, or groove facing; refer to the Crane Discount Sheet for prices.

Valves with 150-Pound end flanges are made to order; prices on application.

Socket-Welding Fittings: For socket-welding fittings, see pages 275 to 279.

Templates for drilling . . . page 462



Bolted Cap, Horizontal
No. 3674 X, Screwed



Bolted Cap, Horizontal
No. 3682 X, Socket-Welding



Bolted Cap, Horizontal
No. 3686 X, Flanged

List Prices and Dimensions

Size		Inches	½	¾	1	1¼	1½	2
No. 3674 X, Screwed		Each	21.30	25.00	30.00	43.00	65.00	87.00
No. 3682 X, Socket-Welding		Each	21.30	25.00	30.00	43.00	65.00	87.00
No. 3686 X, Flanged, F.D. & S.F.		Each	49.70	57.70	70.00	87.00	110.00	142.00
Dimensions, in Inches	End to end	Screwed	3⅝	4⅜	5⅛	6¼	7	8⅜
	End to end	Socket-Welding	3⅝	4⅜	5⅛	6¼	7	8⅜
	Depth of Socket		⅝	11/16	¾	13/16	⅞	1
	*Face to face, Flanged		6½	7½	8½	9	9½	11½
	Center to top	Screwed	2½	3 1/16	3 11/16	4⅛	5⅛	6
	Center to top	Socket-Welding	2½	3 1/16	3 11/16	4⅛	5⅛	6
	Center to top	Flanged	2 9/16	3¼	4 1/16	4 5/16	5⅜	6 9/16
	Diameter of flange		3¾	4⅝	4⅞	5¼	6⅛	6½
	*Thickness of flange		9/16	⅝	11/16	13/16	⅞	1
	Diameter of male face		1⅜	1 11/16	2	2½	2⅞	3⅝
	Diameter of bolt circle		2⅝	3¼	3½	3⅞	4½	5
	No. and diameter of bolts		4—½	4—⅝	4—⅝	4—¾	4—¾	8—⅝

*Face to face dimensions include ¼" male faces; thickness of flange dimensions do not.

Dimensions of ring joint and special facings . . . . pages 469 to 471

Cast Steel Ball Check Valves

These unusually compact 600-Pound Ball Check Valves are specially designed for oil or oil vapor service on temperatures up to 1000° F.

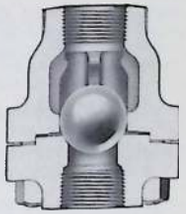
Design: The body, made in two parts of cast carbon steel, is held together by Triplex Steel studs; the joint is male and female and is fitted with a corrugated soft iron gasket. The seat is integral with the body. The highly polished ball disc is solid Exelloy and is uniform in diameter. Ribs in the outlet half of the body guide the ball.

Installation: The valves preferably should be installed in a horizontal line to reduce pressure drop and to eliminate the possibility of chattering at very low flow. They can also be installed in vertical lines with upward flow, but in such use, the valve size should not be larger than the outlet end of the pump connection.

WORKING PRESSURES

Temp. Deg. F.	Pounds Non-Shock	Temp. Deg. F.	Pounds Non-Shock
Class "XS" For Oil or Oil Vapor			
100	2000	600	1110
150	1910	650	1030
200	1820	700	940
250	1730	750	850
300	1640	800	780
350	1550	850	700
400	1460	900	600
450	1370	950	530
500	1280	1000	380
550	1190		

TEST PRESSURES
Shell—2175 pounds hydrostatic
Seat —2100 pounds hydrostatic



Cross Section



Ball Check
No. 3692 XS
Screwed

List Prices and Dimensions

Size	Inches	½	¾	1	1¼	1½	2
No. 3692 XS	Each	23.00	25.70	32.00	41.70	53.30	74.50
End to end	Inches	3⅛	3 11/16	4⅛	4⅞	5⅝	6⅞
Width over all	Inches	2 15/16 sq.	3⅛ sq.	3⅝ sq.	4 1/16 sq.	5⅞ dia.	6⅝ dia.

Valve seat also tested hydrostatically at 40 pounds.

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Cast Steel Swing Check Valves

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Working Pressures, Pounds per Square Inch, Non-Shock
For Valves Shown on pages 253 to 256

[3]Fluid	Temp. Deg. Fahr.	[1]Flanged Valves with Standard Facings Other Than Ring Joint: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	Flanged Valves with Ring Joint Facing, Butt-Welding[2] and Screwed End Valves: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Steam, Water, Oil, Oil Vapor, Gas, or Air [3]*Class X*	100	230	600	800	1200	1800	3000	5000	275	720	960	1440	2160	3600	6000
	150	220	590	785	1180	1770	2950	4915	255	710	945	1420	2130	3550	5915
	200	210	580	770	1160	1740	2900	4830	240	700	930	1400	2100	3500	5830
	250	200	570	760	1140	1710	2850	4750	225	690	920	1380	2070	3450	5750
	300	190	560	740	1120	1680	2800	4660	210	680	910	1365	2050	3415	5690
	350	180	550	725	1095	1645	2740	4565	195	675	900	1350	2025	3375	5625
	400	170	540	710	1075	1615	2690	4475	180	665	890	1330	2000	3330	5550
	450	160	525	700	1050	1580	2630	4380	165	660	875	1320	1975	3295	5490
	500	**150**	500	665	1000	1500	2500	4165	**150**	625	835	1250	1875	3125	5210
	550	140	475	630	950	1420	2370	3950	140	590	790	1180	1775	2955	4925
	600	130	445	590	890	1330	2220	3700	130	555	740	1110	1660	2770	4620
	650	120	415	550	830	1240	2070	3450	120	515	690	1030	1550	2580	4300
	700	110	380	500	760	1140	1900	3160	110	470	635	940	1410	2350	3920
	750	100	360	475	720	1080	1800	2995	100	425	575	850	1275	2125	3550
	800	92	340	450	680	1020	1700	2830	92	375	500	750	1125	1875	3125
	850	82	320	425	640	960	1600	2665	82	350	475	700	1050	1750	2925
	900	[4]70	**300**	**400**	**600**	**900**	**1500**	**2500**	[4]70	325	425	650	975	1625	2700
	950	[4]55	[4]265	[4]350	[4]530	[4]795	[4]1325	[4]2205	[4]55	**300**	**400**	**600**	**900**	**1500**	**2500**
	1000	[4]40	[4]190	[4]250	[4]380	[4]570	[4] 950	[4]1580	[4]40	[4]230	[4]310	[4]470	[4]700	[4]1170	[4]1950
	1050									[4]135	[4]180	[4]270	[4]405	[4] 675	[4]1125
	1100									[4] 90	[4]120	[4]180	[4]270	[4] 450	[4] 750

Flanged No. 5 Chrome-Molybdenum Alloy Steel Valves (Made to order)

		[1]Facings Other Than Ring Joint						Ring Joint Facing					
Oil or Oil Vapor only *Class X*	100 to 750	For temperatures up to 900° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves, above.						For temperatures up to 800° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Valves, above.					
	800							400	525	800	1200	2000	3325
	850							375	500	750	1125	1875	3125
	900	310	410	620	930	1550	2580	350	475	700	1050	1750	2925
	950	**300**	**400**	**600**	**900**	**1500**	**2500**	325	425	650	975	1625	2700
	1000	200	275	400	600	1000	1675	**300**	**400**	**600**	**900**	**1500**	**2500**
	1050	135	180	270	405	675	1125	225	275	425	650	1075	1775
	1100	90	120	180	270	450	750	150	200	275	425	700	1175

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]When welding end valves are used at temperatures over 850° F. in services where graphitization may be a problem, valves made of Crane No. 7 or No. 9 Chrome-Molybdenum Steel are recommended.

[3]**Service recommendations:** The seating surfaces of swing check valves are subject to different operating conditions than those in gate, globe, or angle valves. The contact area is wide and flat, and since the disc swings and swivels freely, there is no tendency to gall or score.

Crane Steel Swing Check Valves are made with only one trim: "X", Exelloy to Exelloy. They can be used in any installation where the fluid being handled requires either "X", "XR", or "U" trim gate, globe, or angle valves; see pages 226 or 243.

The following are maximum recommended temperatures: 1000° F. on 150-Pound Valves, except 850° F. for steam; and 1100° F. on 300 to 2500-Pound Valves, except 950° F. for steam.

For services in which the disc must be more sensitive to flow reversal or must be balanced for low velocities, valves with outside lever and weight can be furnished; see page 253.

[4]These ratings apply only to oil or oil vapor service.

Cold service: For temperatures between 0° and 100° F., the ratings for 100° F. apply. For sub-zero service, materials with suitable impact resistance must be used; recommendations on request.

Flange facings: Unless otherwise ordered, flanged end 150 and 300-Pound Valves regularly are furnished with 1/16-inch raised faces, and 400-Pound and higher pressure valves, with 1/4-inch male faces.

Standards: Crane pressure-temperature ratings agree with those in Supplement No. 1 (ASA B16e0-1949) to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939 and those in the American Petroleum Institute (API) Standard No. 600, Second Edition, 1951.

Cast Steel Swing Check Valves

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Crane Cast Steel Swing Check Valves are unusually strong and rugged in construction.

Low working stresses, secured through the careful distribution of metal and by the use of heavy metal sections, assure a maximum of safety over the recommended pressures and temperatures.

The valves are well suited for services such as are found in modern industrial and power plants, long distance pipe lines, and in oil refineries.

HYDROSTATIC TEST PRESSURES, IN POUNDS

Pressure Class	Flanged Valves With Facing Other Than Ring Joint: Shell	Seat	Flanged Valves With Ring Joint Face Screwed and Butt-Welding Valves: Shell	Seat
150-Pound	350	350	425	350
300-Pound	900	775	1100	775
400-Pound	1200	1000	1450	1000
600-Pound	1800	1550	2175	1550
900-Pound	2700	2250	3250	2250
1500-Pound	4500	3700	5400	3700

Valve seats are also hydrostatically tested at 40 pounds.

For working pressures, see page 252.

The line is complete and includes valves in a wide range of sizes, in seven pressure classes (150, 300, 400, 600, 900, 1500, and 2500-Pound), and with flanged, screwed, or butt-welding ends, as required. Prices and dimensions for the 2500-Pound Valves are furnished on application. Swing Check Valves are used to prevent the reversal of flow in horizontal or vertical pipe lines. In vertical lines, or for any angle from horizontal to vertical, they should be used for upward flow only.

Specification of Materials

150-Pound Valves are regularly made of Crane Carbon Steel; 300, 400, 600, 900, 1500, and 2500-Pound Valves are regularly made of Crane No. 4 Carbon-Molybdenum Alloy Steel.

The valves are furnished with "X" trim; for complete specifications, see the table below.

For extremely severe oil or oil vapor service, valves can be made of Crane No. 5 Chrome-Molybdenum Steel. They are made to order only; see the Crane Discount Sheet for prices.

Orders for these valves should specify the catalog number and suffix. Refer to page 254.

Trim	Names of Parts	150 Pound Valves	300 Pound Valves	400 Pound Valves	600 Pound Valves	900 Pound Valves	1500 Pound Valves	2500 Pound Valves
†Class "X" Oil, Oil Vapor, Steam, or Water 1100° F. Max.	Body and Cap	Carbon Steel	No. 4 Carbon-Molybdenum Alloy Steel					
	Disc 8" and smaller	Exelloy						
	Disc 10 and 12"	Exelloy-Faced Carbon Steel	Exelloy-Faced Alloy Steel		Exelloy			
	Body Seat Ring	Exelloy						
	Hinge	Alloy Steel						
	Cap Gasket	Corrugated Soft Iron		‡Soft Steel Ring Joint Gasket				
	§Cap Bolt-Studs	Triplex						

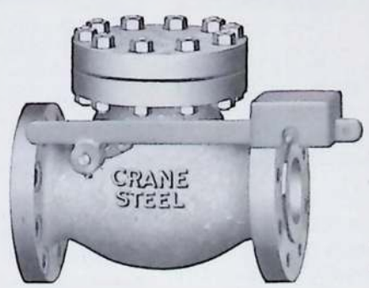
†For detailed service recommendations, see page 252.
‡600-Pound valves, sizes 1/2, 3/4, and 1-inch, have a corrugated soft iron cap gasket (male and female).
§150-Pound Valves in all sizes and 600-Pound Valves in sizes 1/2, 3/4, and 1-inch use Triplex Steel cap studs.

List prices and dimensions . . . page 255 *Description of materials . . . . page 1 to 9*

Valves with Outside Lever and Weight

When so ordered, Crane Cast Steel Swing Check Valves can be furnished with an outside lever and an adjustable weight. Orders must specify whether the weight is to balance the disc or to assist it in closing. Unless otherwise ordered, the lever and weight are mounted on the right hand side of the valve when facing the inlet. Prices are furnished on application.

With the lever and weight mounted so that the weight assists the disc in closing, the valves close the instant the flow stops. Valves so fitted are especially recommended for liquid lines where a sudden reversal of flow may gather considerable momentum before an ordinary valve disc would close, resulting in dangerous or damaging shock. By closing instantly and preventing reversal of flow, they eliminate shock.



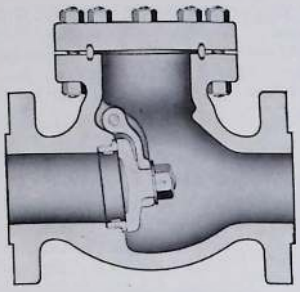
Cast Steel Swing Check Valve With Outside Lever and Weight

With the lever and weight mounted so that the weight balances the weight of the disc, the valve becomes more sensitive to low inlet velocities.

The floating or feathering action of the disc causes the valve to open with a minimum of pressure, and resistance to flow past the disc is minimized.

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Cast Steel Swing Check Valves



Cross Section of Cast Steel Swing Check Valve



Screwed
For Oil, Oil Vapor, Steam, or Water
No. 148 X, 150-Pound
No. 158 X, 300-Pound
No. 174 X, 600-Pound



Flanged
For Oil, Oil Vapor, Steam, or Water
No. 147 X, 150-Pound
No. 159 X, 300-Pound
No. 169 X, 400-Pound
No. 175 X, 600-Pound
No. 187 X, 900-Pound
No. 199 X, 1500-Pound



Butt-Welding
For Oil, Oil Vapor, Steam, or Water
No. 147½ X, 150-Pound
No. 159½ X, 300-Pound
No. 169½ X, 400-Pound
No. 175½ X, 600-Pound
No. 187½ X, 900-Pound
No. 199½ X, 1500-Pound

The Crane line of Cast Steel Swing Check Valves embodies the many refinements in design and materials necessary to withstand severe service.

Materials: These valves are regularly furnished with body and cap made of Crane Carbon Steel on the 150-Pound Valves, and of Crane No. 4 Carbon-Molybdenum Alloy Steel on 300-Pound and higher pressure valves. Seating materials are Exelloy to Exelloy (Class "X" trim), suitable for steam, water, oil, oil vapor, air, or gas.

Design: On flanged and butt-welding valves the full port area is maintained without pockets, from the inlet port to the valve seat, to avoid turbulence. On the outlet side of the valve seat, the body is of generous proportions, allowing full swing of the disc and minimizing erosion and flow resistance.

Body seat ring: A shoulder-type screwed-in body seat ring provides maximum tightness and security.

Cap joint: The 150 and 300-Pound Valves, and sizes 1-inch and smaller of the 600-Pound Valves, have a male and female type cap joint. The 400, 600 (sizes larger than 1-inch), 900, 1500, and 2500-Pound Valves have the ring-type cap joint.

Cap studs and bolt-studs: Valves of the 300-Pound and higher pressure classes, except ½, ¾, and 1-inch 600-Pound, have through bolt-studs of Crane Triplex Steel. 150-Pound Valves and the ½, ¾, and 1-inch 600-Pound Valves have Triplex Steel studs. Both types provide an unusually strong and tight cap joint.

Drilling: Flanged valves of each pressure class are furnished with the end flanges faced, drilled, and spot faced (F.D. & S.F.) unless otherwise ordered. List prices include drilling to the corresponding pressure class of the American Standard. No deduction is made for valves ordered faced only.

Flange facings: The 150 and 300-Pound Flanged Valves are regularly furnished with an American Standard 1/16-inch raised face on the end flanges; the 400, 600, 900, 1500, and 2500-Pound Flanged Valves regularly have a ¼-inch male face (large male). When so ordered, valves can be furnished with other types of facings, such as ring joint, female, tongue, groove, etc.; see the Crane Discount Sheet for prices.

Finish of flange faces: The 1/16-inch raised faces and the ¼-inch male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish can be furnished on raised or male faces, when specified; see the Crane Discount Sheet for prices.

Standards: In design and materials, Crane Cast Steel Swing Check Valves exceed the requirements of Standards issued by the American Standards Association and the American Petroleum Institute.

End flanges on flanged valves conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

150, 300, 400, and 600-Pound Flanged and Butt-Welding Valves conform to the American Standard for Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves, B16.10-1939, for their respective pressure class. This Standard does not include 8, 10, and 12-inch 150-Pound Valves, 5-inch 400-Pound Valves, 3½ and 5-inch 600-Pound Valves, or butt-welding valves in the 10 and 12-inch sizes.

The 300, 400, and 600-Pound Flanged and Butt-Welding Valves, and 6-inch and smaller 150-Pound Flanged Valves conform also to the API Standard for Pipe Line Valves, No. 6-D, Sixth Edition, May, 1949. This Standard does not include 1¼, 1½, 3½, and 5-inch valves, 150-Pound Butt-Welding Valves, or 8-inch and larger 150-Pound Flanged Valves.

Working pressures ..... *page 252*
Service recommendations ..... *page 252*
Test pressures ..... *page 253*
Specification of materials ..... *page 253*
Lever and Weight Valves ..... *page 253*
2500-Pound Valves ..... *page 256*

Cast Steel Swing Check Valves

List Prices, Each

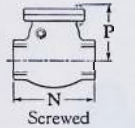
Size Inches	Screwed End Valves 150 Pound	300 Pound	600 Pound	Flanged End Valves, F.D. & S.F. or Butt-Welding End Valves 150 Pound	300 Pound	400 Pound	600 Pound	900 Pound	1500 Pound
½			86.30						
¾			97.70						
1			115.00						
1¼			132.00				144.00		
1½			149.00			Use 600 Pound Valves	161.00	Use 1500 Pound Valves	388.00
2	140.00	167.00	184.00	147.00	174.00		195.00		481.00
2½	161.00	187.00		167.00	194.00		253.00		589.00
*3	181.00	214.00		187.00	*221.00		*288.00	726.00	775.00
†3½				†227.00	†268.00		†334.00		
4	241.00	281.00		247.00	294.00	386.00	437.00	990.00	1085.00
5				334.00	401.00	515.00	598.00	1270.00	1550.00
6				401.00	495.00	631.00	805.00	1617.00	2015.00
8				589.00	736.00	953.00	1150.00	2393.00	2945.00
10				†840.00	1030.00	1287.00	1553.00	3300.00	4340.00
12				†1133.00	1404.00	1738.00	2013.00	4455.00	5890.00

*When 3-inch 300 and 600-Pound Flanged Valves with ring joint facing are to be bolted to Cranelap joints, orders must so specify. A groove of special pitch diameter is required; see page 470 for dimensions.
†Prices shown for all 3½-inch valves and for 10 and 12-inch 150-Pound Valves apply only to flanged end valves.

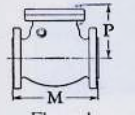
Drilling: Flanged valves are furnished with the end flanges faced, drilled, and spot faced (F.D. & S.F.), unless otherwise ordered. List prices include drilling to the corresponding pressure class of the American Standard. No deduction is made if flanged valves are ordered faced only.

Butt-welding valves: Unless otherwise ordered, 150 and 300-Pound Butt-Welding Valves are bored to match the inside diameter of Standard pipe (the heaviest weight on the 8, 10, and 12-inch sizes). For all other pressure classes, orders must specify the diameter of the bore (I.D. of pipe).

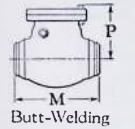
When ordering, specify the catalog number and suffix; see the preceding page.



Screwed



Flanged



Butt-Welding
(Not made in 3½-inch size nor in 10 and 12-inch 150-Pound Class)

Dimensions, in Inches

Class	Size	M	N	P
150 Pound	2	8	8	5
	2½	8½	8½	5½
	3	9½	9½	6
	3½	10½		6½
	4	11½	11½	7
	5	13		8
	6	14		9
	8	19½		10¼
	10	24½		12⅛
	12	27½		13¾
300 Pound	2	10½	9½	6¾
	2½	11½	10¾	8
	3	12½	11¾	8½
	3½	13¼		9¼
	4	14	13	9¾
	5	15¾		10¾
	6	17½		11¾
	8	21		14
	10	24½		15
	12	28		16¾

Class	Size	M	N	P
400 Pound	4	16		10
	5	18		12
	6	19½		12½
	8	23½		14½
	10	26½		**
	12	30		**
600 Pound	½		4⅝	3½
	¾		6	4
	1		7	4½
	1¼	9	7½	6¼
	1½	9½	8½	6¾
	2	11½	9½	7
	2½	13		8¼
	3	14		9
	3½	15		9¾
	4	17		10¼
	5	20		12¾
	6	22		13½
	8	26		15¼
	10	31		18¾
	12	33		21½

Class	Size	M	P
900 Pound	3	15	9½
	4	18	11
	5	22	13¼
	6	24	13¾
	8	29	16½
	10	33	**
	12	38	**
1500 Pound	1½	12	8¼
	2	14½	9¾
	2½	16½	10½
	3	18½	11¼
	4	21½	13¼
	5	26½	15¼
	6	27¾	15¾
	8	32¾	18¼
	10	39	**
	12	44½	**
2500 Pound	On application		

**These dimensions will be furnished on application.

Face to face: 150 and 300-Pound Flanged Valves regularly have a 1/16-inch raised face; and 400, 600, 900, 1500, and 2500-Pound Flanged Valves regularly have a ¼-inch high large male face. Face to face dimensions (dimension "M") shown in the above table include these facings.

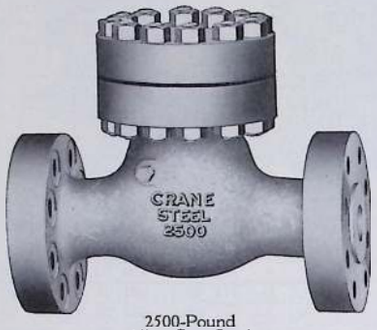
Templates for drilling and flange dimensions ... *pages 461 to 463*
Special facings ... *pages 468 to 471*
Description ... *pages 253 and 254*

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2500-Pound
Alloy Cast Steel Swing Check Valves

Crane 2500-Pound Alloy Cast Steel Swing Check Valves with flanged or butt-welding ends are available in the 4, 5, 6, 8, and 10-inch sizes.

The valves are recommended for the high pressures and temperatures encountered in modern central power stations and oil refineries. They are regularly furnished with Class "X" trimming (Exelloy to Exelloy) and are suitable for oil, oil vapor, steam, water, or general service.



2500-Pound
Alloy Cast Steel
Swing Check Valve

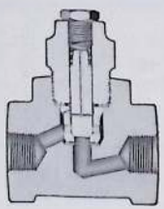
These are extremely heavy valves. They are ruggedly constructed and are amply proportioned throughout.

The full port area is maintained without pockets, from the inlet flange to the valve seat, to avoid turbulence. On the outlet side of the valve seat, the body is of generous proportions, allowing full swing of the disc and minimizing erosion and flow resistance.

Prices and dimensions will be furnished on application.

Working pressures and service recommendations....page 252
General description.....pages 253 and 254
Specification of materials.....page 253
Description of materials.....pages 1 to 9

6000-Pound Hydraulic
Forged Steel Lift Check Valves



Cross Section
No. 227 H

WORKING PRESSURE
6000 pounds cold water or oil, non-shock

TEST PRESSURE
6500 pounds hydrostatic



No. 227 H
Horizontal
Screwed

List Prices and Dimensions

Size	Inches	3/8	1/2	3/4	1	1 1/4
No. 227 H, Horizontal	Each	49.00	54.00	63.00	77.00	105.00
End to end	Inches	2 7/8	3 5/8	5	5 1/4	7
Center to top	Inches	2 5/8	3 1/4	4 3/8	4 7/8	4 5/8

Service recommendations: These valves are recommended for severe and extremely high pressure service on hydraulic lines not subject to shock. They have very heavy metal sections and are exceptionally rugged.

Body and cap: The body is made from a solid steel forging. Sizes 1-inch and smaller have a screwed cap as illustrated. The 1 1/4-inch size has a bolted cap (not illustrated).

Disc and seat: The disc is made of brass and is accurately guided, assuring square seating. The seat bushing, made of Exelloy, is easily renewed.

The valves have a small spring between the disc and cap.

Seat opening: The diameter of the port opening in these valves is slightly smaller than the inside diameter of Extra Strong Pipe.

Steel
Screwed Fittings, Unions, and Flange Unions

Forged and Cast Steel Screwed Fittings are available in a wide range of straight and reducing sizes for a variety of service requirements. Forged Steel Fittings are regularly made in the 2000, 3000, and 6000-Pound W.O.G. pressure classes. Cast Steel Fittings are regularly made in the 1000-Pound W.O.G. pressure class. Special fittings and fittings for higher pressures can be furnished to order; fittings shown in this section include:

90° Elbows	Crosses	Reducers
90° Street Elbows	45° Y-Bends	Caps
45° Elbows	Couplings	Plugs
Tees	Half Couplings	Bushings

Forged Steel Fittings
2000, 3000, and 6000-Pound W.O.G.
General description....page 258
Working pressures....page 258
List prices....pages 259 and 260
Dimensions....page 261

Cast Steel Fittings
1000-Pound W.O.G....page 262

Forged Steel Unions
2000-Pound W.O.G....page 263
3000-Pound W.O.G....page 263
6000-Pound W.O.G....page 264

Forged Steel Flange Unions
2000 and 6000-Pound W.O.G....page 265

Forged Steel Combination Elbows....page 266

For AAR Forged Steel Unions, see page 180

The items listed above comprise only a part of the complete line of Crane steel products. Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

Steel Couplings....page 170
Wrought Steel Nipples....pages 168 and 169
Forged Steel Tongue and Groove Flange Unions....page 182

Steel Flanged Fittings....pages 267 to 274
Steel Welding Fittings....pages 275 to 290
Steel Flanges....pages 291 to 298

Steel Pressure-Seal Bonnet Valves....pages 205 to 217
Steel Lip-Seal Bonnet Valves....pages 218 and 219
Steel Gate Valves....pages 221 to 234
Steel Globe and Angle Valves....pages 235 to 248
Steel Check Valves....pages 249 to 256
Steel Stop-Check Valves....pages 304 and 305

Steel Safety Valves....page 324
Steel Relief Valves....pages 333 and 334
Corrosion-Resistant Valves and Fittings....pages 375 to 396
Valves and Fittings for Marine Service....pages 397 to 408
Steel Sediment Separators....page 356
Fabricated Piping....pages 497 to 522

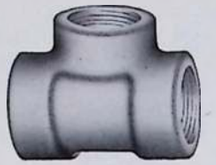
How to read reducing fittings....page 577

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Forged Steel Screwed Fittings
2000, 3000, and 6000-Pound W.O.G.



90° Elbow
No. 240, 2000-Lb. WOG
No. 380, 3000-Lb. WOG
No. 660, 6000-Lb. WOG



Tee
No. 241, 2000-Lb. WOG
No. 381, 3000-Lb. WOG
No. 661, 6000-Lb. WOG



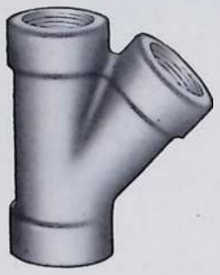
45° Elbow
No. 242, 2000-Lb. WOG
No. 382, 3000-Lb. WOG
No. 662, 6000-Lb. WOG



Cross
No. 243, 2000-Lb. WOG
No. 383, 3000-Lb. WOG
No. 663, 6000-Lb. WOG



90° Street Elbow
No. 384, 3000-Lb. WOG
No. 664, 6000-Lb. WOG

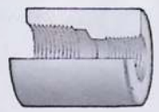


45° Y-Bend
No. 245, 2000-Lb. WOG
No. 385, 3000-Lb. WOG
No. 665, 6000-Lb. WOG

For list prices, see the opposite page.



Coupling
No. 386, 3000-Lb. WOG
No. 666, 6000-Lb. WOG



Reducer
No. 387, 3000-Lb. WOG
No. 667, 6000-Lb. WOG



Half Coupling
No. 388, 3000-Lb. WOG
No. 668, 6000-Lb. WOG

Service recommendations: These fittings are unusually strong and rugged. They are ideally suited for high pressure hydraulic lines and for high pressure-temperature service in oil refineries, oil and gas fields, central power stations, and industrial and chemical plants. The 2000-Pound W.O.G. Fittings, exceptionally compact and light in weight, are intended for services beyond the temperature range of malleable iron fittings and for use on many relatively low pressure installations where the extra strength and safety afforded by steel fittings are desired.

Design and construction: The elbows, tees, crosses, and Y-bends are forged solid; caps, couplings, reducers, plugs, and bushings are machined from solid steel. All openings are drilled. The fittings have liberal metal sections throughout; they have an ample factor of safety over the recommended working pressures.

The forged fittings have each opening reinforced with a wide band. It completely surrounds the thread chamber, extending beyond the last thread. This design not only provides the requisite strength but also makes the fittings more compact and neater in appearance, and permits a better wrench grip.

Materials: High grade carbon steel billets or bar stock, purchased under rigid specifications and carefully inspected and tested for quality, are used in the manufacture of these fittings. The material has been especially selected for its strength, toughness, and resistance to temperature and shock.

Threading: The threads are long and are accurately cut to gauge. The openings are chamfered to permit easy entrance of the pipe. All of the openings are in true alignment.

WORKING PRESSURES
Pounds, Non-Shock
For Steam, Water, Oil, Oil Vapor, Gas, or Air

Temp.	Carbon Steel Fittings			Carbon-Molybdenum Steel Fittings		
Deg. F.	2000 Pound W.O.G.	3000 Pound W.O.G.	6000 Pound W.O.G.	2000 Pound W.O.G.	3000 Pound W.O.G.	6000 Pound W.O.G.
100	2000	3000	6000	2000	3000	6000
150	1980	2960	5915	1980	2960	5915
200	1950	2920	5830	1950	2920	5830
250	1920	2880	5750	1920	2880	5750
300	1900	2840	5690	1900	2840	5690
350	1880	2820	5625	1880	2820	5625
400	1850	2780	5550	1850	2780	5550
450	1830	2740	5490	1830	2740	5490
500	1740	2600	5210	1740	2600	5210
550	1640	2460	4925	1640	2460	4925
600	1550	2310	4620	1550	2310	4620
650	1440	2150	4300	1440	2150	4300
700	1320	1960	3920	1320	1960	3920
750	1190	1775	3550	1190	1775	3550
800	1020	1525	3050	1045	1560	3125
850	835	1250	2500	975	1460	2925
900	585	875	1750	900	1350	2700
950	460	690	1375	835	1250	2500
1000	335	500	1000	650	975	1950

Caps, Plugs, and Bushings . . . . page 260

Dimensions . . . page 261

Forged Steel Screwed Fittings
2000, 3000, and 6000-Pound W.O.G.

For working pressures and description, see the opposite page.

List Prices, Each—Carbon Steel Fittings

Type of Fitting		90° Elbows	Tees	45° Elbows	Crosses	90° Street Elbows	45° Y-Bends	Couplings	Reducers	Half Couplings
	Size Inches	No. 240	No. 241	No. 242	No. 243		No. 245			
2000-Pound W.O.G.	1/8	.55	.80	.68	1.10			Use 3000-Pound W.O.G.		
	1/4	.55	.80	.68	1.10	Use 3000-Pound W.O.G.	1.40			
	3/8	.55	.80	.68	1.10		1.85			
	1/2	.65	.95	.78	1.30		2.00			
	3/4	.75	1.10	.90	1.50		2.50			
	1	.90	1.35	1.08	1.90		3.00			
	1 1/4	1.20	1.75	1.44	2.80		3.75			
	1 1/2	1.50	2.30	1.80	3.50		4.75			
	2	1.90	2.90	2.28	5.00		5.80			
	2 1/2	2.90	4.40	3.48	7.30					
	3	5.00	7.50	6.00	10.00					
	4	12.50	17.00	14.00	23.00					
	Size Inches	No. 380	No. 381	No. 382	No. 383	No. 384	No. 385	No. 386	No. 387	No. 388
3000-Pound W.O.G.	1/8	.55	.80	.68	1.10			.40		.25
	1/4	.55	.80	.68	1.10	.75	1.40	.40	.55	.25
	3/8	.55	.80	.68	1.10	.85	1.85	.40	.55	.25
	1/2	.65	.95	.78	1.30	.85	2.00	.40	.70	.25
	3/4	.75	1.10	.90	1.50	1.05	2.50	.45	1.00	.30
	1	.90	1.35	1.08	1.90	1.40	3.00	.55	1.20	.35
	1 1/4	1.20	1.75	1.44	2.80	2.00	3.75	.70	1.35	.40
	1 1/2	1.50	2.30	1.80	3.50	2.50	4.75	.85	1.60	.50
	2	1.90	2.90	2.28	5.00	3.15		1.15	1.85	.70
	2 1/2	2.90	4.40	3.48	7.30			1.60	2.75	.95
	3	5.00	7.50	6.00	10.00			2.75	3.75	1.65
	3 1/2	12.50	17.00	14.00	23.00			3.85	5.50	2.30
	4	12.50	17.00	14.00	23.00			4.80	6.75	2.85
	Size Inches	No. 660	No. 661	No. 662	No. 663	No. 664	No. 665	No. 666	No. 667	No. 668
6000-Pound W.O.G.	1/8	.55	.80	.68	1.10			.60		.35
	1/4	.55	.80	.68	1.10	1.05		.60	.75	.35
	3/8	.65	.95	.78	1.30	1.40	2.00	.60	.75	.35
	1/2	.75	1.10	.90	1.50	1.40	2.50	.60	.90	.35
	3/4	.90	1.35	1.08	1.90	2.00	3.00	.65	1.25	.40
	1	1.20	1.75	1.44	2.80	2.50	3.75	.85	1.50	.50
	1 1/4	1.50	2.30	1.80	3.50	3.15	4.75	1.05	1.70	.60
	1 1/2	1.90	2.90	2.28	5.00	3.75		1.30	2.10	.80
	2	2.90	4.40	3.48	7.30			1.75	2.50	1.05
	2 1/2	5.00	7.50	6.00	10.00			2.40	3.60	1.45
	3	12.50	17.00	14.00	23.00			4.75	5.75	2.85
	3 1/2	12.50	17.00	14.00	23.00			8.50	9.50	5.10
	4							10.90	11.75	6.50

Reducing fittings: Reducing fittings can be made in any reduction from straight size forging blanks; they use the same list price as straight size fittings. The list prices of Reducers apply to any reduction. See the Crane Discount Sheet for prices.

Galvanized fittings: Galvanized fittings can be made to order; see the Crane Discount Sheet.

Alloy steel fittings: Fittings made of Carbon-Molybdenum Steel, Chromium-Molybdenum Steel (4 to 6% Chrome), or Stainless Steel (18-8) can be made to order; prices will be furnished on application.

Other types of fittings: The Crane line includes an unusually complete assortment of steel fittings.

In addition to the fittings listed here, steel plugs, bushings, and caps are shown on the following page. Steel screwed unions, flange unions, and combination elbows are shown on pages 263 to 266. 1000-Pound W.O.G. Cast Steel Screwed Fittings in sizes as large as 12-inch are listed on page 262.

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Steel Screwed Caps, Plugs, and Bushings

3000 and 6000-Pound W.O.G.

Caps



No. 389
Cap
3000-Pound W.O.G.

Plugs



No. 309
Square Head
Plug
3000-Pound
W.O.G.



No. 308
Round Head
Plug
3000-Pound
W.O.G.



No. 602
Hexagon Head
Plug
6000-Pound
W.O.G.

Bushings



No. 600
Hexagon
Bushing
6000-Pound
W.O.G.



No. 601
Face
Bushing
6000-Pound
W.O.G.

Design and construction: The caps, plugs, and bushings listed on this page have liberal metal sections throughout; they have an ample factor of safety over the recommended working pressures. For added description and working pressures, refer to page 258.

Galvanized fittings: Galvanized caps, plugs, and bushings can be made to order; see the Crane Discount Sheet for prices.

Alloy steel fittings: Caps, plugs, and bushings made of Carbon-Molybdenum Steel, Chromium-Molybdenum Steel (4 to 6% Chrome), or Stainless Steel (18-8) can be made to order; prices are furnished on application.

List Prices, Each—Carbon Steel Caps and Plugs

Size	Caps	Plugs		
	No. 389	No. 309 Square Head	No. 308 Round Head	No. 602 Hexagon Head
Inches	3000 Pound	3000 Pound	3000 Pound	6000 Pound
1/8	.35	Use Solid Plugs shown on page 166; they are made of steel.	.25	.25
1/4	.35		.25	.25
3/8	.35		.25	.25
1/2	.45		.25	.25
3/4	.65	.30	.30	.30
1	.90	.35	.35	.40
1 1/4	1.00	.50	.50	.55
1 1/2	1.30	.75	.75	.85
2	2.00	1.50	1.50	1.65
2 1/2	3.65	3.00	3.00	3.30
3	4.35	5.00	5.00	5.50
3 1/2	5.45	5.75	5.75	6.35
4	13.00	6.50	6.50	7.15

List Prices, Each—Carbon Steel Bushings

Size	No. 600 Hexagon Bushings	No. 601 Face Bushings
Inches	6000 Pound	6000 Pound
1/4 ×1/8	*	*
3/8 ×1/4	*	*
×1/8		
1/2 ×3/8	.45	*
×1/4		
×1/8		
3/4 ×1/2	.45	*
×3/8		
×1/4		
×1/8		....
1 ×3/4	.50	.60
×1/2		
×3/8		
×1/4		
×1/8		....
1 1/4×1	.66	.75
×3/4		
×1/2		
×3/8		....
×1/4		....
1 1/2×1 1/4	.83	.95
×1		
×3/4		
×1/2		....
×3/8		....
×1/4		....

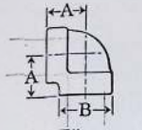
Size	No. 600 Hexagon Bushings	No. 601 Face Bushings
Inches	6000 Pound	6000 Pound
2 ×1 1/2	1.32	1.50
×1 1/4		
×1		
×3/4	1.20	....
×1/2		....
×3/8		....
×1/4		....
2 1/2×2	5.00	2.00
×1 1/2		
×1 1/4	4.50	....
×1		....
×3/4		....
×1/2		....
3 ×2 1/2	8.00	5.00
×2		....
×1 1/2	7.25	....
×1 1/4		....
×1		....
×3/4		....
×1/2		....
3 1/2×3	9.00	6.00
×2 1/2		
×2	8.25	....
×1 1/2		....
×1 1/4		....
×1		....
4 ×3 1/2	10.50	7.50
×3		
×2 1/2		
×2	9.50	....
×1 1/2		....
×1 1/4		....
×1		....

*For sizes indicated with an asterisk, use the hexagon and face bushings shown on page 167; they are made of steel.

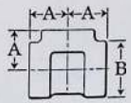
Description and working pressures . . . page 258
Dimensions of caps . . . page 261

Forged Steel Screwed Fittings

Dimensions, in Inches



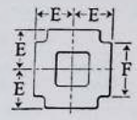
90° Elbow



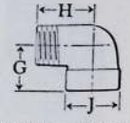
Tee



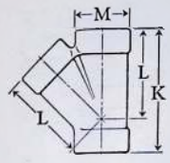
45° Elbow



Cross



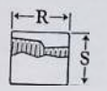
90° Street Elbow



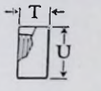
45° Y-Bend



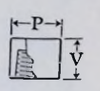
Coupling



Reducer



Half Coupling



Cap

Dimensions of reducing sizes are the same as those of the straight size corresponding to the largest opening.

Size	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
2000-Pound W.O.G. Fittings																			
1/8	13/16	29/32	11/16	15/16	31/32	1													
1/4	13/16	29/32	3/4	1 1/32	31/32	1					2 5/16	1 5/8	13/16						
3/8	31/32	1 1/32	3/4	1 1/32	31/32	1					2 11/16	1 7/8	1						
1/2	1 1/8	15/16	7/8	15/16	1 1/8	15/16					3	2 1/8	15/16						
3/4	15/16	1 1/2	1	1 1/2	15/16	1 1/2					3 9/16	2 9/16	1 1/2						
1	1 1/2	1 13/16	1 1/8	1 13/16	1 1/2	1 13/16					4 1/8	3	1 13/16						
1 1/4	1 3/4	2 7/32	1 5/16	2 7/32	1 3/4	2 3/16					4 13/16	3 1/2	2 3/16						
1 1/2	2	2 15/32	1 7/16	2 15/32	2	2 7/16					5 3/8	3 15/16	2 7/16						
2	2 3/8	3	1 11/16	3	2 3/8	2 31/32					6 7/16	4 3/4	2 31/32						
2 1/2	3	3 5/8	2 1/16	4	3 1/4	4													
3	3 3/8	4 5/16	2 1/2	4 5/8	3 3/8	4 5/8													
4	4 3/16	5 3/4	3 1/8	5 3/4	4 3/16	5 3/4													
3000-Pound W.O.G. Fittings																			
1/8	13/16	29/32	11/16	15/16	31/32	1											1 1/8	19/32	
1/4	31/32	1 1/32	3/4	1 1/32	31/32	1	7/8	1 1/4	1								1 3/8	3/4	1 3/8
3/8	1 1/8	15/16	7/8	15/16	1 1/8	15/16	1	1 1/2	1 1/4								1 5/8	15/16	1 1/2
1/2	15/16	1 1/2	1	1 1/2	15/16	1 1/2	1 1/8	1 5/8	1 1/2	3 9/16	2 9/16	1 1/2	1 7/8	1 1/8	1 7/8	1 1/8	1 7/8	1 1/8	1 1/4
3/4	1 1/2	1 13/16	1 1/8	1 13/16	1 1/2	1 13/16	1 3/8	1 7/8	1 3/4	4 1/8	3	1 13/16	2 1/8	1 3/8	2	1 3/8	1	1 3/8	1 1/4
1	1 3/4	2 7/32	1 5/16	2 7/32	1 3/4	2 3/16	1 3/4	2 1/4	2	4 13/16	3 1/2	2 3/16	2 3/8	1 3/4	2 3/8	1 3/4	1 5/16	1 3/4	1 1/2
1 1/4	2	2 15/32	1 7/16	2 15/32	2	2 7/16	2	2 5/8	2 7/16	5 3/8	3 15/16	2 7/16	2 7/8	2 1/4	2 3/8	2 1/4	1 5/16	2 1/4	1 5/8
1 1/2	2 3/8	3	1 11/16	3	2 3/8	2 31/32	2 1/8	2 13/16	2 3/4	6 7/16	4 3/4	2 31/32	2 7/8	2 1/2	3 1/8	2 1/2	1 9/16	2 1/2	1 5/8
2	2 1/2	3 9/16	1 23/32	3 5/16	2 1/2	3 5/16	2 1/2	3 5/16	3 5/16				3 3/8	3	3 3/8	3	1 11/16	3	2
2 1/2	3 3/8	4 3/8	2 1/16	4	3 1/4	4							3 5/8	3 5/8	3 5/8	3 5/8	1 13/16	3 5/8	2 3/8
3	3 3/4	4 3/4	2 1/2	4 5/8	3 3/8	4 5/8							4 1/4	4 1/4	4 1/4	4 1/4	2 1/8	4 1/4	2 9/16
3 1/2	4 1/2	6	3 1/8	5 3/4	4 3/16	5 3/4							4 1/2	4 3/4	4 1/2	4 3/4	2 1/4	4 3/4	2 5/8
4	4 1/2	6	3 1/8	5 3/4	4 3/16	5 3/4							4 3/4	5 1/2	4 3/4	5 1/2	2 3/8	5 1/2	2 11/16
6000-Pound W.O.G. Fittings																			
1/8	31/32	1 1/32	3/4	1 1/16	31/32	1											1 1/4	7/8	
1/4	1 1/8	15/16	7/8	15/16	1 1/8	15/16	1	1 1/2	1 1/4								1 3/8	1	1 3/8
3/8	15/16	1 1/2	1	1 1/2	15/16	1 1/2	1 1/8	1 5/8	1 1/2	3 9/16	2 9/16	1 1/2	1 1/2	1 1/4	1 1/2	1 1/4	3/4	1 1/4	
1/2	1 1/2	1 13/16	1 1/8	1 13/16	1 1/2	1 13/16	1 3/8	1 7/8	1 3/4	4 1/8	3	1 13/16	1 7/8	1 1/2	1 7/8	1 1/2	1 5/16	1 1/2	
3/4	1 3/4	2 7/32	1 5/16	2 3/16	1 3/4	2 3/16	1 3/4	2 1/4	2	4 13/16	3 1/2	2 3/16	2	1 3/4	2	1 3/4	1	1 3/4	
1	2	2 15/32	1 11/32	2 7/16	2	2 7/16	2	2 5/8	2 7/16	5 3/8	3 15/16	2 7/16	2 3/8	2 1/4	2 3/8	2 1/4	1 3/16	2 1/4	
1 1/4	2 3/8	3	1 11/16	2 31/32	2 3/8	2 31/32	2 1/8	2 13/16	2 3/4	6 7/16	4 3/4	2 31/32	2 5/8	2 1/2	2 5/8	2 1/2	1 5/16	2 1/2	
1 1/2	2 1/2	3 9/16	1 23/32	3 5/16	2 1/2	3 5/16	2 1/2	3 5/16	3 5/16				3 1/8	3	3 1/8	3	1 9/16	3	
2	3 3/8	4 3/8	2 1/16	4	3 1/4	4							3 5/8	3 5/8	3 5/8	3 5/8	1 11/16	3 5/8	
2 1/2	3 3/4	4 3/4	2 1/2	4 5/8	3 3/8	4 5/8							3 5/8	4 1/4	3 5/8	4 1/4	1 13/16	4 1/4	
3	4 3/16	5 3/4	3 1/8	5 3/4	4 3/16	5 3/4							4 1/4	5	4 1/4	5	2 1/8	5	
3 1/2	4 1/2	6	3 1/8	5 3/4	4 3/16	5 3/4							4 1/2	5 3/4	4 1/2	5 3/4	2 1/4	5 3/4	
4													4 3/4	6 1/4	4 3/4	6 1/4	2 3/8	6 1/4	

Description, prices, and ratings . . . pages 258 to 260
Thread engagement . . . page 494

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1000-Pound W.O.G. Cast Steel Screwed Fittings



No. 760 D
90° Elbow



No. 762 D
45° Elbow



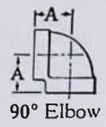
No. 764 D
Tee

WORKING PRESSURES

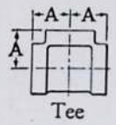
For Steam, Water, Oil, Oil Vapor, Gas, or Air

Temp. Deg. F.	Pounds Non-Shock	Temp. Deg. F.	Pounds Non-Shock
100	1000	600	775
150	990	650	720
200	975	700	660
250	960	750	595
300	950	800	510
350	940	850	415
400	925	900	290
450	915	950	230
500	870	1000	165
550	820	....	...

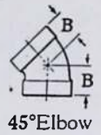
TEST PRESSURE
1000 pounds hydrostatic



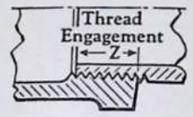
90° Elbow



Tee



45°Elbow



For explanation, see page 494.

List Prices and Dimensions

Size		Inches	5	6	8	10	12
No. 760 D, 90° Elbows		Each	32.00	39.00	80.00	144.00	217.00
No. 762 D, 45° Elbows		Each	32.00	39.00	80.00	144.00	217.00
No. 764 D, Tees		Each	48.00	59.00	120.00	215.00	326.00
Dimensions, in Inches	A—Center to end		5½	6¼	7¾	9¼	11½
	B—Center to end		3 3/16	3½	4 5/16	5 3/16	6
	Z—Thread engagement		1¼	1 5/16	1 7/16	1⅝	1¾

Reducing fittings: Reducing Elbows and Tees can be made to order. Reducing sizes use the same list prices as straight size fittings but are sold at an advance in price; see the Crane Discount Sheet for prices.

Service recommendations: Crane 1000-Pound W.O.G. Cast Steel Fittings are recommended for services that are beyond the pressure-temperature range of malleable or cast iron fittings, or where stronger, more rugged fittings are desired. They are well suited for service on steam, hot oil, gas, and water lines.

Material and construction: The fittings are made of Crane Carbon Steel. They are cast from special patterns and are not to be compared with cast steel fittings made from patterns designed for cast iron fittings. Metal sections are ample throughout, and heavy bands reinforce the ends of the fittings.

Threading: Threads are long and are accurately cut to gauge; all openings are in true alignment. Openings are chamfered to permit easy entrance of the pipe.

Alloy steel: Fittings made of Crane No. 5 Chrome-Molybdenum Alloy Cast Steel to withstand elevated temperatures, corrosion, and erosion can be made to order. Prices on application.

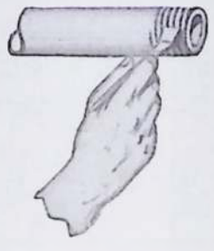
Smaller sizes: For smaller sizes, use the forged steel fittings shown on pages 258 and 259.

Steel Screwed Unions.....pages 263 and 264
Steel Flange Unions.....page 265
Steel Tongue and Groove Flange Unions.....page 182

Applying Thread Lubricant

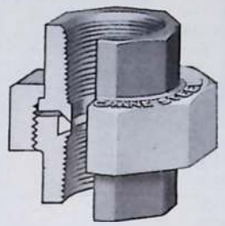
Pipe dope or thread lubricant should always be used when making up screwed joints. But, apply it to the male end of the joint only, not to the female threads in valves or fittings. The excess will then be forced to the outside, and not into the line where it is likely to cause trouble.

Crane High Temperature Thread Lubricant is unusually well suited for use on installations where high temperatures will be encountered. For complete information and recommendations, see page 464.

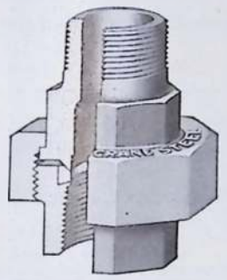


Forged Steel Ground Joint Unions

2000-Pound W.O.G.
Brass to Steel Seat



No. 250 H
Female



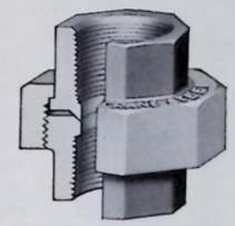
No. 253 H
Male and Female

WORKING PRESSURES
(Steam, Water, Oil, Oil Vapor, Gas, or Air)

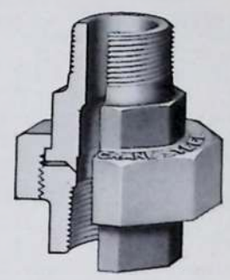
Temp. Fahr.	Pounds, Non-Shock: Brass to Steel Seat Unions	Pounds, Non-Shock: Steel to Steel Seat Unions
100°	2000	3000
150	1980	2960
200	1950	2920
250	1920	2880
300	1900	2840
350	1880	2820
400	1850	2780
450	1830	2740
500	1740	2600
550	1640	2460
600	....	2310
650	....	2150
700	....	1960
750	....	1775
800	....	1525
850	....	1250
900	....	875
950	....	690
1000	....	500

Tested 300 pounds air-under-water

3000-Pound W.O.G.
Steel to Steel Seat



No. 252 H
Female



No. 254 H
Male and Female

List Prices, Each

Size		Inches	1/8	¼	3/8	½	¾	1	1¼	1½	2	2½	3
Black with Cadmium Plated Ring	Female	No. 250 H, Brass to Steel	2.25	2.25	2.50	3.00	3.50	4.25	5.50	6.80	8.50	17.00	26.00
		No. 252 H, Steel to Steel	2.15	2.15	2.35	2.70	3.30	4.00	5.25	6.30	8.00	16.00	24.50
	Male & Female	No. 253 H, Brass to Steel		2.80	3.10	3.70	4.35	5.25	6.75	8.50	10.50	21.00	32.50
		No. 254 H, Steel to Steel		2.70	2.95	3.40	4.15	5.00	6.50	8.00	10.00	20.00	31.00
Cadmium Plated All Over	Female	No. 250 H, Brass to Steel	2.50	2.50	2.75	3.30	3.85	4.65	6.00	7.50	9.35	18.75	28.50
		No. 252 H, Steel to Steel	2.40	2.40	2.60	3.00	3.65	4.40	5.75	7.00	8.85	17.75	27.00
	Male & Female	No. 253 H, Brass to Steel		3.10	3.40	4.10	4.80	5.75	7.40	9.35	11.50	23.00	36.00
		No. 254 H, Steel to Steel		3.00	3.25	3.80	4.60	5.50	7.15	8.85	11.00	22.00	34.50

1/8-inch unions have round ends; larger sizes have octagon ends.
On Male and Female Unions sizes 2½ and 3-inch, the male tail-piece is cast steel.

Service recommendations: These unions are recommended for high pressures and temperatures or for unusually severe service on steam, oil, water, air, or gas. Although light in weight, they are exceptionally tough and rugged.

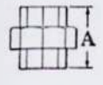
Seat: The unions have steel to steel seats or brass to steel seats. In the former, the seats are integral with the end-pieces. In the latter, a large brass ring is rolled under high pressure into the thread-piece; it will not loosen in service.

Cadmium plating: These unions are furnished with black end-pieces and cadmium plated union ring or are cadmium plated all over. The parts are plated inside and outside after being machined and before being assembled. Cadmium plating offers excellent resistance to atmospheric corrosion (rust) and is a permanent and effective lubricant.

AAR design: In design and dimensions, the No. 250 H and No. 253 H Unions sizes ¼ to 3-inch comply with the specifications of the Association of American Railroads for 300-pound unions.

Identification of seat: Brass to steel seat unions are marked "2000 W.O.G." on the union ring; steel to steel seat unions are marked "3000 W.O.G."

Dimensions, in Inches



No. 250 H
or
No. 252 H

Size		1/8	¼	3/8	½	¾	1	1¼	1½	2	2½	3
End to end	A	1½	1 5/8	1 13/16	1 15/16	2¼	2 7/16	2 13/16	3	3 3/8	4	4 5/16
	B		2¼	2½	2 11/16	3 1/8	3 3/8	3 3/4	3 15/16	4 5/16	5 1/16	5½



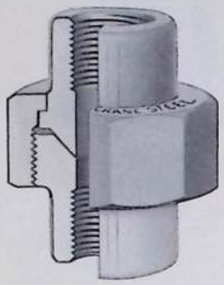
No. 253 H
or
No. 254 H

AAR Forged Steel Unions....page 180 *Thread engagement....page 494*

Forged Steel Ground Joint Unions

6000-Pound W.O.G.

With Steel to Steel Seat and Chromium Plated Thread-Piece



No. 246 X, Female

These are exceptionally heavy, superior quality unions, designed for very high pressure-temperature service. All three parts are forged steel; the thread-piece is chromium plated to prevent seizing and to resist corrosion at the seat and at the joint with the union ring.

The unions can be identified by the marking "6000 W.O.G." on the union ring.

Working Pressures, Non-Shock
(Steam, Water, Oil, Oil Vapor, Gas, or Air)

Temp.	Pounds	Temp.	Pounds
100° F.	6000	600° F.	4620
150	5915	650	4300
200	5830	700	3920
250	5750	750	3550
300	5690	800	3050
350	5625	850	2500
400	5550	900	1750
450	5490	950	1375
500	5210	1000	1000
550	4925	....	....

Tested 300 pounds air-under-water

List Prices and Dimensions



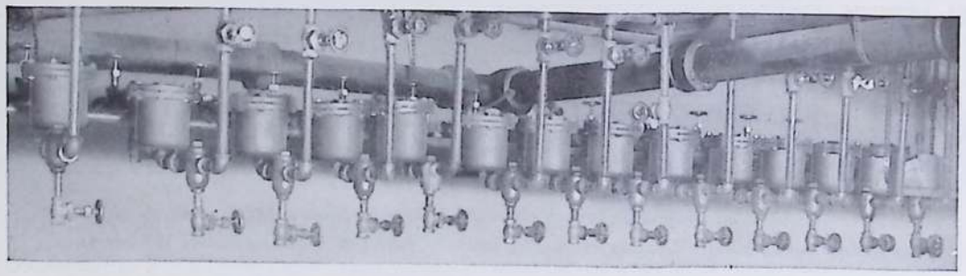
Size	Inches	1/4	3/8	1/2	3/4	1
No. 246 X, Female	Each	4.00	5.00	6.25	8.00	11.50
A—End to end	Inches	2	2 1/8	2 7/16	2 13/16	3 9/16

For larger sizes, use No. 330 D or No. 331 D Flange Unions; page 265.

AAR Forged Steel Unions....page 180

Thread engagement....page 494

Save Material and Labor with Crane Unions and Union Fittings



Photograph of a battery of 13 Crane Inverted Open Float Steam Traps draining condensate from cooking kettles in a candy manufacturing plant.

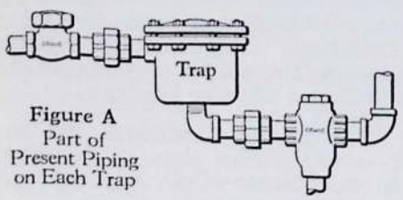


Figure A
Part of Present Piping on Each Trap

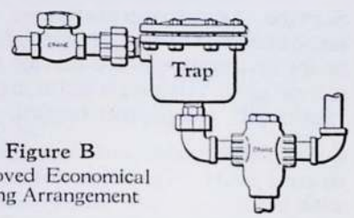


Figure B
Improved Economical Piping Arrangement

Figure "A" illustrates a portion of the piping on each of the traps shown in the photograph. Only female unions are used.

* * * * * * * * *

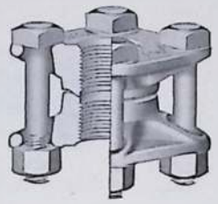
For your convenience, Crane manufactures a complete line of unions and union fittings. Worthwhile savings of labor and material, as illustrated here, can be made through the careful selection of the particular type best suited to the individual installation.

Figure "B" shows an improved and more economical arrangement.

Through the use of a male and female union and a union fitting the installation has been simplified and made compact, providing easy and direct access for removal of the trap. Two nipples, one fitting, and three joints are saved on each trap connection. Using this arrangement on the battery of traps would result in a very substantial saving of time, material, and labor.

Forged Steel Ground Joint Flange Unions

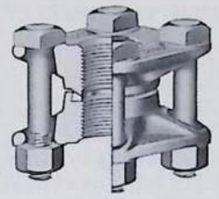
2000-Pound W.O.G.



With Steel to Steel Seat

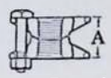
No. 328 D
2000-Pound

No. 340 D
2000-Pound, with Triplex Steel Bolt-Studs threaded full length and fitted with a nut on each end.

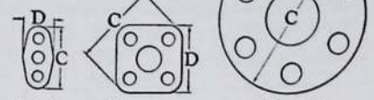


With Brass to Steel Seat

No. 329 D
2000-Pound

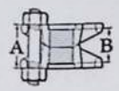


2000-Pound

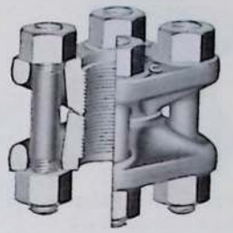


Oval Square Round

6000-Pound W.O.G.



6000-Pound



With Steel to Steel Seat

No. 330 D
6000-Pound, with Cold Rolled Steel Bolt-Studs

No. 331 D
6000-Pound, with Triplex Steel Bolt-Studs threaded full length and fitted with a nut on each end.

List Prices and Dimensions

Size	List Prices			Dimensions, in Inches				Style of flange
Inches	No. 328 D Each	No. 329 D Each	No. 340 D Each	A	C	D	No. & dia. of bolts	
1/4	5.70	6.50	7.00	1 3/4	3 5/8	1 5/8	2-1/2	Oval
3/8	6.00	6.90	7.30	1 7/8	3 13/16	1 3/4	2-1/2	
1/2	6.50	7.40	8.00	2	4	2	2-9/16	
3/4	7.00	8.00	8.80	2 1/8	4 3/4	2 1/4	2-3/4	
1	7.50	8.60	10.00	2 3/8	4 3/4	2 5/8	2-3/4	
1 1/4	8.70	10.00	12.00	2 5/8	5	3 15/16	4-5/8	Square
1 1/2	10.00	11.50	14.00	2 3/4	6	4 11/16	4-5/8	
2	12.00	14.00	16.50	2 3/4	6 1/2	5 1/16	4-3/4	
2 1/2	17.50	20.00	23.00	3 3/8	7 1/2	5 13/16	4-7/8	
3	28.00	32.00	36.00	3 3/8	8 1/4		6-7/8	Round
4	43.00	48.00	53.00	3 5/8	10		8-1	

Size	List Prices		Dimensions, in Inches					Style of flange
Inches	No. 330 D Each	No. 331 D Each	A	B	C	D	No. & dia. of bolts	
1/4	6.85	8.25	2 1/4	1 11/16	3 3/8	2	2-5/8	Oval
3/8	6.85	8.25	2 1/4	1 11/16	3 3/8	2	2-5/8	
1/2	6.85	8.25	2 1/4	1 11/16	3 3/8	2	2-5/8	
3/4	9.00	10.75	2 3/8	1 13/16	3 5/8	3	4-9/16	Square
1	10.00	12.00	2 1/2	2	4 1/2	3 5/8	4-5/8	
1 1/4	11.80	14.00	2 3/4	2 3/16	5 1/4	4 1/4	4-3/4	
1 1/2	14.50	17.50	2 7/8	2 5/16	5 7/8	4 3/4	4-7/8	
2	22.50	27.00	3 11/16	3	6 7/8	5 1/2	4-1 1/8	
2 1/2	35.00		3 15/16	3 1/8	7 13/16	6 1/4	4-1 1/4	
3	71.00		4 5/8	3 7/8	9 1/2		6-1 1/4	Round

Service recommendations: The 2000-Pound Unions are compact, yet amply strong. They are recommended especially for hydraulic lines. In addition, the No. 340 D, having Triplex Steel bolting, are suitable for high pressure-temperature service.

The 6000-Pound Flange Unions are made for the extreme pressures and temperatures encountered in some steam plants and oil refineries, and for very high hydraulic pressures. They are unusually massive and rugged, and they have liberal bolting.

Construction: These unions are forged from a high grade steel, especially selected for its strength and toughness. They have long thread lengths. They will withstand hard usage and repeated dismantling; their ground joints holds pressure easily, and no gasket is required.

Bolting: The No. 328 D and No. 329 D Unions have commercial bolts. The No. 330 D Unions have cold rolled steel bolt-studs.

The Nos. 340 D and 331 D have Triplex Steel bolt-studs, threaded full length and fitted with medium carbon oil-quenched semi-finished hexagon steel nuts. Triplex Steel has excellent physical properties.

Working Pressures

Steam, Water, Oil, Oil Vapor, Gas, or Air

Temperature	Working Pressures—Pounds (Non-Shock)			
	2000-Pound		6000-Pound	
Degrees Fahr.	No. 328 D and No. 329 D	No. 340 D	No. 330 D	No. 331 D
100	2000	2000	6000	6000
150	1980	1980	5915	5915
200	1950	1950	5830	5830
250	1920	1920	5750	5750
300	1900	1900	5690	5690
350	1880	1880	5625	5625
400	1850	1850	5550	5550
450	1830	1830	5490	5490
500	1740	1740	5210	5210
550	....	1640	....	4925
600	....	1550	....	4620
650	....	1440	....	4300
700	....	1320	....	3920
750	....	1190	....	3550
800	....	1020	....	3050
850	....	835	....	2500
900	....	585	....	1750
950	....	460	....	1375
1000	....	335	....	1000

For Forged Steel Tongue and Groove Flange Unions, see page 182.

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Forged Steel Combination Elbows

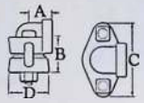


No. 1529, Complete
With Flange, Bolts, and Cranite or Lead Gasket

WORKING PRESSURES
300 pounds steam or oil (500° F.)—300 pounds ammonia
1000 pounds cold water, oil, or gas, non-shock

List Prices and Dimensions

Size	Inches	½	¾	1	1¼
No. 1529, Complete	Each	5.65	6.10	6.85	7.75
A	Inches	1⅛	1 5/16	1 7/16	1¾
B	Inches	1 15/16	2⅛	2⅜	2 11/16
C	Inches	4	4¾	4¾	5¼
D	Inches	2	2¼	2⅝	3
No. and dia. of bolts		2-½	2-⅝	2-⅝	2-⅝




View of Elbow Only

Combination Elbows are furnished complete only.

Strong, compact connections are made conveniently and economically with these elbows. They are ideal where a union angle joint is needed in close quarters and for making meter, small by-pass, and similar connections.

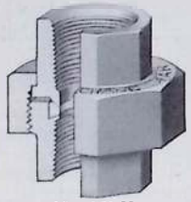
The flange portion is the No. 1547 Tongue Flange on the ½ and ¾-inch sizes and the No. 1582½ Tongue Flange on the 1 and 1¼-inch sizes; see the illustrations shown on page 415.

When used in place of ordinary screwed fittings, the No. 1529 replaces an elbow, a nipple, and a flange, eliminating two joints. When used in place of a flanged elbow, it eliminates one gasket joint. In both cases, the No. 1529 takes up considerably less space.

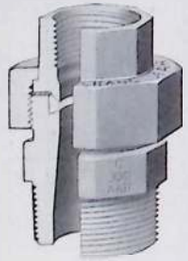
No. 1529 Combination Elbows are regularly furnished with a Cranite gasket; when orders so specify, they will be furnished with a lead gasket at no extra charge.

Extra gaskets . . . . page 416

AAR Forged Steel Unions



No. 950 H
AAR Union



No. 953½ H
AAR Reducing Air Pump Union

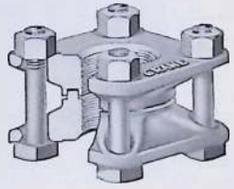
AAR Forged Steel Unions have a brass to steel seat and a ground joint. Refer to page 180.

Supplementing the Crane line of forged steel screwed unions, flange unions, and combination elbows shown in this section are the AAR Forged Steel Unions and Forged Steel Tongue and Groove Flange Unions illustrated in the adjacent columns; for description and prices, refer to pages 180 and 182 respectively.

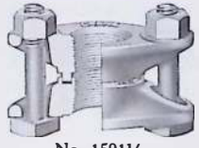
In addition to forged steel, Crane manufactures screwed unions, union fittings, and flange unions in an extensive assortment of metals suitable for a wide variety of services. For prices and description, refer to the following pages:

Malleable Iron Unions and Union Fittings, including Railroad and AAR types. . . . . pages 174 to 180
Malleable Iron and Cast Iron Flange Unions. . . . . page 181
Brass Unions and Union Elbows. . . . . page 187
18-8 Mo Alloy Steel Unions. . page 383
Brass Solder-Joint Unions. . . . page 423
Circulating Boiler Fittings. . . page 145

Forged Steel Tongue and Groove Flange Unions



No. 1589
Flange Union
With Cranite or Lead Gasket



No. 1591½
Flange Union
With Cranite or Lead Gasket

Forged Steel Tongue and Groove Flange Unions with either a Cranite or lead gasket, are described and priced on page 182.

The No. 1591½ is particularly adapted to making pipe coils with close centers.

Cast Steel Flanged Fittings

The Crane line of Cast Steel Flanged Fittings, embracing a wide range of sizes and types in 150, 300, 400, 600, 900, 1500, and 2500-Pound pressure classes, is described in detail on the pages that follow. Special fittings will be made to order; fittings listed in this section include:

90° Elbows	Crosses
90° Long Radius Elbows	45° Laterals
90° Base Elbows	Taper Reducers
45° Elbows	Eccentric Reducers
Tees	Return Bends

Pressure-Temperature Ratings. . . . . page 268
General Description and Tests. . . . . page 269
List Prices
150 and 300-Pound. . . . . page 270
400, 600, 900, and 1500-Pound. . . . . page 271
Dimensions
150 and 300-Pound. . . . . page 272
400, 600, 900, 1500, and 2500-Pound. . . . . page 273
4000-Pound Fittings. . . . . page 274

The Cast Steel Flanged Fittings listed above comprise only a part of the complete line of Crane steel products.

Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

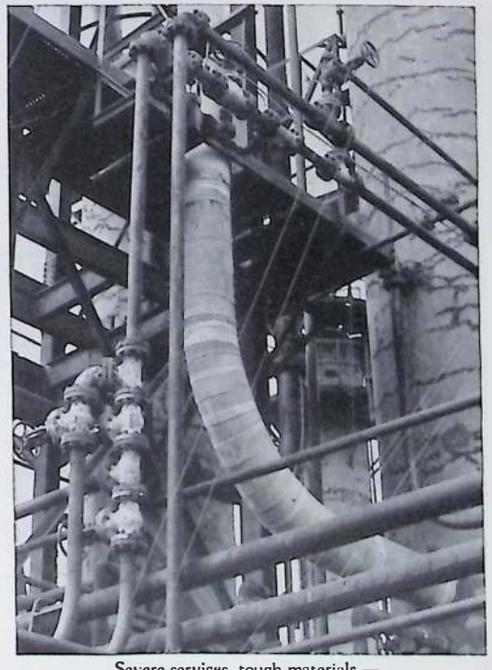
Steel Flanges. . . . . pages 291 to 298
Steel Welding Fittings. . . . . pages 275 to 290
Forged Steel Flange Unions. . . . . page 265
Forged Steel Unions. . . . . pages 263 and 264
Forged Steel Unions, AAR. . . . . page 180

Steel Screwed Fittings. . . . . pages 257 to 262
Steel Couplings. . . . . page 170
Wrought Steel Nipples. . . . . pages 168 and 169
Corrosion-Resistant Products. . . . . pages 375 to 396

Steel Gate Valves. . . . . pages 221 to 234
Steel Globe and Angle Valves. . . . . pages 235 to 248
Steel Check Valves. . . . . pages 249 to 256
Steel Stop-Check Valves. . . . . pages 304 and 305

Steel Safety Valves. . . . . page 324
Steel Relief Valves. . . . . pages 333 and 334
Steel Pressure-Seal Bonnet Valves. . . . . pages 205 to 217
Steel Lip-Seal Bonnet Valves. . . . . pages 218 and 219
Steel Sediment Separators. . . . . page 356

How to read reducing fittings . . . . page 577
Fabricated Piping . . . . pages 497 to 522



Severe services, tough materials —
Crane Steel Valves, Fittings, and Flanges

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Cast Steel Flanged Fittings

Working Pressures, Pounds per Square Inch, Non-Shock
For Fittings Shown on pages 269 to 273

Fluid	Temp. Deg. Fahr.	[1]Flanged Fittings with Standard Facings Other Than Ring Joint: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	Flanged Fittings with Ring Joint Facing: Carbon Steel 150 Lb.	No. 4 Carbon-Molybdenum Alloy Steel: 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Steam, Water, Oil, Oil Vapor, Gas, or Air	100	230	600	800	1200	1800	3000	5000	275	720	960	1440	2160	3600	6000
	150	220	590	785	1180	1770	2950	4915	255	710	945	1420	2130	3550	5915
	200	210	580	770	1160	1740	2900	4830	240	700	930	1400	2100	3500	5830
	250	200	570	760	1140	1710	2850	4750	225	690	920	1380	2070	3450	5750
	300	190	560	740	1120	1680	2800	4660	210	680	910	1365	2050	3415	5690
	350	180	550	725	1095	1645	2740	4565	195	675	900	1350	2025	3375	5625
	400	170	540	710	1075	1615	2690	4475	180	665	890	1330	2000	3330	5550
	450	160	525	700	1050	1580	2630	4380	165	660	875	1320	1975	3295	5490
	500	**150**	500	665	1000	1500	2500	4165	**150**	625	835	1250	1875	3125	5210
	550	140	475	630	950	1420	2370	3950	140	590	790	1180	1775	2955	4925
	600	130	445	590	890	1330	2220	3700	130	555	740	1110	1660	2770	4620
	650	120	415	550	830	1240	2070	3450	120	515	690	1030	1550	2580	4300
	700	110	380	500	760	1140	1900	3160	110	470	635	940	1410	2350	3920
	750	100	360	475	720	1080	1800	2995	100	425	575	850	1275	2125	3550
	800	92	340	450	680	1020	1700	2830	92	375	500	750	1125	1875	3125
	850	82	320	425	640	960	1600	2665	82	350	475	700	1050	1750	2925
	900	[2]70	**300**	**400**	**600**	**900**	**1500**	**2500**	[2]70	325	425	650	975	1625	2700
	950	[2]55	[2]265	[2]350	[2]530	[2]795	[2]1325	[2]2205	[2]55	**300**	**400**	**600**	**900**	**1500**	**2500**
	1000	[2]40	[2]190	[2]250	[2]380	[2]570	[2] 950	[2]1580	[2]40	[2]230	[2]310	[2]470	[2]700	[2]1170	[2]1950
	1050									[2]135	[2]180	[2]270	[2]405	[2] 675	[2]1125
	1100									[2] 90	[2]120	[2]180	[2]270	[2] 450	[2] 750

Fluid	Temp. Deg. Fahr.	[1]Flanged Fittings with Standard Facings Other Than Ring Joint: No. 5 Chrome-Molybdenum Alloy Steel (Made to order) 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	Flanged Fittings with Ring Joint Facing: No. 5 Chrome-Molybdenum Alloy Steel (Made to order) 300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Oil or Oil Vapor	100 to 750	For temperatures up to 900° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Flanged Fittings, above.						For temperatures up to 800° F., these ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Flanged Fittings, above.					
	800							400	525	800	1200	2000	3325
	850							375	500	750	1125	1875	3125
	900	310	410	620	930	1550	2580	350	475	700	1050	1750	2925
	950	**300**	**400**	**600**	**900**	**1500**	**2500**	325	425	650	975	1625	2700
	1000	200	275	400	600	1000	1675	**300**	**400**	**600**	**900**	**1500**	**2500**
	1050	135	180	270	405	675	1125	225	275	425	650	1075	1775
	1100	90	120	180	270	450	750	150	200	275	425	700	1175

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]These ratings apply only to oil or oil vapor service.

Flange facings: Unless otherwise ordered, 150 and 300-Pound Flanged Fittings are furnished with 1/16-inch raised faces, and 400-Pound and higher pressure Flanged Fittings, with 1/4-inch male faces.

Cold service: For temperatures between 0° and 100° F., the ratings for 100° F. apply. For sub-zero service, materials with suitable impact resistance must be used; recommendations on request.

Standards: Crane pressure-temperature ratings agree with those in Supplement No. 1 (ASA B16e6-1949) to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, and those in the American Petroleum Institute (API) Standard No. 600, Second Edition, 1951.

Cast Steel Flanged Fittings



90° Elbow
Straight
No. 525 D, 150-Pound
No. 401 D, 300-Pound
No. 601 D, 400-Pound
No. 845 D, 600-Pound
No. 1245 D, 900-Pound
No. 1545 D, 1500-Pound
Reducing
No. 545 D, 150-Pound
No. 421 D, 300-Pound
No. 621 D, 400-Pound
No. 841 D, 600-Pound
No. 1241 D, 900-Pound
No. 1541 D, 1500-Pound



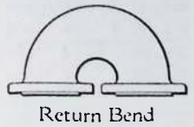
90° Long Radius Elbow
No. 551 D, 150-Pound
No. 427 D, 300-Pound



45° Elbow
No. 527 D, 150-Pound
No. 403 D, 300-Pound
No. 603 D, 400-Pound
No. 846 D, 600-Pound
No. 1246 D, 900-Pound
No. 1546 D, 1500-Pound



90° Base Elbow
With Round Base
No. 550 D, 150-Pound
No. 425½ D, 300-Pound
No. 625 D, 400-Pound
No. 854 D, 600-Pound
No. 1254 D, 900-Pound
No. 1554 D, 1500-Pound



Return Bend
No. 553 D, 150-Pound
No. 429 D, 300-Pound

HYDROSTATIC TEST PRESSURES

Pressure Class	With Facing Other Than Ring Joint	With Ring Joint Facing
150-Pound	350 pounds	425 pounds
300-Pound	900 pounds	1100 pounds
400-Pound	1200 pounds	1450 pounds
600-Pound	1800 pounds	2175 pounds
900-Pound	2700 pounds	3250 pounds
1500-Pound	4500 pounds	5400 pounds

For working pressures, see opposite page.

Crane Cast Steel Flanged Fittings are available in a complete assortment of types and a wide range of straight and reducing sizes. They are made in a variety of materials and with various flange facings, providing fittings for every requirement.

The Crane line includes fittings in the 150, 300, 400, 600, 900, 1500, and 2500-Pound pressure classes. Prices and dimensions are shown on pages 270 to 273 (prices for 2500-Pound on application).

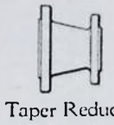
Materials: The 150-Pound Flanged Fittings are regularly made of Crane Carbon Steel. All other fittings are made of Crane No. 4 Carbon-Molybdenum Steel, unless otherwise ordered.

300-Pound and higher fittings of Crane No. 5 Chrome-Molybdenum Steel can be supplied to order; see the Crane Discount Sheet for prices.

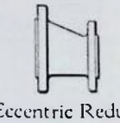
Base elbows: Base elbows have a round base flange, plain faced. The base flange is not drilled unless so ordered. The base is suitable only for support in compression and is not to be installed for service as an anchor or support in tension or shear.

Special fittings: Special Angle Elbows, Base and Anchorage Tees, and other unusual fittings can be made to order; prices on application. Inquiries should be accompanied by drawings.

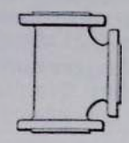
American Standard: Crane Cast Steel Flanged Fittings, with the exception of the fabricated base on 90° Base Elbows, conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class. This Standard does not include Return Bends or ½ and ¾-inch 45° Laterals in the 1500-Pound class.



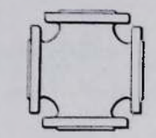
Taper Reducer
No. 547 D, 150-Pound
No. 423 D, 300-Pound
No. 623 D, 400-Pound
No. 853 D, 600-Pound
No. 1253 D, 900-Pound
No. 1553 D, 1500-Pound



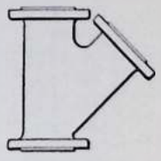
†Eccentric Reducer
No. 548 D, 150-Pound
No. 423½ D, 300-Pound
No. 624 D, 400-Pound
No. 855 D, 600-Pound
No. 1255 D, 900-Pound
No. 1555 D, 1500-Pound



Tee
Straight
No. 534 D, 150-Pound
No. 412 D, 300-Pound
No. 605 D, 400-Pound
No. 847 D, 600-Pound
No. 1247 D, 900-Pound
No. 1547 D, 1500-Pound
Reducing
No. 531 D, 150-Pound
No. 407 D, 300-Pound
No. 607 D, 400-Pound
No. 848 D, 600-Pound
No. 1248 D, 900-Pound
No. 1548 D, 1500-Pound



Cross
Straight
No. 537 D, 150-Pound
No. 413 D, 300-Pound
No. 613 D, 400-Pound
No. 849 D, 600-Pound
No. 1249 D, 900-Pound
No. 1549 D, 1500-Pound
Reducing
No. 539 D, 150-Pound
No. 415 D, 300-Pound
No. 615 D, 400-Pound
No. 850 D, 600-Pound
No. 1250 D, 900-Pound
No. 1550 D, 1500-Pound



45° Lateral
Straight
No. 541 D, 150-Pound
No. 417 D, 300-Pound
No. 617 D, 400-Pound
No. 851 D, 600-Pound
No. 1251 D, 900-Pound
No. 1551 D, 1500-Pound
Reducing
No. 543 D, 150-Pound
No. 419 D, 300-Pound
No. 619 D, 400-Pound
No. 852 D, 600-Pound
No. 1252 D, 900-Pound
No. 1552 D, 1500-Pound

†Eccentric reducers are made to order only; prices on application.

List prices . . pages 270 and 271 *Description of materials . . pages 1 to 9* *Dimensions . . pages 272 and 273*

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Cast Steel Flanged Fittings

Drilling: End flanges are faced, drilled and spot faced, unless otherwise ordered. Prices include drilling to the corresponding pressure class of the American Standard. No deduction is made if fittings are ordered faced only.

Flange facing and finish: 150 and 300-Pound Fittings regularly have an American Standard 1/16-inch raised face on the end flanges; 400, 600, 900, 1500, and 2500-Pound Fittings regularly have a 1/4-inch male face (large male).

Other facings such as ring joint, female, etc., are available when specified. See the Crane Discount Sheet for prices.

Raised and male faces are furnished with concentric grooves (serrated), approximately 32 per inch. A smooth finish can be furnished, when specified; see the Crane Discount Sheet for prices.

Prices of reducing fittings: Prices of Reducing Tees, Crosses, and 45° Laterals apply to any reduction.

Prices of 90° Reducing Elbows and Taper Reducers apply only to the reductions shown in the table at the right; other reductions or reducing sizes are made to order; prices on application.

Reducing fitting prices are governed by the size of the largest opening.

Sizes of Reducing Elbows and Taper Reducers

Size	Pressure Class	
2 ×1 1/2"	150, 300, and 600 Lb.	.....
2 1/2×2		.....
3 ×2 1/2		1500 Lb.
×2		.....
3 1/2×3		.....
4 ×3		.....
×2 1/2		
×2		1500 Lb.
5 ×4		
×3		
6 ×5	400 and 900 Lb.	
×4		
×3		
8 ×6		
×5		
×4		
10 ×8		.....
×6		.....
12 ×10		.....
×8		.....

Catalog numbers, description, and tests....page 269
Taps and drains for flanged fittings..page 578 *Dimensions.....pages 272 and 273*
How to read reducing sizes.....page 577 *Galvanized fittings.....page 476*

List Prices, Each—Faced, Drilled, and Spot Faced
150-Pound Carbon Steel and 300-Pound No. 4 Carbon-Molybdenum Steel Fittings

Pressure Class	Size	Elbows			90° Base Elbows		Tees		Crosses or 45° Laterals		Taper Reducers	Return Bends	
		90° or 45°	90° Reducing (Sizes above)	90° Long Radius	With Base Faced Only	Extra to Drill & Spot Face Base	Straight	Reducing Any reduction	Straight	Reducing Any reduction	(Sizes above)	Size by Center to Center Inches	List Price
	Inches												
150-Pound	1	26.00					39.00		52.00			2×7	47.50
	1 1/4	28.00					41.50	47.00	54.50	61.00		3×7 1/2	60.00
	1 1/2	31.00					44.00	49.50	60.00	67.50		×8	62.00
	2	34.00	41.50	44.00			47.00	52.50	65.00	73.50	34.00	×9	64.00
	2 1/2	39.00	47.00	49.50			52.00	58.50	75.50	86.00	39.00	4×9	80.50
	3	44.00	52.00	57.00			60.00	67.50	86.00	96.00	44.00	×10	84.50
	3 1/2	52.00	62.50	67.50			67.50	77.00	100.00	112.00	52.00	×11	88.00
	4	57.00	67.50	75.50	83.00	7.80	75.50	86.00	110.00	124.00	57.00	×12	91.00
	5	70.00	83.00	101.00	107.00	7.80	96.00	110.00	135.00	151.00	70.00	×13	94.50
	6	86.00	101.00	125.00	130.00	7.80	120.00	135.00	165.00	186.00	86.00	×14	97.50
	8	125.00	146.00	182.00	182.00	15.60	170.00	192.00	240.00	268.00	125.00	×18	114.00
	10	174.00	205.00	240.00	252.00	21.00	235.00	265.00	330.00	374.00	174.00	6×12	134.00
	12	218.00	260.00	300.00	312.00	26.00	285.00	325.00	416.00	473.00	218.00	×15	150.00
	14	280.00		408.00	416.00	31.00	380.00	435.00	535.00	608.00			
	16	365.00		535.00	535.00	39.00	495.00	565.00	690.00	785.00			
	18	468.00		700.00	700.00	39.00	640.00	730.00	885.00	1010.00			
	20	585.00		910.00	910.00	39.00	830.00	950.00	1120.00	1275.00			
	24	925.00		1420.00	1430.00	39.00	1275.00	1455.00	1755.00	2000.00			
300-Pound	1	34.00					50.50		67.50			2×7 1/2	63.50
	1 1/4	37.00					54.00	60.50	71.00	79.50		*3×8 1/2	81.00
	1 1/2	40.50					57.50	64.00	77.50	88.00		* ×12	89.50
	2	44.00	54.00	57.50			60.50	68.50	84.50	95.50	44.00	4×10	110.00
	2 1/2	50.50	60.50	64.00			67.50	76.00	98.00	111.00	50.50	×11	114.00
	*3	57.50	67.50	74.50			77.50	88.00	111.00	125.00	57.50	×11 1/2	116.00
	3 1/2	67.50	81.00	88.00			88.00	100.00	128.00	145.00	67.50	×12	118.00
	4	74.50	88.00	98.00	108.00	10.00	98.00	111.00	142.00	160.00	74.50	×16 1/2	141.00
	5	91.00	108.00	132.00	138.00	10.00	125.00	142.00	172.00	196.00	91.00	×17	143.00
	6	111.00	132.00	162.00	169.00	10.00	155.00	176.00	213.00	241.00	111.00	×17 1/2	146.00
	8	162.00	189.00	236.00	236.00	20.50	219.00	250.00	307.00	348.00	162.00	×18	149.00
	10	226.00	267.00	311.00	327.00	27.00	304.00	344.00	429.00	486.00	226.00	6×14	189.00
	12	284.00	338.00	388.00	405.00	34.00	371.00	422.00	540.00	614.00	284.00	×15	194.00
	14	365.00		530.00	540.00	40.50	496.00	567.00	692.00	790.00		×16 1/2	206.00
	16	473.00		692.00	692.00	50.50	640.00	732.00	894.00	1020.00		×17	209.00
	18	608.00		910.00	910.00	50.50	827.00	945.00	1150.00	1310.00		×18	216.00
	20	760.00		1180.00	1180.00	50.50	1080.00	1230.00	1450.00	1655.00		8×17 1/2	304.00
	24	1200.00		1840.00	1855.00	50.50	1655.00	1890.00	2280.00	2600.00			

*Specify when 3" size with ring joint facing is to be bolted to Cranelap Joints. A groove having a special pitch diameter is required; page 470 for dimensions.

List Prices, Each—Faced, Drilled, and Spot Faced
400, 600, 900, and 1500-Pound No. 4 Carbon-Molybdenum Steel Fittings

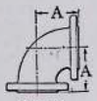
Pressure Class	Size	Elbows		90° Base Elbows		Tees		Crosses or 45° Laterals		Taper Reducers
		90° or 45°	90° Reducing Page 270 For Sizes	With Base Faced Only	Extra to Drill & Spot Face Base	Straight	Reducing Any reduction	Straight	Reducing Any reduction	Page 270 For Sizes
	Inches									
400-Pound	4	105.00	125.00	151.00	13.50	154.00	174.00	213.00	241.00	105.00
	5	135.00	159.00	201.00	13.50	192.00	219.00	267.00	304.00	135.00
	6	162.00	192.00	241.00	13.50	230.00	260.00	317.00	361.00	162.00
	8	243.00	287.00	351.00	27.00	341.00	388.00	476.00	540.00	243.00
	10	338.00	405.00	479.00	36.30	476.00	540.00	662.00	753.00	338.00
	12	450.00	540.00	631.00	44.70	631.00	719.00	878.00	1000.00	450.00
For smaller sizes, use 600-Pound.	14	590.00		840.00	54.00	834.00	948.00	1160.00	1325.00	
	16	776.00		1100.00	67.50	1095.00	1245.00	1525.00	1740.00	
	18	980.00		1385.00	67.50	1380.00	1575.00	1925.00	2195.00	
	20	1250.00		1770.00	67.50	1760.00	2005.00	2455.00	2800.00	
	24	1905.00		2700.00	67.50	2685.00	3065.00	3745.00	4280.00	
600-Pound	1/2	40.50				59.00		82.50		
	3/4	44.00				64.00	72.50	89.50	101.00	
	1	49.00				72.50	82.50	101.00	115.00	
	1 1/4	52.50				77.50	88.00	106.00	120.00	
	1 1/2	57.50				84.50	96.00	116.00	132.00	
	2	64.00	77.50			94.50	106.00	132.00	149.00	64.00
	2 1/2	74.50	89.50			110.00	123.00	152.00	172.00	74.50
	*3	84.50	101.00			125.00	141.00	172.00	196.00	84.50
	3 1/2	98.00	118.00			145.00	164.00	203.00	230.00	98.00
*Specify when 3" size with ring joint facing is to be bolted to Cranelap Joints. A groove having a special pitch diameter is required; page 470 for dimensions.	4	115.00	138.00	169.00	16.20	172.00	196.00	240.00	272.00	115.00
	5	161.00	194.00	246.00	16.20	244.00	278.00	339.00	386.00	161.00
	6	206.00	248.00	314.00	16.20	307.00	351.00	425.00	483.00	206.00
	8	300.00	361.00	445.00	32.00	457.00	521.00	635.00	722.00	300.00
	10	473.00	567.00	665.00	44.00	705.00	803.00	986.00	1125.00	473.00
	12	614.00	736.00	857.00	54.00	932.00	1065.00	1300.00	1480.00	614.00
	14	780.00		1065.00	64.00	1170.00	1335.00	1625.00	1855.00	
	16	1095.00		1500.00	81.00	1635.00	1870.00	2280.00	2600.00	
	18	1370.00		Prices on application		1930.00	2200.00	2695.00	3070.00	
	20	1750.00				2460.00	2805.00	3440.00	3920.00	
	24	2670.00				3755.00	4290.00	5245.00	5990.00	
900-Pound	3	130.00				206.00	234.00	287.00	325.00	
	4	197.00	237.00	296.00	22.00	308.00	350.00	427.00	485.00	197.00
	5	283.00	339.00	425.00	22.00	445.00	507.00	613.00	697.00	283.00
	6	365.00	438.00	548.00	22.00	566.00	642.00	785.00	891.00	365.00
	8	646.00	777.00	956.00	44.00	1005.00	1145.00	1390.00	1585.00	646.00
	10	960.00	1155.00	1360.00	58.50	1515.00	1725.00	2095.00	2385.00	960.00
	12	1315.00	1575.00	1845.00	73.00	2060.00	2345.00	2865.00	3265.00	1315.00
For smaller sizes, use 1500-Pound.	14	1645.00		2265.00	87.50	2575.00	2925.00	3560.00	4050.00	
	16	2135.00		2920.00	110.00	3350.00	3805.00	4635.00	5275.00	
	18	2665.00		Prices on application		3755.00	4280.00	5240.00	5980.00	
	20	3400.00				4790.00	5455.00	6695.00	7630.00	
	24	5195.00				7300.00	8350.00	10210.00	11660.00	
1500-Pound	1/2	65.50				96.00		130.00		
	3/4	70.00				105.00	119.00	138.00	157.00	
	1	77.00				118.00	136.00	157.00	178.00	
	1 1/4	84.00				130.00	147.00	180.00	206.00	
	1 1/2	94.50				145.00	164.00	200.00	230.00	
	2	112.00	136.00			173.00	196.00	238.00	270.00	112.00
	2 1/2	137.00	164.00			215.00	243.00	297.00	337.00	137.00
	3	209.00	252.00			332.00	380.00	458.00	514.00	209.00
	4	316.00	380.00	472.00	35.00	493.00	560.00	683.00	770.00	316.00
	5	453.00	547.00	678.00	35.00	720.00	818.00	982.00	1120.00	453.00
	6	584.00	700.00	880.00	35.00	907.00	1030.00	1260.00	1425.00	584.00
	8	1035.00	1240.00	1535.00	70.00	1615.00	1845.00	2225.00	2525.00	1035.00
	10	1540.00		2185.00	93.50	2425.00	2760.00	3350.00	3835.00	
	12	2105.00		2950.00	117.00	3305.00	3765.00	4585.00	5235.00	
	14	2640.00		3645.00	140.00	4160.00	4720.00	5750.00	6545.00	

Prices of 2500-Pound Flanged Fittings furnished on application.

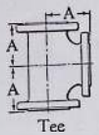
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Cast Steel Flanged Fittings

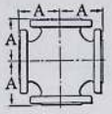
Dimensions, in Inches



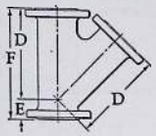
90° Elbow



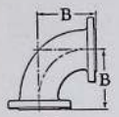
Tee



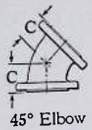
Cross



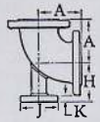
45° Lateral



90° Long Radius Elbow



45° Elbow



90° Base Elbow



Taper Reducer



Return Bend

Class	Size	A	B	C	D	E	F	G	H	J	K
150 Pound	1	3½	5	1¾	5¾	1¾	7½				
	1¼	3¾	5½	2	6¼	1¾	8				
	1½	4	6	2¼	7	2	9				
	2	4½	6½	2½	8	2½	10½	5			
	2½	5	7	3	9½	2½	12	5½			
	3	5½	7¾	3	10	3	13	6			
	3½	6	8½	3½	11½	3	14½	6½			
	4	6½	9	4	12	3	15	7	5½	6	11/16
	5	7½	10¼	4½	13½	3½	17	8	6¼	7	13/16
	6	8	11½	5	14½	3½	18	9	7	7	15/16
	8	9	14	5½	17½	4½	22	11	8⅜	9	⅞
	10	11	16½	6½	20½	5	25½	12	9¾	9	⅞
	12	12	19	7½	24½	5½	30	14	11¼	11	15/16
	14	14	21½	7½	27	6	33		12½	11	15/16
	16	15	24	8	30	6½	36½		13¾	11	15/16
	18	16½	26½	8½	32	7	39		15	13½	1 1/16
	20	18	29	9½	35	8	43		16	13½	1 1/16
	24	22	34	11	40½	9	49½		18½	13½	1 1/16
300 Pound	1	4	5	2¼	6½	2	8½				
	1¼	4¼	5½	2½	7¼	2¼	9½				
	1½	4½	6	2¾	8½	2½	11				
	2	5	6½	3	9	2½	11½	5			
	2½	5½	7	3½	10½	2½	13	5½			
	3	6	7¾	3½	11	3	14	6			
	3½	6½	8½	4	12½	3	15½	6½			
	4	7	9	4½	13½	3	16½	7	6	6½	13/16
	5	8	10¼	5	15	3½	18½	8	6¾	7½	15/16
	6	8½	11½	5½	17½	4	21½	9	7½	7½	15/16
	8	10	14	6	20½	5	25½	11	9	10	1 3/16
	10	11½	16½	7	24	5½	29½	12	10½	10	1 3/16
	12	13	19	8	27½	6	33½	14	12	12½	1⅜
	14	15	21½	8½	31	6½	37½		13½	12½	1⅜
	16	16½	24	9½	34½	7½	42		14¾	12½	1⅜
	18	18	26½	10	37½	8	45½		16¼	15	1 9/16
	20	19½	29	10½	40½	8½	49		17⅞	15	1 9/16
	24	22½	34	12	47½	10	57½		20¾	17½	1 13/16

Drilling of Base on 90° Base Elbow

Size Elbow	150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.
	Diameter of Bolt Circle					
4	4¾	5	5	5⅞	5⅞	7⅞
5	5½	5⅞	5⅞	7⅞	7⅞	7⅞
6	5½	5⅞	5⅞	7⅞	7⅞	10⅝
8	7½	7⅞	7⅞	10⅝	10⅝	10⅝
10	7½	7⅞	7⅞	10⅝	10⅝	13
12	9½	10⅝	10⅝	13	13	13
14	9½	10⅝	10⅝	13	13	15¼
16	9½	10⅝	10⅝	13	13	
18	11¾	13	13			
20	11¾	13	13			
24	11¾	15¼	15¼			
	Diameter of Bolts					
4	⅝	⅝	⅝	¾	¾	¾
5	⅝	¾	¾	¾	¾	¾
6	⅝	¾	¾	¾	¾	¾
8	⅝	¾	¾	¾	¾	¾
10	⅝	¾	¾	¾	¾	⅞
12	¾	¾	¾	⅞	⅞	⅞
14	¾	¾	¾	⅞	⅞	1
16	¾	¾	¾	⅞	⅞	
18	¾	⅞	⅞			
20	¾	⅞	⅞			
24	¾	1	1			
	Number of Bolts					
All sizes	4	4	4	4	4	4

90° Base Elbows are regularly furnished with the base flange plain faced. When drilling is ordered, the base flange will be drilled (unless otherwise specified) to the corresponding pressure class of the American Standard, as indicated above, and spot faced. Extra list prices apply; see pages 270 and 271.

Return Bends		Size	2	3				4							6		
150 Pound	L		7	7½	8	9	9	10	11	12	13	14	18	12	15		
	M		6	7	7¼	7¾	8⅝	9⅛	9⅝	10⅛	10⅝	11⅛	13⅛	11¼	12¾		
	Size		2	3				4						6			8
300 Pound	L		7½	8½	12	10	11	11½	12	16½	17	17½	18	14	15	16½	17	18	17½
	M		6⅝	8	9¾	9⅝	10⅛	10⅜	10⅝	12⅞	13⅛	13⅜	13⅝	13	13½	14¼	14½	15	16

Dimensions, in Inches (Cont.)

Class	Size	A	C	D	E	F	G	H	J	K
400 Pound	4	8	5½	16	4½	20½	8¼	6	6½	13/16
	5	9	6	16¾	5	21¾	9¼	6¾	7½	15/16
	6	9¾	6¼	18¾	5¼	24	10	7½	7½	15/16
	8	11¾	6¾	22¼	5¾	28	12	9	10	1 3/16
	10	13¼	7¾	25¾	6¼	32	13½	10½	10	1 3/16
	12	15	8¾	29¾	6½	36¼	15¼	12	12½	1⅜
	14	16¼	9¼	32¾	7	39¾		13½	12½	1⅜
	16	17¾	10¼	36¼	8	44¼		14¾	12½	1⅜
	18	19¼	10¾	39¼	8½	47¾		16¼	15	1 9/16
	20	20¾	11¼	42¾	9	51¾		17⅞	15	1 9/16
	24	24¼	12¾	50¼	10½	60¾		20¾	17½	1 13/16
600 Pound	½	3¼	2	5¾	1¾	7½				
	¾	3¾	2½	6¾	2	8¾				
	1	4¼	2½	7¼	2¼	9½				
	1¼	4½	2¾	8	2½	10½				
	1½	4¾	3	9	2¾	11¾				
	2	5¾	4¼	10¼	3½	13¾	6			
	2½	6½	4½	11½	3½	15	6¾			
	3	7	5	12¾	4	16¾	7¼			
	3½	7½	5½	14	4½	18½	7¾			
	4	8½	6	16½	4½	21	8¾	7	7½	15/16
	5	10	7	19½	6	25½	10¼	8¼	10	1 3/16
	6	11	7½	21	6½	27½	11¼	9	10	1 3/16
	8	13	8½	24½	7	31½	13¼	11	12½	1⅜
	10	15½	9½	29½	8	37½	15¾	12½	12½	1⅜
	12	16½	10	31½	8½	40	16¾	13¼	15	1 9/16
	14	17½	10¾	34¼	9	43¼		14¾	15	1 9/16
	16	19½	11¾	38½	10	48½		16	15	1 9/16
	18	21½	12¼	42	10½	52½		Dimensions on application		
	20	23½	13	45½	11	56½				
	24	27½	14¾	53	13	66				
900 Pound	3	7½	5½	14½	4½	19				
	4	9	6½	17½	5½	23	9¼	7	7½	15/16
	5	11	7½	21	6½	27½	11¼	8¼	10	1 3/16
	6	12	8	22½	6½	29	12¼	9	10	1 3/16
	8	14½	9	27½	7½	35	14¾	11	12½	1⅜
	10	16½	10	31½	8½	40	16¾	12½	12½	1⅜
	12	19	11	34½	9	43½	17¾	13¼	15	1 9/16
	14	20¼	11½	36½	9½	46		14¾	15	1 9/16
	16	22¼	12½	40¾	10½	51¼		16	15	1 9/16
	18	24	13¼	45½	12	57½		Dimensions on application		
	20	26	14½	50¼	13	63¼				
	24	30½	18	60	15½	75½				
1500 Pound	½	4¼	3							
	¾	4½	3¼							
	1	5	3½	9	2½	11½				
	1¼	5½	4	10	3	13				
	1½	6	4¼	11	3½	14½				
	2	7¼	4¾	13¼	4	17¼	7¼			
	2½	8¼	5¼	15¼	4½	19¾	8¼			
	3	9¼	5¾	17¼	5	22¼	9¼			
	4	10¾	7¼	19¼	6	25¼	10¾	7¾	10	1 3/16
	5	13¼	8¾	23¼	7½	30¾	13¾	9¾	12½	1⅜
	6	13⅞	9⅞	24⅞	8⅛	33	14½	11½	12½	1⅜
	8	16⅜	10⅞	29⅞	9⅛	39	17	13¾	15	1 9/16
	10	19½	12	36	10¼	46¼		15½	15	1 9/16
	12	22¼	13¼	40¾	12	56½		17¼	17½	1 13/16
	14	24¾	14¼	44	12½	56½				
	16	27¼	16¼	48¼	14¾	63				
	18	30¼	17¾	53¼	16½	69¾				
	20	32¾	18¾	57¾	17¾	75½				
	24	38¼	20¾	67¼	20½	87¾				

Class	Size	A	C	D	E	F	G
2500 Pound	½	5 3/16					
	¾	5⅜					
	1	6 1/16	4				
	1¼	6⅞	4¼				
	1½	7 9/16	4¾				
	2	8⅞	5¾	15¼	5¼	20½	9½
	2½	10	6¼	17¼	5¾	23	10½
	3	11⅜	7¼	19¾	6¾	26½	11¾
	4	13¼	8½	23	7¾	30¾	13½
	5	15⅝	10	27¼	9¼	36½	15¾
	6	18	11½	31¼	10½	41¾	18
	8	20⅛	12¾	35¼	11¾	47	20½
	10	25	16	43¼	14¾	58	25½
	12	28	17¾	49¼	16¼	65½	29

Center to Face

The 150 and 300-Pound Fittings are regularly furnished with an American Standard 1/16-inch raised face on the end flanges; the 400, 600, 900, 1500, and 2500-Pound Fittings regularly have a 1/4-inch high large male facing. Center to face and face to face dimensions include the facing.

Special Angle Elbows

The center to face dimensions of 45° elbows are used for special angle elbows of 1° to 45°; for angles greater than 45° and up to 90°, use the center to face dimensions of 90° elbows.

Reducing Fittings

Center to face dimensions of reducing fittings correspond to those of straight fittings of the same size as the largest opening.

American Standard

Crane Cast Steel Flanged Fittings, with the exception of the fabricated base on 90° Base Elbows, conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective working pressures.

The American Standard does not include Return Bends or ½ and ¾-inch 45° Laterals in the 1500-Pound pressure class.

Working pressures ..... page 268
List prices ..... pages 270 and 271
Description ..... page 269
Drilling templates ... pages 461 to 463
Flange dimensions ... pages 461 to 463
Special facings ..... pages 468 to 471

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4000-Pound Pressure Class



90° Elbow



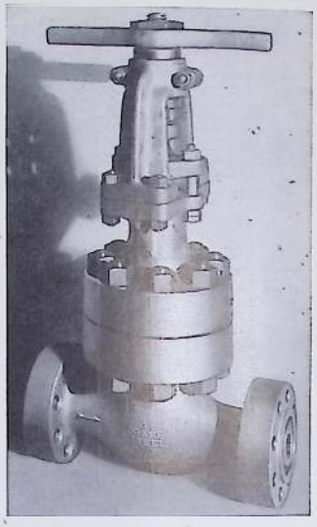
Tee

For pressures and temperatures beyond the scope of the 1500 and 2500-Pound Pressure Classes, Crane is equipped to supply valves, fittings, and flanges in the 4000-Pound Pressure Class.

These products are generally made of Crane No. 5 Chrome-Molybdenum Alloy Cast Steel, and finished with ring joint facing. When so desired, they can be supplied in other alloys, such as Crane No. 4 Carbon-Molybdenum Alloy Cast Steel, or furnished with other types of facings.

Inquiries should be accompanied by complete specifications including operating pressures and temperatures, and plans of proposed installation.

Prices, description, dimensions, and complete information furnished on application.



Globe Valve

The illustrations on this page are actual photographs of Crane Valves and Fittings with flanged ends and ring joint facing supplied for a 4000-Pound installation. They are made of Crane No. 5 Chrome-Molybdenum Alloy Cast Steel, and are recommended for operating service at 4000 pounds pressure at 900° F. temperature.



Group of Fittings for 4000-Pound Pressure Class

Steel Welding Fittings

Socket-Welding Fittings
Description and Ratings . . . . . pages 276 and 278
List Prices . . . . . pages 277 and 278
Dimensions . . . . . pages 278 and 279
Reducer Inserts, List Prices and Dimensions . . . . . page 278

Butt-Welding Fittings
For Use with Standard Pipe . . . . . pages 280 and 281
For Use with Extra Strong Pipe . . . . . pages 282 and 283
For Use with Schedule 160 Pipe . . . . . page 284
For Use with Double Extra Strong Pipe . . . . . page 284
Reducers, Welding Saddles, and Welding Sleeves . . . page 285
Dimensions . . . . . page 286
Pressure-Temperature Ratings . . . . . pages 288 and 289

Bonney WeldOlets . . . . . page 287

Boiler Flanges . . . . . page 290

The Crane line of Steel Welding Fittings — comprising two types, socket-welding and butt-welding — includes all of the popular kinds of fittings in a wide range of sizes, and in all regular, commercially available weights.

Wherever the user of welding fittings demands easy installation — wherever maintenance costs are carefully considered — wherever quality, completeness, and adaptability are of prime importance — Crane Steel Welding Fittings are chosen.

Socket-Welding Fittings: Forged Steel Socket-Welding Fittings (see pages 276 to 279) are ideal when welding fittings are wanted for use in small pipe lines.

The fittings are of high quality throughout; they are forged solid from high grade steel or are machined from bar stock, depending upon the type of fitting; the openings are drilled and the ends are bored to slip over pipe.

Butt-Welding Fittings: Butt-Welding Fittings (see pages 280 to 286), recommended for general all-around welding service, are designed to combine serviceability with ease of installation; the use of these fittings reduces the welder's task to its simplest form — that of making circumferential butt-welds. The materials from which the fittings are made are especially selected to assure strength, resistance to piping strains and temperature, and easy weldability.

Crane Steel Butt-Welding Fittings are fully as strong as, or stronger than, Grade A Seamless Steel Pipe of corresponding thickness. They can be used for any pressure or temperature for which the pipe is used, with equal safety; see pages 288 and 289.

The fittings have a uniform circular section of full diameter, uniform center to end dimensions, and accurately beveled, true, round ends.

Other welding end products: Crane supplies a complete welding line—not the fittings only! Real advantages accrue to the user by being able to secure welding valves and other accessories for welded piping, as well as fittings and flanges, from one reliable source—and all of the highest quality. A uniformly satisfactory installation is within reach when Crane welding materials are used.

Forged Steel Flanges—Welding Neck, Slip-On Welding, and Cranelap (for use with Cranelap Stub Ends) —are available in a full range of sizes in all pressure classes; see pages 291 to 298. Steel Gate, Globe, Angle, and Check Valves with welding ends also are available in a complete range of sizes and in all pressure classes; see pages 205 to 256.

In addition, Crane Fabricating Shops are unusually well equipped, as explained in Section 41, to supply pre-fabricated piping, assembled in units for final erection with a minimum of field effort.

American Standard: Crane Steel Butt-Welding Fittings conform to the American Standard for Steel Butt-Welding Fittings, B16.9-1951. This Standard includes the following types of fittings in sizes 1 to 24-inch inclusive:

90° Elbows, Long Radius
45° Elbows, Long Radius
Tees . . The Standard includes dimensions for the center to end of run on all sizes up to 24-inch, and the center to the end of outlet on all sizes up to 12-inch.
Caps
Return Bends, Long Radius
Reducers . The Standard does not include sizes 3 x 1, 4 x 1¼, 4 x 1, 6 x 2, 8 x 3, and 10 x 3-inch.
Lapped Joint Stub Ends (Cranelap Stub Ends)

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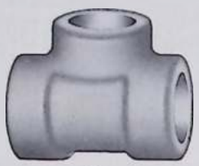
Forged Steel Socket-Welding Fittings

2000, 3000, 4000, and 6000-Pound W.O.G.

For list prices, see the opposite page.



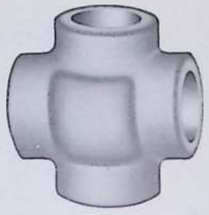
90° Elbow
No. 1240, 2000-Lb. WOG
No. 1380, 3000-Lb. WOG
No. 1460, 4000-Lb. WOG
No. 1660, 6000-Lb. WOG



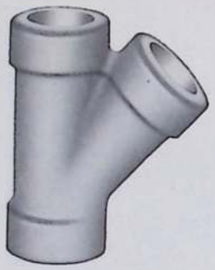
Tee
No. 1241, 2000-Lb. WOG
No. 1381, 3000-Lb. WOG
No. 1461, 4000-Lb. WOG
No. 1661, 6000-Lb. WOG



45° Elbow
No. 1242, 2000-Lb. WOG
No. 1382, 3000-Lb. WOG
No. 1462, 4000-Lb. WOG
No. 1662, 6000-Lb. WOG



Cross
No. 1243, 2000-Lb. WOG
No. 1383, 3000-Lb. WOG
No. 1463, 4000-Lb. WOG
No. 1663, 6000-Lb. WOG



45° Y-Bend
No. 1245, 2000-Lb. WOG
No. 1385, 3000-Lb. WOG
No. 1465, 4000-Lb. WOG
No. 1665, 6000-Lb. WOG



Coupling
No. 1246, 2000-Lb. WOG
No. 1386, 3000-Lb. WOG
No. 1466, 4000-Lb. WOG
No. 1666, 6000-Lb. WOG



Reducer
No. 1247, 2000-Lb. WOG
No. 1387, 3000-Lb. WOG
No. 1467, 4000-Lb. WOG
No. 1667, 6000-Lb. WOG



Cap
No. 1249, 2000-Lb. WOG
No. 1389, 3000-Lb. WOG
No. 1469, 4000-Lb. WOG
No. 1669, 6000-Lb. WOG

2000-Pound W.O.G. Fittings are for use with Schedule 40 or Standard Pipe.
3000-Pound W.O.G. Fittings are for use with Schedule 80 or Extra Strong Pipe.
4000-Pound W.O.G. Fittings are for use with Schedule 160 Pipe.
6000-Pound W.O.G. Fittings are for use with Double Extra Strong Pipe.

These unusually rugged, durable fittings are ideally suited for small (up to and including 4-inch size) welded lines on relatively low pressure service, or for high pressure hydraulic lines and high pressure-temperature service.

Design and construction: Elbows, tees, crosses, and Y-bends are forged solid; reducer inserts (illustrated on page 278), couplings, reducers, and caps are machined from solid steel. All openings are drilled, and the ends are bored to slip over pipe.

Elbows, tees, crosses, and Y-bends have each opening reinforced with a wide band. It completely surrounds the socket chamber, extending well beyond the back of the socket, and complies with recognized requirements for socket weld dimensions.

WORKING PRESSURES
Pounds, Non-Shock
For Steam, Water, Oil, Oil Vapor, Gas, or Air

Temp.	Carbon Steel Fittings				Carbon-Molybdenum Steel Fittings			
Deg. F.	2000 Pound W.O.G.	3000 Pound W.O.G.	4000 Pound W.O.G.	6000 Pound W.O.G.	2000 Pound W.O.G.	3000 Pound W.O.G.	4000 Pound W.O.G.	6000 Pound W.O.G.
100	2000	3000	4000	6000	2000	3000	4000	6000
150	1980	2960	3960	5915	1980	2960	3960	5915
200	1950	2920	3890	5830	1950	2920	3890	5830
250	1920	2880	3840	5750	1920	2880	3840	5750
300	1900	2840	3800	5690	1900	2840	3800	5690
350	1880	2820	3760	5625	1880	2820	3760	5625
400	1850	2780	3700	5550	1850	2780	3700	5550
450	1830	2740	3660	5490	1830	2740	3660	5490
500	1740	2600	3480	5210	1740	2600	3480	5210
550	1640	2460	3290	4925	1640	2460	3290	4925
600	1550	2310	3090	4620	1550	2310	3090	4620
650	1440	2150	2880	4300	1440	2150	2880	4300
700	1320	1960	2620	3920	1320	1960	2620	3920
750	1190	1775	2370	3550	1190	1775	2370	3550
800	1020	1525	2040	3050	1045	1560	2090	3125
850	835	1250	1670	2500	975	1460	1950	2925
900	585	875	1170	1750	900	1350	1800	2700
950	460	690	920	1375	835	1250	1670	2500
1000	335	500	665	1000	650	975	1300	1950

Materials: The fittings are made from high grade carbon steel, having unusual strength and toughness. It is particularly suitable for fusion welding.

American Standard: These fittings conform to the American Standard for Steel Socket-Welding Fittings (B16.11-1946). This Standard includes elbows, tees, crosses, and couplings in sizes ⅛ to 3 inches for use with Schedule 40 and 80 Pipe and in sizes ½ to 3 inches for use with Schedule 160 Pipe.

The Standard specifies that the fittings may be used for the same pressure-temperature ratings as the pipe of the indicated schedule number.

Reducer Inserts . . . page 278 *Dimensions . . . page 279*

Forged Steel Socket-Welding Fittings

2000, 3000, 4000, and 6000-Pound W.O.G.

List Prices, Each—Carbon Steel Fittings
For working pressures and description, see the opposite page.

Type of Fittings	Size Inches	90° Elbows No. 1240	Tees No. 1241	45° Elbows No. 1242	Crosses No. 1243	45° Y-Bends No. 1245	Couplings No. 1246	Reducers No. 1247	Caps No. 1249
2000-Pound W.O.G. Fittings *For use with Schedule 40 or Standard Pipe*	⅛	.55	.80	.68	1.10		.40		.35
	¼	.55	.80	.68	1.10	1.40	.40	.55	.35
	⅜	.55	.80	.68	1.10	1.85	.40	.55	.35
	½	.65	.95	.78	1.30	2.00	.40	.70	.45
	¾	.75	1.10	.90	1.50	2.50	.45	1.00	.65
	1	.90	1.35	1.08	1.90	3.00	.55	1.20	.90
	1¼	1.20	1.75	1.44	2.80	3.75	.70	1.35	1.00
	1½	1.50	2.30	1.80	3.50	4.75	.85	1.60	1.30
	2	1.90	2.90	2.28	5.00	5.80	1.15	1.85	2.00
	2½	2.90	4.40	3.48	7.30		1.60	2.75	3.65
	3	5.00	7.50	6.00	10.00		2.75	3.75	4.35
	4	12.50	17.00	14.00	23.00		4.80	6.75	13.00
	Size Inches	No. 1380	No. 1381	No. 1382	No. 1383	No. 1385	No. 1386	No. 1387	No. 1389
3000-Pound W.O.G. Fittings *For use with Schedule 80 or Extra Strong Pipe*	¼	.55	.80	.68	1.10	1.40	.40	.55	.35
	⅜	.55	.80	.68	1.10	1.85	.40	.55	.35
	½	.65	.95	.78	1.30	2.00	.40	.70	.45
	¾	.75	1.10	.90	1.50	2.50	.45	1.00	.65
	1	.90	1.35	1.08	1.90	3.00	.55	1.20	.90
	1¼	1.20	1.75	1.44	2.80	3.75	.70	1.35	1.00
	1½	1.50	2.30	1.80	3.50	4.75	.85	1.60	1.30
	2	1.90	2.90	2.28	5.00	5.80	1.15	1.85	2.00
	2½	2.90	4.40	3.48	7.30		1.60	2.75	3.65
	3	5.00	7.50	6.00	10.00		2.75	3.75	4.35
	4	12.50	17.00	14.00	23.00		4.80	6.75	13.00
	Size Inches	No. 1460	No. 1461	No. 1462	No. 1463	No. 1465	No. 1466	No. 1467	No. 1469
4000-Pound W.O.G. Fittings *For use with Schedule 160 Pipe*	½	.75	1.10	.90	1.50	2.50	.60	.90	.65
	¾	.90	1.35	1.08	1.90	3.00	.65	1.25	.90
	1	1.20	1.75	1.44	2.80	3.75	.85	1.50	1.00
	1¼	1.50	2.30	1.80	3.50	4.75	1.05	1.70	1.30
	1½	1.90	2.90	2.28	5.00	5.80	1.30	2.10	2.00
	2	2.90	4.40	3.48	7.30		1.75	2.50	3.65
	2½	5.00	7.50	6.00	10.00		2.40	3.60	4.35
	3	12.50	17.00	14.00	23.00		4.75	5.75	5.45
	4	18.00	25.00	21.00	31.50		10.90	11.75	18.00
	Size Inches	No. 1660	No. 1661	No. 1662	No. 1663	No. 1665	No. 1666	No. 1667	No. 1669
6000-Pound W.O.G. Fittings *For use with Double Extra Strong Pipe*	⅜*	.65	.95	.78	1.30	2.00	.60	.75	.45
	½	.75	1.10	.90	1.50	2.50	.60	.90	.65
	¾	.90	1.35	1.08	1.90	3.00	.65	1.25	.90
	1	1.20	1.75	1.44	2.80	3.75	.85	1.50	1.00
	1¼	1.50	2.30	1.80	3.50	4.75	1.05	1.70	1.30
	1½	1.90	2.90	2.28	5.00	5.80	1.30	2.10	2.00
	2	2.90	4.40	3.48	7.30		1.75	2.50	3.65
	2½	5.00	7.50	6.00	10.00		2.40	3.60	4.35
	3	12.50	17.00	14.00	23.00		4.75	5.75	5.45
	4	18.00	25.00	21.00	31.50		10.90	11.75	18.00

*⅜ inch 6000-Pound W.O.G. Fittings are bored for pipe having an I.D. of .187" and a wall thickness of .244".

Reducing fittings: Reducing fittings can be made in any reduction from straight size forging blanks; see the Crane Discount Sheet for prices.

Alloy steel fittings: Fittings of Carbon-Molybdenum Steel or of stainless steel, Type 347, can be made to order; prices are furnished on application.

Sleeve and half couplings: Couplings, unless otherwise ordered, are the socket-end type listed above.

Sleeve couplings, made without the internal shoulder, and half couplings can be furnished when ordered; they use the same list prices as regular couplings. See the Crane Discount Sheet for prices.

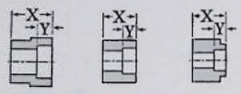
Reducer Inserts . . . page 278 *Dimensions . . . page 279*

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Steel Socket-Welding Reducer Inserts

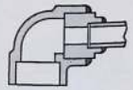


Reducer Insert
No. 1250
For use with Standard or Schedule 40 Pipe
No. 1390
For use with Extra Strong or Schedule 80 Pipe



Type No. 1 Type No. 2 Type No. 3

Socket-Welding Reducer Inserts serve the same purpose as threaded bushings used with screwed fittings. They simplify the problem of making reductions in the sizes of pipe in socket-welded lines and avoid the delays and extra costs involved in procuring reducing fittings. By carrying an assorted stock of Reducer Inserts, the user can make up many combinations of reducing sizes in any type of fitting in the least amount of time and at low cost.



Illustrating the application of a Socket-Welding Reducer Insert to a Socket-Welding 90° Elbow.

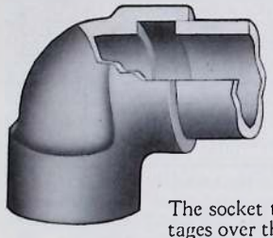
The illustration at the right shows one of these fittings inserted in a straight size 90° elbow to make a reducing size. The Insert is placed in the end of the fitting and fillet welded; the smaller size pipe is then inserted in the smaller pipe end of the Reducer Insert and welded.

Reducer Inserts are available in 1, 1¼, 1½, and 2-inch sizes, the No. 1250 being made for use with Standard or Schedule 40 Pipe and the No. 1390 being made for use with Extra Strong or Schedule 80 Pipe. Regularly supplied of Carbon Steel, they can be furnished made of Carbon-Molybdenum Steel; prices on application. The fittings are made in three types, depending on the size, as illustrated above.

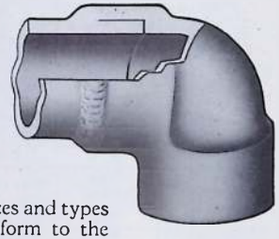
List Prices, Carbon Steel, and Dimensions

Size Inches	List Prices, Each No. 1250	List Prices, Each No. 1390	Dimensions, in Inches Type No.	X	Y
1 ×¾	.45	.45	1	1½	9/16
×½			2	15/16	½
1¼×1	.55	.55	1	1 11/16	5/8
×¾			2	1⅜	9/16
×½			3	1⅜	½
1½×1¼	.70	.70	1	1⅞	11/16
×1			2	1 7/16	5/8
×¾			3	1 7/16	9/16
×½			3	1 7/16	½
2 ×1½	1.10	1.10	2	1 9/16	¾
×1¼			3	1 9/16	11/16
×1			3	1 9/16	5/8
×¾			3	1 9/16	9/16
×½			3	1 9/16	½

Advantages of Steel Socket-Welding Fittings



On installations where the pipe need not butt against the shoulder, the socket compensates for inaccuracies in measuring and cutting the pipe.



On installations where the pipe must butt against the shoulder, free, uninterrupted flow is assured. Fitting and pipe have the same inside diameter.

The socket type weld has advantages over the butt weld that recommend it strongly for fittings for small size pipe lines. The pipe used with it does not require beveling.

Since the pipe end slips into, and is supported by the socket, the joint is self-aligning; tack welding and special clamps to line up and hold the joint are unnecessary. Because the weld metal is deposited on the outer surface of the pipe, there is no danger of forming welding icicles which would clog the line and restrict flow.

These fittings have the same inside diameter as Standard or Schedule 40, Extra Strong or Schedule 80, Schedule 160, or Double Extra Strong Pipe, depending upon the weight of fitting ordered. On installations where the pipe is butted against the shoulder at the back of the socket, the fittings permit free, uninterrupted flow of the fluid in the line.

The fittings, in the sizes and types covered therein, conform to the American Standard, A.S.A. B16.11–1946, as explained on page 276. The bore diameter of the socket is the same for all fittings regardless of the pressure class.

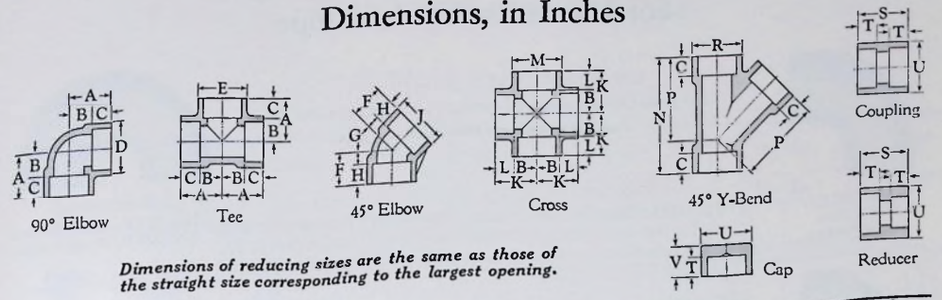
Forged Steel Socket-Welding Fittings have ample metal sections throughout; the long, low band forming the socket wall extends beyond the shoulder at the back of the bore, leaving no weak corner. Exhaustive tests show conclusively that the fittings are as strong as, or stronger than, pipe.

Being only slightly larger than pipe, the fittings, when welded in place, make an exceptionally neat appearing, workmanlike installation.

Size of Fitting	Bore Diameter of Socket (Minimum)
⅛"	0.420"
¼	0.555
⅜	0.690
½	0.855
¾	1.065
1	1.330
1¼	1.675
1½	1.915
2	2.406
2½	2.906
3	3.535
4	4.545

Forged Steel Socket-Welding Fittings

Dimensions, in Inches



Dimensions of reducing sizes are the same as those of the straight size corresponding to the largest opening.

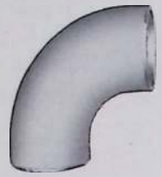
Size	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
2000-Pound W.O.G. Fittings, for use with Schedule 40 or Standard Pipe																			
⅛	13/16	7/16	⅜	15/16	⅞	11/16	5/16	⅜	15/16	31/32	17/32	1				1	⅜	¾	5/8
¼	13/16	7/16	⅜	15/16	⅞	11/16	5/16	7/16	1 1/32	31/32	17/32	1	2 5/16	1⅝	13/16	1	⅜	¾	5/8
⅜	31/32	17/32	7/16	1 1/32	1 1/32	¾	5/16	7/16	1 1/32	31/32	7/16	1	2 11/16	1⅞	1	1 1/8	7/16	1	11/16
½	1⅛	⅝	½	15/16	15/16	⅞	7/16	7/16	1 5/16	1⅛	½	1 15/16	3	2⅛	1¼	1⅜	½	1¼	¾
¾	15/16	¾	9/16	1½	1½	1	½	½	1½	1 15/16	9/16	1½	3 9/16	2 9/16	1½	1½	9/16	1½	1 13/16
1	1½	⅞	⅝	1 13/16	1 13/16	1⅛	9/16	9/16	1 13/16	1½	⅝	1 13/16	4⅛	3	1 13/16	1¾	⅝	1¾	1
1¼	1¾	1 1/16	1 1/16	2 7/32	2 7/32	1 5/16	11/16	⅝	2 7/32	1¾	1 1/16	2 3/16	4 13/16	3½	2 3/16	1⅞	11/16	2¼	1 1/16
1½	2	1¼	¾	2 15/32	2 15/32	17/16	13/16	⅝	2 15/32	2	¾	2 7/16	5⅜	3 15/16	2 7/16	2	¾	2½	1 13/16
2	2⅜	1½	⅞	3	3	1 11/16	1	1 1/16	3	2⅜	⅞	2 31/32	6 7/16	4¾	2 31/32	2½	⅞	3	1⅜
2½	3	1⅝	1⅜	3⅝	3⅝	2 1/16	1⅛	1 5/16	4	3¼	1⅝	4				2½	⅞	3⅝	1½
3	3⅜	2¼	1⅛	4 5/16	4 5/16	2½	1¼	1¼	4⅝	3⅜	1⅛	4⅝				2¾	1	4⅛	1⅝
4	4 3/16	2⅝	1 9/16	5¾	5¾	3⅛	1⅝	1½	5¾	4 3/16	1 9/16	5¾				3	1⅛	5¼	1⅞
3000-Pound W.O.G. Fittings, for use with Schedule 80 or Extra Strong Pipe																			
¼	13/16	7/16	⅜	29/32	29/32	¾	5/16	7/16	1 1/32	31/32	17/32	1	2 5/16	1⅝	13/16	1	⅜	⅞	11/16
⅜	31/32	17/32	7/16	1 1/32	1 1/32	¾	5/16	7/16	1 1/32	31/32	7/16	1	2 11/16	1⅞	1	1⅛	7/16	1	¾
½	1⅛	⅝	½	1 5/16	1 5/16	⅞	7/16	7/16	1 5/16	1⅛	½	1 15/16	3	2⅛	1¼	1⅜	½	1¼	⅞
¾	15/16	¾	9/16	1½	1½	1	½	½	1½	1 15/16	9/16	1½	3 9/16	2 9/16	1½	1½	9/16	1½	1
1	1½	⅞	⅝	1 13/16	1 13/16	1⅛	9/16	9/16	1 13/16	1½	⅝	1 13/16	4⅛	3	1 13/16	1¾	⅝	1¾	1 1/16
1¼	1¾	1 1/16	1 1/16	2 7/32	2 7/32	1 5/16	11/16	⅝	2 7/32	1¾	1 1/16	2 3/16	4 13/16	3½	2 3/16	1⅞	11/16	2¼	1 3/16
1½	2	1¼	¾	2 15/32	2 15/32	17/16	13/16	⅝	2 15/32	2	¾	2 7/16	5⅜	3 15/16	2 7/16	2	¾	2½	1 11/16
2	2⅜	1½	⅞	3	3	1 11/16	1	1 1/16	3	2⅜	⅞	2 31/32	6 7/16	4¾	2 31/32	2½	⅞	3	1⅜
2½	3	1⅝	1⅜	3⅝	3⅝	2 1/16	1⅛	1 5/16	4	3¼	1⅝	4				2½	⅞	3⅝	1½
3	3⅜	2¼	1⅛	4 5/16	4 5/16	2½	1¼	1¼	4⅝	3⅜	1⅛	4⅝				2¾	1	4⅛	1⅝
4	4 3/16	2⅝	1 9/16	5¾	5¾	3⅛	1⅝	1½	5¾	4 3/16	1 9/16	5¾				3	1⅛	5½	1⅞
4000-Pound W.O.G. Fittings, for use with Schedule 160 Pipe																			
½	15/16	¾	9/16	1½	1½	1	½	½	1½	1 15/16	9/16	1½	3 9/16	2 9/16	1½	1⅜	½	1½	⅞
¾	1½	⅞	⅝	1 13/16	1 13/16	1⅛	9/16	9/16	1 13/16	1½	⅝	1 13/16	4⅛	3	1 13/16	1½	⅝	1¾	1 5/16
1	1¾	1 1/16	1 1/16	2 3/16	2 3/16	1 5/16	11/16	⅝	2 3/16	1¾	1 1/16	2 3/16	4 13/16	3½	2 3/16	1¾	⅝	2 1/16	1 3/16
1¼	2	1¼	¾	2 7/16	2 7/16	1 11/32	13/16	17/32	2 7/16	2	¾	2 7/16	5⅜	3 15/16	2 7/16	1⅞	11/16	2½	1 3/16
1½	2⅜	1½	⅞	2 31/32	2 31/32	1 11/16	1	1 1/16	2 31/32	2⅜	⅞	2 31/32	6 7/16	4¾	2 31/32	2	¾	3	1⅜
2	2½	1⅝	⅞	3 5/16	3 5/16	1 23/32	1⅛	1 9/32	3 5/16	2½	⅞	3 5/16				2½	⅞	4⅛	1⅝
2½	3¼	2¼	1	4	4	2 1/16	1¼	1 13/16	4	3¼	1	4				2¾	1	4⅝	1¾
3	3¾	2½	1¼	4¾	4¾	2½	1⅜	1⅛	4⅝	3⅜	⅞	4⅝				3	1⅛	6	2
4	4 3/16	2⅝	1 9/16	5¾	5¾	3⅛	1⅝	1½	5¾	4 3/16	1 9/16	5¾							
6000-Pound W.O.G. Fittings, for use with Double Extra Strong Pipe																			
⅜	1⅛	17/32	19/32	15/16	15/16	⅞	⅜	½	15/16	1⅛	19/32	15/16	3	2⅛	1¼	1⅛	7/16	15/16	15/16
½	15/16	⅝	11/16	1½	1½	1	⅜	⅝	1½	15/16	11/16	1½	3 9/16	2 9/16	1½	1⅜	½	1½	1
¾	1½	¾	¾	1 13/16	1 13/16	1⅛	7/16	11/16	2 3/16	1½	¾	1 13/16	4⅛	3	1 13/16	1½	9/16	1¾	1 1/16
1	1¾	⅞	⅞	2 3/16	2 3/16	1 5/16	½	13/16	2 3/16	1¾	⅞	2 3/16	4 13/16	3½	2 3/16	1¾	⅝	2 1/16	1 1/4
1¼	2	1 11/16	1 5/16	2 7/16	2 7/16	1 11/32	⅝	13/16	2 7/16	2	15/16	2 7/16	5⅜	3 15/16	2 7/16	1⅞	11/16	2½	1 5/16
1½	2⅜	1¼	1⅛	2 31/32	2 31/32	1 11/16	19/32	1 3/32	2 31/32	2⅜	1⅛	2 31/32	6 7/16	4¾	2 31/32	2	¾	3	1⅜
2	2½	1½	1	3 5/16	3 5/16	1 23/32	⅞	27/32	3 5/16	2½	1	3 5/16				2½	⅞	3⅝	1⅝
2½	3¼	1¾	1½	4	4	2 1/16	1	1 1/16	4	3¼	1½	4				2½	⅞	4¼	1⅝
3	3¾	2⅛	1⅝	4¾	4¾	2½	1¼	1¼	4⅝	3⅜	1¼	4⅝				2¾	1	5	1⅞
4	4½	2⅝	1⅞	6	6	3⅛	1⅝	1½	5¾	4 3/16	1 9/16	5¾				3	1⅛	6¼	2⅛

Description, prices, and ratings....pages 276 to 278

Reducer Inserts....page 278

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 161 of 314
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asbestosclaims.law/library/21276/161

Steel Butt-Welding Fittings
For Use With Standard Pipe



No. 352 E
90° Elbow
Long Radius

27



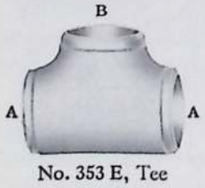
No. 331 E
90° Elbow
Short Radius



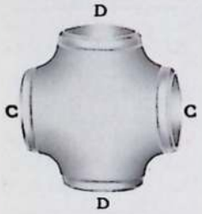
No. 335 E
90° Long Radius Elbow
with Long Tangent
On One End



No. 354 E
45° Long Radius Elbow



No. 353 E, Tee



No. 336 E, Cross

For pressure-temperature ratings, see pages 288 and 289.
For list prices, see the following page.

Thickness: Standard fittings in sizes 12-inch and smaller are made for use with Standard pipe (the heaviest weight on 8, 10, and 12-inch sizes); and in sizes 14-inch and larger, for use with O.D. pipe ⅜-inch thick.

Materials: Unless otherwise specified, butt-welding fittings will be Carbon Steel, Grade A variety, conforming to A.S.T.M. Specification A-234.

Butt-welding fittings made of Grade B Carbon Steel, genuine wrought iron, stainless steel, or other materials can be furnished when ordered; prices on application.

American Standard: These fittings, in the sizes and types included in the Standard, conform to the American Standard for Steel Butt-Welding Fittings, B16.9-1951; see page 275.

90° Elbow with long tangent: The No. 335 E 90° Long Radius Elbows have a long tangent on one end to permit welding on a slip-on welding flange. That end is not beveled; the other end is beveled.

Cranelap Stub Ends: Cranelap Stub Ends, made of Grade A Seamless Steel Pipe lapped to the full thickness of the pipe wall, and Cranelap Flanges (see page 294) afford an ideal method of installing flanged equipment in a welded line. The swivel flange eliminates the difficulty of aligning bolt holes and permits installing the equipment at any angle.



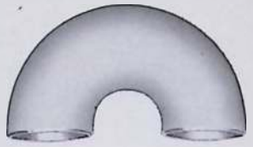
No. 357 E
Cap

Shaped Nipples: Shaped Nipples eliminate the use of templates when saddling one pipe upon another; they save time and assure an accurate fit. Both ends are beveled for welding. When ordering, be sure to specify nominal size of header on which Nipple will be used.

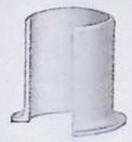
List of Sizes of Reducing Fittings
(List prices, shown on the following page, apply only to these sizes.)

No. 352 E 90° Elbows				No. 353 E, Tees						No. 336 E, Crosses					
A	B	A	B	A	B	A	B	A	B	C	D	C	D	C	D
2	×1½	5	×4	1	×¾	3	×2½	6	×5	14×12	2	×1½	4×3½	8	×6
	×1¼		×3½	1¼	×1		×2		×4	×10		×1¼	×3		×5
	×1		×3		×¾		×1½		×3½	×8		×1	×2½		×4
2½	×2		×2½	1½	×1¼		×1¼		×3	×6		×¾	×2		×3½
	×1½	6	×5		×1	3½	×3	8	×6	16×14	2½	×1½	×1½	10×8	
	×1¼		×4		×¾		×2½		×5	×12		×1¼	5×4		×6
3	×2½		×3½	2	×1½	4	×3½		×4	×10		×1	×3½		×5
	×2		×3		×1¼		×3		×3½	×8	3	×2½	×3		×4
	×1½	8	×6		×1			10×8		18×16		×2	×2½	12×10	
3½	×3		×5		×¾				×6	×14		×1½	6×5		×8
	×2½		×4	2½	×1½				×5	×12	3½	×2½	×4		×6
	×2	10	×8		×1¼				×4	×10		×2	×3½		×5
4	×3½		×6		×1			12×10		20×18		×1½	×3		
	×3		×5						×8	×16	4	×3½	×2½		
	×2½	12	×10						×6	×14		×3			
	×2		×8						×5	×12		×2½			
			×6							24×20		×2			
										×18					
										×16					

General description . . . . page 275 *Dimensions . . . . page 286*



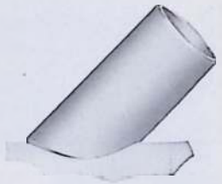
Return Bend
No. 372 E, Short Radius
No. 373 E, Long Radius



No. 574
Cranelap Stub End



No. 350 E
Shaped Nipple
90° Type



No. 351 E
Shaped Nipple
45° Type



Reducer
See page 285



No. 374 E
Backing Ring
Nub Type

Steel Butt-Welding Fittings
For Use With Standard Pipe

List Prices, Each, Standard

Size of Pipe	90° Elbows				45° Elbows	Tees		Crosses		Caps
	No. 352 E Long Radius		No. 331E Short Radius	No. 335 E With Long Tangent One End	No. 354 E Long Radius	No. 353 E		No. 336 E		No. 357 E
Inches	Straight	*Reducing				Straight	*Reducing	Straight	*Reducing	
¾	1.00				.90	2.15				
1	1.20		1.20		1.08	2.15	2.70			1.70
1¼	1.40		1.40		1.26	2.90	3.60			1.70
1½	1.70		1.70	3.00	1.53	3.65	4.55			1.70
2	2.10	3.60	2.10	3.70	1.90	5.00	6.25	7.50	9.40	1.85
2½	3.40	5.80	3.40	5.95	3.05	7.30	9.10	10.95	13.65	2.00
3	4.90	8.35	4.90	8.60	4.40	9.50	11.85	14.25	17.80	2.40
3½	6.35	10.80	6.35	11.10	5.70	12.50	15.60	18.75	23.40	3.20
4	7.65	13.00	7.65	13.40	6.90	13.00	16.25	19.50	24.40	3.70
5	10.85	18.45	10.85	19.00	9.80	24.00	30.00	36.00	45.00	4.90
6	15.80	25.30	15.80	27.65	14.25	28.00	35.00	42.00	52.50	5.95
8	30.00	48.00	30.00	52.50	27.00	45.00	56.25	67.50	84.40	10.10
10	53.40	85.45	53.40	93.45	48.00	76.00	95.00	114.00	142.50	14.60
12	80.70	129.10	80.70	141.25	72.75	110.00	137.50	165.00	206.25	20.85
14	120.00		120.00	Prices above do not include Flange.	108.00	165.00	165.00			24.00
16	175.00		175.00		158.00	200.00	200.00			28.00
18	235.00		235.00		212.00	245.00	245.00			32.00
20	270.00		270.00		245.00	295.00	295.00			35.50
24	340.00		340.00		315.00	380.00	380.00			41.75

Size of Pipe	Return Bends				Cranelap Stub Ends	Shaped Nipples			Backing Rings	
	No. 372 E Short Radius		No. 373 E Long Radius		No. 574	Shaped to Fit Headers (Nominal Sizes)	No. 350 E 90° Type	No. 351E 45° Type	Number of Nubs	No. 374 E Nub Type
Inches	Center to center	List Price	Center to center	List Price						
¾			2¼"	2.20	3.55					
1	2"	2.65	3	2.65	3.55				3	.16
1¼	2½	3.10	3¾	3.10	4.00				3	.17
1½	3	3.75	4½	3.75	4.45				3	.18
2	4	4.65	6	4.65	5.75	2 to 16"	.95	1.05	3	.19
2½	5	7.50	7½	7.50	6.50	2½ to 16	1.20	1.35	3	.22
3	6	10.80	9	10.80	7.30	3 to 20	1.50	1.80	3	.24
3½	7	14.00	10½	14.00	8.10	3½ to 20	1.85	2.30	4	.26
4	8	17.00	12	17.00	9.30	4 to 24	2.20	2.75	4	.29
5	10	23.90	15	23.90	10.75	5 to 24	3.70	4.70	5	.33
6	12	34.80	18	34.80	12.75	6 to 24	4.50	6.00	6	.40
8	16	66.00	24	66.00	16.00	8 to 24	7.50	10.25	8	.53
10	20	117.50	30	117.50	22.75	10 to 24	12.00	17.00	8	.61
12	24	177.50	36	177.50	30.75	12 to 24	15.75	23.00	9	.66
14	28	264.00	42	264.00	53.00					
16	30	385.00	48	385.00	72.00					
18	33	517.00	54	517.00	92.00					
20	41	594.00	60	594.00	113.00					
24	44	748.00	72	748.00	138.00					

***Reducing fittings:** The prices of Reducing 90° Elbows, Tees, and Crosses shown above apply only to the list of sizes shown in the table on the opposite page. The price is determined by the size of the largest opening. When ordering reducing tees and crosses, specify the size of openings in the sequence of the letters shown on the illustrations in the lower left hand corner of the preceding page.

General description . . . pages 275 and 280 *Dimensions . . . . page 286*

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Steel Butt-Welding Fittings
For Use With Extra Strong Pipe



No. 452 E
90° Elbow
Long Radius

27



No. 431 E
90° Elbow
Short Radius



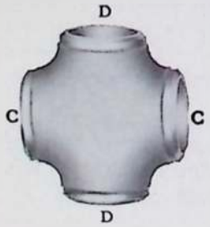
No. 458 E
90° Long Radius Elbow
with Long Tangent
On One End



No. 454 E
45° Long Radius Elbow



No. 453 E, Tee



No. 436 E, Cross

For pressure-temperature ratings, see pages 288 and 289.
For list prices, see the following page.

Thickness: Extra Strong fittings in sizes 12-inch and smaller are made for use with Extra Strong pipe; and in sizes 14-inch and larger, for use with O.D. pipe ½-inch thick.

Materials: Unless otherwise specified, butt-welding fittings will be Carbon Steel, Grade A variety, conforming to A.S.T.M. Specification A-234.

Butt-Welding fittings made of Grade B Carbon Steel, genuine wrought iron, stainless steel, or other materials can be furnished when ordered; prices on application.

American Standard: These fittings, in the sizes and types included in the Standard, conform to the American Standard for Steel Butt-Welding Fittings, B16.9-1951; see page 275.

90° Elbow with long tangent: The No. 458 E 90° Long Radius Elbows have a long tangent on one end to permit welding on a slip-on welding flange. That end is not beveled; the other end is beveled.

Cranelap Stub Ends: Cranelap Stub Ends, made of Grade A Seamless Steel Pipe lapped to the full thickness of the pipe wall, and Cranelap Flanges (see page 294) afford an ideal method of installing flanged equipment in a welded line. The swivel flange eliminates the difficulty of aligning bolt holes and permits installing the equipment at any angle. Cranelap Stub Ends can be made to order of heavier than Extra Strong Pipe; prices on application.



No. 457 E
Cap

Shaped Nipples: Shaped Nipples eliminate the use of templates when saddling one pipe upon another; they save time and assure an accurate fit. Both ends are beveled for welding. When ordering, be sure to specify nominal size of header on which Nipple will be used.

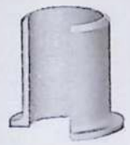
List of Sizes of Reducing Fittings
(List prices, shown on the following page, apply only to these sizes.)

No. 452 E 90° Elbows				No. 453 E, Tees								No. 436 E, Crosses					
A	B	A	B	A	B	A	B	A	B	A	B	C	D	C	D	C	D
2	×1½	5	×4	1	×¾	3	×2½	6	×5	14	×12	2	×1½	4	×3½	8	×6
	×1¼		×3½	1¼	×1		×2		×4		×10		×1¼		×3		×5
	×1		×3		×¾		×1½		×3½		×8		×1		×2½		×4
2½	×2		×2½	1½	×1¼		×1¼		×3		×6		×¾		×2		×3½
	×1½	6	×5		×1	3½	×3		×2½	16	×14	2½	×2		×1½	10	×8
	×1¼		×4		×¾		×2½	8	×6		×12		×1½	5	×4		×6
3	×2½		×3½	2	×1½		×2		×5		×10		×1¼		×3½		×5
	×2	8	×6		×1¼		×1½		×4		×8		×1		×3		×4
	×1½		×5		×1	4	×3½		×3½	18	×16	3	×2½		×2½	12	×10
3½	×3		×4		×¾		×3	10	×8		×14		×2		×2		×8
	×2½	10	×8	2½	×2		×2½		×6		×12	3½	×1½	6	×5		×6
	×2		×6		×1½		×2		×5		×10		×1¼		×4		×5
4	×3½		×5		×1¼	5	×4	12	×10	20	×18				×3½		
	×3	12	×10		×1		×3½		×8		×16				×3		
	×2½		×8				×3		×6		×14				×2½		
	×2		×6				×2½		×5		×12						
							×2			24	×20						
											×18						
											×16						

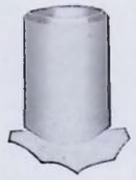
General description . . . . page 275 *Dimensions . . . . page 286*



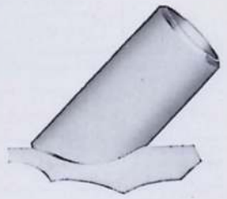
Return Bend
No. 472 E, Short Radius
No. 473 E, Long Radius



No. 497 E
Cranelap Stub End



No. 450 E
Shaped Nipple
90° Type



No. 451 E
Shaped Nipple
45° Type



Reducer
See page 285



No. 474 E
Backing Ring
Nub Type

Steel Butt-Welding Fittings
For Use With Extra Strong Pipe

List Prices, Each, Extra Strong

Size of Pipe	90° Elbows				45° Elbows	Tees		Crosses		Caps
	No. 452 E Long Radius		No. 431 E Short Radius	No. 458 E With Long Tangent One End	No. 454 E Long Radius	No. 453 E		No. 436 E		No. 457 E
Inches	Straight	*Reducing				Straight	*Reducing	Straight	*Reducing	
¾	1.50				1.35	2.15				
1	1.50				1.35	2.15	2.70			2.10
1¼	1.75				1.60	2.90	3.60			2.10
1½	2.15		2.15	3.90	1.95	3.65	4.55			2.10
2	2.65	4.50	2.65	4.65	2.40	5.00	6.25	7.50	9.40	2.25
2½	4.25	7.20	4.25	7.45	3.80	7.30	9.10	10.95	13.65	2.50
3	6.15	10.45	6.15	10.80	5.55	12.00	15.00	18.00	22.50	3.30
3½	7.95	13.50	7.95	14.00	7.15	16.00	20.00	24.00	30.00	4.25
4	9.55	16.25	9.55	16.70	8.60	17.00	21.25	25.50	31.90	4.90
5	13.55	23.05	13.55	23.70	12.20	30.00	37.50	45.00	56.25	5.85
6	19.75	31.60	19.75	34.50	17.80	35.00	43.75	52.50	65.65	7.50
8	37.50	60.00	37.50	65.50	33.75	58.00	72.50	87.00	108.75	12.20
10	67.00	107.20	67.00	117.00	60.50	97.00	120.00	145.00	180.00	18.50
12	101.00	161.60	101.00	177.00	91.00	135.00	168.00	202.50	252.00	25.00
14	150.00		150.00	Prices above do not include Flange.	135.00	205.00	205.00			30.00
16	219.00		219.00		197.00	255.00	255.00			34.50
18	294.00		294.00		265.00	320.00	320.00			38.50
20	340.00		340.00		310.00	355.00	355.00			45.00
24	410.00		410.00		370.00	490.00	490.00			49.00

Size of Pipe	Return Bends				Cranelap Stub Ends	Shaped Nipples			Backing Rings	
	No. 472 E Short Radius		No. 473 E Long Radius		No. 497 E	Shaped to Fit Headers (Nominal Sizes)	No. 450 E 90° Type	No. 451 E 45° Type	Number of Nubs	No. 474 E Nub Type
Inches	Center to center	List Price	Center to center	List Price						
¾					3.80					
1			3"	3.30	3.80				3	.19
1¼	2½"	3.85	3¾	3.85	4.25				3	.20
1½	3	4.75	4½	4.75	4.70				3	.21
2	4	5.85	6	5.85	6.25	2 to 10"	1.25	1.40	3	.22
2½	5	9.35	7½	9.35	7.15	2½ to 16	1.70	1.95	3	.26
3	6	13.55	9	13.55	8.25	3 to 20	2.25	2.65	3	.29
3½	7	17.60	10½	17.60	9.40	3½ to 20	2.50	3.10	4	.32
4	8	21.00	12	21.00	10.90	4 to 24	2.75	3.50	4	.34
5	10	29.70	15	29.70	13.50	5 to 24	5.00	6.40	5	.40
6	12	43.50	18	43.50	16.35	6 to 24	6.75	9.00	6	.48
8	16	82.50	24	82.50	24.00	8 to 24	11.50	15.50	8	.63
10	20	147.40	30	147.40	35.75	10 to 24	18.50	26.00	8	.73
12	24	222.20	36	222.20	48.75	12 to 24	23.50	35.00	9	.79
14	28	330.00	42	330.00	72.00					
16	30	482.00	48	482.00	93.00					
18	33	647.00	54	647.00	114.00					
20	41	748.00	60	748.00	136.00					
24	44	902.00	72	902.00	162.00					

***Reducing fittings:** The prices of Reducing 90° Elbows, Tees, and Crosses shown above apply only to the list of sizes shown in the table on the opposite page. The price is determined by the size of the largest opening. When ordering reducing tees and crosses, specify the size of openings in the sequence of the letters shown on the illustrations in the lower left hand corner of the preceding page.

General description . . . . pages 275 and 282 *Dimensions . . . . page 286*

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Steel Butt-Welding Fittings

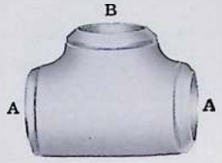
For Use With Schedule 160 or Double Extra Strong Pipe



90° Long Radius Elbow
No. 552 E, Schedule 160
No. 652 E, Double Extra Strong



45° Long Radius Elbow
No. 554 E, Schedule 160
No. 654 E, Double Extra Strong



Tee
No. 553 E, Schedule 160
No. 653 E, Double Extra Strong

List Prices, Each

Size of Pipe Inches	Schedule 160				Double Extra Strong			
	No. 552 E 90° Elbows Long Radius	No. 554 E 45° Elbows Long Radius	No. 553 E Tees		No. 652 E 90° Elbows Long Radius	No. 654 E 45° Elbows Long Radius	No. 653 E Tees	
			Straight	*Reducing			Straight	*Reducing
1	4.00	4.00	5.00	5.00	4.50	4.50	7.00	7.00
1¼	5.00	4.50	6.00	6.00	5.50	5.00	9.00	9.00
1½	6.00	5.50	7.00	7.00	6.50	6.00	11.00	11.00
2	7.00	6.50	10.00	10.00	8.00	7.50	15.00	15.00
2½	11.00	10.00	20.00	20.00	13.00	12.00	22.00	22.00
3	16.00	14.50	35.00	35.00	18.50	17.00	60.00	60.00
4	27.00	24.50	60.00	60.00	29.00	26.00	85.00	85.00
5	38.00	35.50	110.00	110.00	41.00	37.00	150.00	150.00
6	57.00	52.00	126.00	126.00	60.00	54.00	175.00	175.00
8	125.00	113.00	240.00	240.00	125.00	113.00	240.00	240.00
10	190.00	171.00	420.00	420.00				
12	280.00	252.00	620.00	620.00				

Thickness: Schedule 160 Fittings are for use with Schedule 160 Pipe; Double Extra Strong Fittings are for use with Double Extra Strong Pipe. Fittings made for pipe thicknesses other than listed here or on the preceding four pages can be furnished when ordered; prices on application.

Materials: These fittings are regularly made of Grade A Carbon Steel. Fittings made of Grade B Carbon Steel or of other materials can be furnished when ordered; prices on application.

***Reducing Tees:** The prices of reducing tees shown above apply only to the list of sizes shown in the table at the right. The price is determined by the size of the largest opening. When ordering reducing tees, specify the size of openings in the sequence of the letters shown on the illustration above.

American Standard: These fittings, in the sizes and types included in the Standard, conform to the American Standard for Steel Butt-Welding Fittings, B16.9-1951; see page 275.

List of Sizes of Reducing Tees
(List prices shown above apply only to these sizes.)

No. 553 E Schedule 160 A	No. 553 E Schedule 160 B	No. 653 E Double Extra Strong A	No. 653 E Double Extra Strong B
1	×¾	1	×¾
1¼	×1	1¼	×1
	×¾		×¾
1½	×1¼	1½	×1¼
	×1		×1
	×¾		×¾
2½	×1½	2½	×1½
	×1¼		×1¼
	×1		×1
3	×2½	3	×2½
	×2		×2
	×1½		×1½
	×1¼		×1¼
4	×3	4	×3
	×2½		×2½
	×2		×2
	×1½		×1½
5	×4	4	×3
	×3		×2½
	×2½		×2
	×2		×1½
6	×5	5	×4
	×4		×3
	×3		×2½
	×2½		×2
8	×6	6	×5
	×5		×4
	×4		×3
10	×8		×2½
	×6	8	×6
	×5		×5
	×4		×4
12	×10	10	×8
	×8		×6
	×6		×5
	×5	12	×10

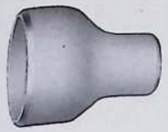
General description . . . . page 275

Dimensions . . . page 286

Steel Butt-Welding Reducers

For Use With Standard or Extra Strong Pipe

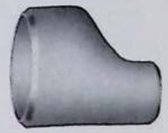
For pressure-temperature ratings, see pages 288 and 289.



Concentric Reducer
No. 359 E Standard
No. 459 E Extra Strong

Standard Reducers in sizes 12-inch and smaller are made for use with Standard pipe (heaviest weight on 8, 10, and 12" sizes); and in sizes 14-inch and larger, for use with O.D. pipe ⅜-inch thick. Extra Strong Reducers in sizes 12-inch and smaller are made for use with Extra Strong pipe; and in sizes 14-inch and larger, for use with O.D. pipe ½-inch thick.

In the sizes covered by the Standard, these reducers conform to the American Standard for Steel Butt-Welding Fittings, B16.9-1951.



Eccentric Reducer
No. 360 E Standard
No. 460 E Extra Strong

List Prices

Size of Pipe In.	Price, Each Concentric or Eccentric Standard	Extra Strong	Size of Pipe In.	Price, Each Concentric or Eccentric Standard	Extra Strong	Size of Pipe In.	Price, Each Concentric or Eccentric Standard	Extra Strong	Size of Pipe In.	Price, Each Concentric or Eccentric Standard	Extra Strong	Size of Pipe In.	Price, Each Concentric or Eccentric Standard	Extra Strong
¾ ×½	1.25*	2.25*	3 ×2½	3.00	5.25	5×4	6.00	10.50	10×8	18.00	40.00	18×16	85.00	148.00
1 ×¾	1.50	2.75	×2	3.00	5.25	×3½	6.50	11.50	×6	20.00	44.00	×14	85.00	148.00
×½	1.50	2.75	×1½	3.25	5.70	×3	6.50	11.50	×5	26.00	48.00	×12	95.00	166.00
1¼×1	2.00	3.50	×1¼	3.25	5.70	×2½	6.50	11.50	×4	26.00	48.00	×10	105.00	184.00
×¾	2.00	3.50	×1	3.25*	5.70*	×2	6.50	11.50	×3	30.00*		20×18	90.00	157.50
×½	2.50	4.50	3½×3	3.50	6.00	6×5	8.00	14.00	12×10	32.00	56.00	×16	90.00	157.50
1½×1¼	2.00	3.50	×2½	3.50	6.00	×4	8.00	14.00	×8	36.00	63.00	×14	100.00	175.00
×1	2.00	3.50	×2	3.50	6.00	×3½	9.00	15.75	×6	36.00	63.00	×12	100.00	175.00
×¾	2.50	4.50	×1½	3.75	6.50	×3	9.00	15.75	×5	40.00	70.00	24×20	140.00	245.00
×½	2.50	4.50	×1¼	3.75	6.50*	×2½	9.00	15.75	14×12	40.00	70.00	×18	155.00	270.00
2 ×1½	2.25	3.75	4 ×3½	4.00	7.00	×2	10.00*	17.50*	×10	40.00	70.00	×16	170.00	295.00
×1¼	2.25	3.75	×3	4.00	7.00	8×6	12.00	26.25	×8	45.00	78.75			
×1	2.25	3.75	×2½	4.00	7.00	×5	15.00	30.60	×6	50.00	87.50			
×¾	2.75	4.75	×2	4.00	7.00	×4	15.00	30.60	16×14	70.00	105.00			
2½×2	2.50	4.50	×1½	4.50	8.00	×3½	15.00	30.60	×12	70.00	105.00			
×1½	2.75	5.00	×1¼	4.50*	8.00*	×3	18.00*	35.00*	×10	80.00	122.50			
×1¼	2.75	5.00	×1	4.50*					×8	85.00	140.00			
×1	2.75	5.00												

*Note: Prices with an asterisk indicate sizes made only in the Concentric style.

General description of butt-welding fittings, page 275.

Dimensions, page 286.

Welding Saddles

List Prices

Size of Pipe (Outlet) Inches	Shaped to Fit Headers (Nominal Sizes)	No. 358 E Reinforcing Welding Saddles Each
1	1¼ to 8"	4.90
1¼	1½ to 8	4.90
1½	1½ to 12	4.90
2	2 to 24	4.90
2½	2½ to 24	5.35
3	3 to 24	5.85
3½	3½ to 24	6.80
4	4 to 24	7.80
5	5 to 24	10.75
6	6 to 24	13.65
8	8 to 24	21.50
10	10 to 24	27.25
12	12 to 24	31.00
14	14 to 24	36.00
16	16 to 24	43.00
18	18 to 24	50.00
20	20 to 24	58.00
24	24	70.00



Reinforcing Welding Saddle, No. 358 E

Welding Saddles are used to reinforce 90° welded outlet connections on headers or pipes. They relieve the weld of the greater part of the tensile, bending, and shearing stresses to which it would otherwise be subjected.

Be sure to specify nominal size of header.

Welding Sleeves



Welding Sleeve No. 361 E

Welding Sleeves are ideal for reinforcing butt-welds in pipe lines. They relieve the weld of any bending stress and of much of the tensile stress to which it would otherwise be subjected.

The large transverse recess at the center provides more than ample space for the conventional type of butt-weld used between two lengths of pipe.

List Prices

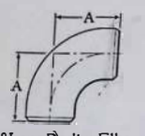
Size of Pipe Inches	No. 361 E Welding Sleeve Each
1	4.00
1¼	4.00
1½	4.00
2	4.00
2½	4.60
3	5.00
3½	5.50
4	6.20
5	7.25
6	8.30
8	11.40
10	15.75
12	20.40
14	23.70
16	28.60
18	34.50
20	41.50
24	57.00

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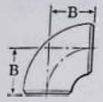
Steel Butt-Welding Fittings

Dimensions, in Inches

For list prices and description, see pages 280 to 285.



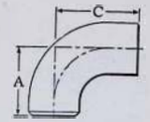
90° Long Radius Elbow Straight and Reducing



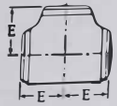
90° Short Radius Elbow



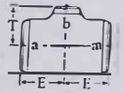
45° Long Radius Elbow



90° Long Radius Elbow Long Tangent One End



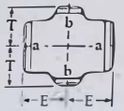
Straight Tee



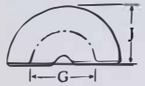
Reducing Tee



Straight Cross



Reducing Cross



Short Radius Return Bend



Long Radius Return Bend



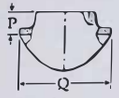
Cranclap Stub End



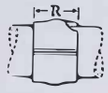
90° Type Shaped Nipples



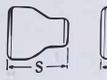
45° Type



Reinforcing Welding Saddle



Welding Sleeve



Concentric Reducer



Eccentric Reducer



Cap

Size	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	Pipe Schedule Numbers: For Std. Ftgs.	Pipe Schedule Numbers: For Extra Strong
¾	1⅛			9/16	1⅛*			2¼		1 11/16	4						2	40	80
1	1½	1		⅞	1½*	1½	2	3	1⅝	2 3/16	4	2		1	4⅛	3	2	40	80
1¼	1⅞	1¼		1	1⅞*	1½	2½	3¾	2 1/16	2¾	4	2½		1⅛	4¾	3	2	40	80
1½	2¼	1½	3¼	1⅛	2¼*	1½	3	4½	2 7/16	3¼	4	2⅞		1⅛	5¼	3	2½	40	80
2	3	2	4¼	1⅜	2½	1½	4	6	3 3/16	4 3/16	6	3⅝	6	1⅛	5 15/16	3	3	40	80
2½	3¾	2½	5	1¾	3	1½	5	7½	3 15/16	5 3/16	6	4⅛	6	1⅛	6 7/16	3	3½	40	80
3	4½	3	5¾	2	3⅜	2	6	9	4¾	6¼	6	5	6	1⅛	7 9/16	3	3½	40	80
3½	5¼	3½	6¾	2¼	3¾	2½	7	10½	5½	7¼	6	5½	6	1¼	8 1/16	3½	4	40	80
4	6	4	7½	2½	4½	2½	8	12	6¼	8¼	6	6 3/16	6	1⅜	8 9/16	4	4	40	80
5	7½	5	9	3⅛	4⅞	3	10	15	7¾	10 5/16	8	7 5/16	8	1⅜	9⅝	5	5	40	80
6	9	6	10¾	3¾	5⅝	3½	12	18	9 5/16	12 5/16	8	8½	8	1½	11¾	6	5½	40	80
8	12	8	13¾	5	7	4	16	24	12 5/16	16 5/16	8	10⅝	8	2	14¾	8	6	40	80
10	15	10	17	6¼	8½	5	20	30	15⅜	20⅜	10	12¾	10	2½	17⅞	10	7	40	60
12	18	12	20½	7½	10	6	24	36	18⅜	24⅜	10	15	10	2¾	20⅞	12	8	.....	.....
14	21	16		8¾	11*	6½	28	42	21	28	12	16¼		3¼	22⅛	14	13	30	.....
16	24	18		10	12*	7	32	48	23	32	12	18½		3½	24⅛	16	14	30	40
18	27	20		11¼	13½*	8	36	54	25½	36	12	21		4	26⅛	18	15	.....	.....
20	30	20		12 7/16	15*	9	40	60	30½	40	12	23		4	30⅛	20	20	20	30
24	36	24		14 15/16	17*	10½	48	72	34	48	12	27¼		4	34⅛	24	20	20	.....

Reducing Tees and Crosses—Center to End of Outlet

Size a	Size b	T
1	×¾*	1½
1¼	×1*	1⅞
	×¾*	1⅞
1½	×1¼*	2¼
	×1*	2¼
	×¾*	2¼
2	×1½	2⅜
	×1¼	2¼
	×1	2
	×¾	1¾
2½	×2	2¾
	×1½	2⅝
	×1¼	2½
	×1	2¼
3	×2½	3¼
	×2	3
	×1½	2⅞
	×1¼	2¾
3½	×3	3⅝
	×2½	3½
	×2	3¼
	×1½	3⅛
4	×3½	4
	×3	3⅞
	×2½	3¾
	×2	3½
	×1½	3⅜
5	×4	4⅝
	×3½	4½
	×3	4⅜
	×2½	4¼
	×2	4⅛
6	×5	5⅜
	×4	5⅛
	×3½	5
	×3	4⅞
	×2½	4¾

Size a	Size b	T
8	×6	6⅝
	×5	6⅜
	×4	6⅛
	×3½	6
10	×8	8
	×6	7⅝
	×5	7½
	×4	7¼
12	×10	9½
	×8	9
	×6	8⅝
	×5	8½
14	×12*	10⅝
	×10*	10⅛
	×8*	9⅝
	×6*	9¼

Size a	Size b	T
16	×14*	12
	×12*	11⅝
	×10*	11⅛
	×8*	10⅝
18	×16*	13
	×14*	13
	×12*	12⅝
	×10*	12⅛
20	×18*	14½
	×16*	14
	×14*	14
	×12*	13⅝
24	×20*	17
	×18*	16½
	×16*	16

*Only Tees are made in these sizes

Standard, Extra Strong, Schedule 160, and Double Extra Strong Fittings have the same outside dimensions.

American Standard: These fittings, in the sizes and types included in the Standard, conform to the American Standard, B16.9-1951; see page 275.

Thickness: Standard Fittings in sizes 12-inch and smaller are made for use with Standard pipe (heaviest weight on 8, 10, and 12-inch sizes); and in sizes 14-inch and larger, for use with O.D. pipe ⅜-inch thick.

Extra Strong Fittings in sizes 12-inch and smaller are made for use with Extra Strong pipe; and in sizes 14-inch and larger, for use with O.D. pipe ½-inch thick.

Schedule 160 Fittings are made for use with Schedule 160 pipe; and Double Extra Strong Fittings, for use with Double Extra Strong pipe.

Bonney WeldOlets

Bonney WeldOlets are welding fittings forged from steel of low carbon content. They are designed for making right angle branch pipe outlets such as tees, crosses, and side outlets by welding. They eliminate the preparation of preliminary layouts of main and branch pipes. No templates are used, nor is any complicated cutting, threading, forming, and fitting of the main pipe necessary. Branch connections made with WeldOlets are strong, permanent, and leakproof.

Types and Sizes Available

Pipe Class	Outlet Pipe Size, Inches	Size of Run Pipe, in Inches: Reducing Fittings: Welding Outlets	Reducing Fittings: Socket Outlets	Reducing Fittings: Threaded Outlets	Full Size Fittings: Welding Outlets	Full Size Fittings: Socket or Threaded Outlets
For Standard Pipe	⅛	⅜ to 24	⅜ to 24		..	..
	¼	⅜ to 24	⅜ to 24		..	..
	⅜	¾ to 24	¾ to 24		..	..
	½	¾ to 24	¾ to 24		½	½
	¾	1 to 24	1 to 24		¾	¾
	1	1¼ to 24	1¼ to 24		1	1
	1¼	1½ to 24	1½ to 24		1¼	1¼
	1½	2 to 24	2 to 24		1½	1½
	2	2½ to 24	2½ to 24		2	2
	2½	3 to 24	3 to 24		2½	2½
	3	3½ to 24	3½ to 24		3	3
	3½	4 to 24	4 to 24		3½	3½
	4	5 to 24	5 to 24		4	4
	5	6 to 24	6 to 24		5*	5*
	6	8 to 24	8 to 24		6	6*
	8	10 to 24*	10 to 24*		8*	
	10	12 to 24*	12 to 24*		10*	
	12	14 to 24*	..		12*	
	14	16 to 24*	..		14*	
	16	18 to 24*	..		16*	
	18	20 to 24*	..		18*	
	20	24*	..		20*	
	24	..	..		24*	
For Extra Strong Pipe	⅛	⅜ to 24	⅜ to 24	⅜ to 24	..	
	¼	⅜ to 24	¾ to 24	¾ to 24	..	
	⅜	½ to 24	¾ to 24	¾ to 24	..	
	½	¾ to 24	1 to 24	1 to 24	½	
	¾	1 to 24	1¼ to 24	1¼ to 24	¾	
	1	1¼ to 24	1½ to 24	1½ to 24	1	
	1¼	1½ to 24	2 to 24	2 to 24	1¼	
	1½	2 to 24	2½ to 24	2½ to 24	1½	
	2	2½ to 24	3 to 24	3 to 24	2	
	2½	3 to 24	3½ to 24	..	2½	
	3	3½ to 24	4 to 24	..	3	
	3½	4 to 24	5 to 24	..	3½	
	4	5 to 24	6 to 24	..	4	
	5	6 to 24	..	..	5*	
	6	8 to 24	..	..	6	
	8	10 to 24*	..	..	8*	
	10	12 to 24*	..	..	10*	
	12	14 to 24*	..	..	12*	
	14	16 to 24*	..	..	14*	
	16	18 to 24*	..	..	16*	
	18	20 to 24*	..	..	18*	
	20	24*	..	..	20*	
	24	..	..	..	24*	
For Schedule 160 Pipe	½	¾ to 12	1 to 24	1¼ to 24	½	
	¾	1¼ to 12	1¼ to 24	1½ to 24	¾	
	1	1¼ to 12	1½ to 24	2 to 24	1	
	1¼	1½ to 12	2 to 24	2½ to 24	1¼	
	1½	2½ to 12	2½ to 24	3 to 24	1½	
	2	2½ to 12	3 to 24	4 to 24	2	
	2½	3 to 12	..	..	2½	
	3	4 to 12	..	..	3	
	4	5 to 12	..	..	4	
	5	6 to 12*	..	..	5*	
	6	8 to 12*	..	..	6*	
	8	10 to 12*	..	..	8*	
	10	12*	..	..	10*	
	12	..	..	..	12*	

*Carbon steel castings. ***Prices on application.***



Welding Outlets

A right angle branch pipe outlet can be made by welding a Welding Outlet to the main pipe. An ordinary V-weld is used. The button may be removed before or after the fitting is attached to the main pipe. The junction is completed by welding the branch pipe to the outlet. Where the Outlet saddles on the run pipe, it tapers at the proper angles and provides a single bevel groove joint at the crotch section blending into a V-butt joint at the ear portion.



Threaded Outlets

Threaded Outlets are installed on the main line in the same manner as Welding Outlets. A V-weld is used. The threaded branch pipe is screwed into position in the tapped outlet of the fitting. Threaded Outlets are widely used as radiator take-offs, and in other locations where it is desirable to make connections without disturbing the main pipe.



Socket Outlets

Socket Outlets are similar to the Welding and Threaded types except the outlet is bored to accept standard outside pipe diameters. They are installed in the same manner as the Welding and Threaded Outlets. No beveling nor threading of the branch pipe is necessary.

Steel Butt-Welding Fittings

Pressure-Temperature Ratings Based on the Code for Pressure Piping

When computing the thickness of pipe for a given service condition, it is the generally accepted practice among designers to use the formulas provided by the Code for Pressure Piping, the A.S.M.E. Boiler Construction Code, or such other codes as may apply.

For the convenience of users, Crane engineers have calculated the working pressures shown on this and the opposite page. They apply to Grade A Seamless Steel Pipe used in accordance with Section 1 and Section 3 of the Code for Pressure Piping. See the explanation below.

Crane Steel Butt-Welding Fittings, made for use with Standard or Extra Strong Pipe, are as strong as, or stronger than, Grade A Seamless Steel Pipe. They can, therefore, be used for any pressure or temperature for which Grade A Pipe of corresponding thickness is suitable, with equal safety.

Note: The pressure ratings given in the following tables do not necessarily comply with the rules given in the A.S.M.E. Boiler Construction Code. Where ratings are to comply with these rules, the formulas given in the A.S.M.E. Code should be used.

* * * * * * * * * * * *

Code for Pressure Piping: The Code for Pressure Piping, American Standard B31.1-1942, with 1944 Supplement No. 1 and 1947 Supplement No. 2, includes five sections on piping systems: Section 1, Power; Section 2, Gas and Air; Section 3, Oil; Section 4, District Heating; and Section 5, Refrigeration. The tables shown here apply to Power Piping (Section 1) and to Oil Piping (Section 3), the latter being further limited to "Within Refinery Limits".

The formula used for calculating the working pressures for Section 1, Power Piping is as follows:

$$P = \frac{2S\,(t - c)}{D - .8(t - c)}$$

and for Section 3, Oil Piping, the formula is:

$$P = \frac{2S\,(t - c)}{D}$$

Where: P = maximum working pressure, psi (gauge)
S = allowable stress for material, psi
t = minimum pipe wall thickness, inches
c = allowance for threading, mechanical strength, and for corrosion, inches
D = outside diameter of pipe, inches

"S" Value: The stresses permitted by the Code for Grade A Seamless Steel Pipe, A.S.T.M. Specification A 106, are shown in the table at the right.

Wall thickness: Wall thicknesses correspond to those used in Crane Steel Butt-Welding Fittings. To establish minimum thickness, "t", required by the formula, the nominal thickness was reduced 12½% to compensate for the tolerance required by pipe mills.

"C" Value: "C" value for plain end steel pipe is:
Power Piping — ¾ and 1-inch sizes....0.05"
— 1¼-inch and larger...0.065"
Oil Piping — All sizes.....0.05"

"S" Values, Pounds per Square Inch

Temp. Fahr.	Power Piping	†Oil Piping	Temp. Fahr.	Power Piping	†Oil Piping
100°	12,240	18,000	600°	9,840	12,550
150°	12,000	17,450	650°	9,600	12,000
200°	11,760	16,900	700°	9,250	11,550
250°	11,520	16,350	750°	8,700	10,900
300°	11,280	15,800	800°	8,000	10,000
350°	11,040	15,300	850°	6,850	8,550
400°	10,800	14,700	900°	5,600	7,000
450°	10,560	14,150	950°	3,800	4,750
500°	10,320	13,600	1000°	2,000	2,500
550°	10,080	13,100			

†Values apply to Oil Piping Within Refinery Limits.

Other ratings: A simplified method for calculating other ratings is explained on pages 541 to 545.

Standard Grade A Seamless Steel Pipe
For Power Piping, Section 1, Code for Pressure Piping

Size of Pipe	*Wall Thickness	Temperature — Degrees Fahrenheit: 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
		Working Pressures, Pounds per Square Inch																		
¾"	.113"	1185	1165	1140	1115	1095	1070	1050	1025	1000	980	955	930	895	845	775	665	545	370	195
1	.133	1285	1260	1235	1210	1185	1160	1135	1110	1085	1060	1035	1010	970	915	840	720	590	400	210
1¼	.140	870	850	835	820	800	785	765	750	735	715	700	680	655	620	570	485	400	270	140
1½	.145	820	805	790	770	755	740	725	710	690	675	660	645	620	585	535	460	375	255	135
2	.154	735	720	705	690	675	660	650	635	620	605	590	575	555	520	480	410	335	230	120
2½	.203	990	970	955	935	915	895	875	855	835	815	795	780	750	705	650	555	455	310	160
3	.216	895	875	860	840	825	805	790	770	755	735	720	700	675	635	585	500	410	275	145
3½	.226	830	815	800	785	765	750	735	720	700	685	670	655	630	590	545	465	380	260	135
4	.237	795	780	765	750	735	720	700	685	670	655	640	625	600	565	520	445	365	245	130
5	.258	720	710	695	680	665	650	635	625	610	595	580	565	545	515	470	405	330	225	120
6	.280	685	670	660	645	630	620	605	590	580	565	550	540	520	485	450	385	315	215	110
8	.322	625	610	600	590	575	565	550	540	525	515	500	490	470	445	410	350	285	195	100
10	.365	590	575	565	555	540	530	520	505	495	485	470	460	445	420	385	330	270	180	95
12	.375	515	505	495	485	475	465	455	445	435	425	415	405	390	365	335	290	235	160	85
14 OD	.375	465	455	445	440	430	420	410	400	390	385	375	365	350	330	305	260	215	145	75
16 OD	.375	405	395	390	380	370	365	355	350	340	335	325	315	305	285	265	225	185	125	65
18 OD	.375	365	360	355	345	340	330	325	315	310	300	295	290	280	260	240	205	170	115	60
20 OD	.375	330	325	320	310	305	300	290	285	280	270	265	260	250	235	215	185	150	105	55
24 OD	.375	270	265	260	255	250	245	240	230	225	220	215	210	205	190	175	150	125	85	45

*These are the nominal wall thicknesses; they correspond to the thickness of Standard and Extra Strong Butt-Welding Fittings.

Pressure-Temperature Ratings Based on Code for Pressure Piping

Extra Strong Grade A Seamless Steel Pipe
For Power Piping, Section 1, Code for Pressure Piping

Size of Pipe	*Wall Thickness	Temperature — Degrees Fahrenheit: 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
		Working Pressures, Pounds per Square Inch																		
1"	.179"	2120	2075	2035	1990	1950	1910	1870	1825	1785	1745	1700	1660	1600	1505	1385	1185	970	655	345
1¼	.191	1580	1550	1515	1485	1455	1425	1395	1360	1330	1300	1270	1240	1195	1120	1030	885	720	490	260
1½	.200	1480	1450	1420	1395	1365	1335	1305	1280	1250	1220	1190	1160	1120	1055	970	830	680	460	240
2	.218	1360	1330	1305	1280	1250	1225	1200	1170	1145	1120	1090	1065	1025	965	890	760	620	420	220
2½	.276	1580	1550	1515	1485	1455	1425	1395	1360	1330	1300	1270	1240	1195	1120	1030	885	720	490	260
3	.300	1445	1415	1390	1360	1330	1305	1275	1245	1220	1190	1160	1135	1090	1025	945	810	660	450	235
3½	.318	1360	1330	1305	1280	1250	1225	1200	1170	1145	1120	1090	1065	1025	965	890	760	620	420	220
4	.337	1310	1285	1260	1230	1205	1180	1155	1130	1105	1080	1055	1025	990	930	855	735	600	405	215
5	.375	1200	1175	1150	1130	1105	1080	1060	1035	1010	990	965	940	905	855	785	670	550	370	195
6	.432	1200	1175	1150	1130	1105	1080	1060	1035	1010	990	965	940	905	855	785	670	550	370	195
8	.500	1090	1070	1045	1025	1005	985	960	940	920	895	875	855	825	775	710	610	500	340	180
10	.500	870	850	835	820	800	785	765	750	735	715	700	680	655	620	570	485	400	270	140
12	.500	735	720	705	690	675	660	650	635	620	605	590	575	555	520	480	410	335	230	120
14 OD	.500	660	650	635	620	610	595	585	570	555	545	530	520	500	470	430	370	300	205	110
16 OD	.500	575	565	550	540	530	520	510	495	485	475	450	450	435	410	375	320	265	180	95
18 OD	.500	515	505	495	485	475	465	455	435	425	425	415	405	390	365	335	290	235	160	85
20 OD	.500	465	455	445	440	430	420	410	400	390	385	375	365	350	330	305	260	215	145	75
24 OD	.500	380	370	365	355	350	340	335	325	320	310	305	300	285	270	250	210	175	120	60

Standard Grade A Seamless Steel Pipe
For Oil Piping Within Refinery Limits, Section 3, Code for Pressure Piping

Size of Pipe	*Wall Thickness	Temperature — Degrees Fahrenheit: 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
		Working Pressures, Pounds per Square Inch																		
¾"	.113"	1675	1625	1570	1520	1470	1425	1365	1315	1265	1220	1165	1115	1075	1015	930	795	650	450	235
1	.133	1820	1760	1705	1650	1595	1545	1485	1430	1375	1325	1270	1210	1165	1100	1010	865	705	480	255
1¼	.140	1565	1520	1470	1420	1375	1330	1280	1230	1185	1140	1090	1045	1005	950	870	745	610	415	220
1½	.145	1460	1415	1370	1325	1280	1240	1190	1145	1100	1060	1015	970	935	885	810	695	565	385	205
2	.154	1280	1240	1200	1160	1120	1085	1045	1005	965	930	890	850	820	775	710	605	495	335	180
2½	.203	1600	1555	1505	1455	1405	1360	1310	1260	1210	1165	1115	1070	1030	970	890	780	625	425	225
3	.216	1420	1380	1335	1290	1250	1210	1160	1120	1075	1035	990	950	910	860	790	675	555	375	200
3½	.226	1330	1290	1255	1210	1170	1130	1090	1045	1005	970	930	890	855	805	740	635	520	350	185
4	.237	1260	1220	1185	1145	1105	1070	1030	990	950	915	880	840	810	765	700	600	490	335	175
5	.258	1135	1100	1065	1030	995	965	925	890	855	825	790	755	730	685	630	540	440	300	160
6	.280	1060	1030	995	965	930	905	865	835	800	775	740	710	680	645	590	505	415	280	150
8	.322	970	940	915	885	855	825	795	765	735	705	680	650	625	590	540	460	380	255	135
10	.365	900	875	845	820	790	765	735	710	680	655	630	600	580	545	500	430	350	240	125
12	.375	790	770	745	720	695	675	645	625	600	575	550	530	510	480	440	375	310	210	110
14 OD	.375	720	700	675	655	630	610	590	565	545	525	500	480	460	435	400	340	280	190	100
16 OD	.375	630	610	590	570	555	535	515	495	475	460	440	420	405	380	350	300	245	165	90
18 OD	.375	560	540	525	505	490	475	455	440	420	405	390	370	360	340	310	265	215	145	80
20 OD	.375	505	490	475	460	440	430	410	395	380	365	350	335	325	305	280	240	195	135	70
24 OD	.375	415	400	390	375	365	350	340	325	315	300	290	275	265	250	230	195	160	110	60

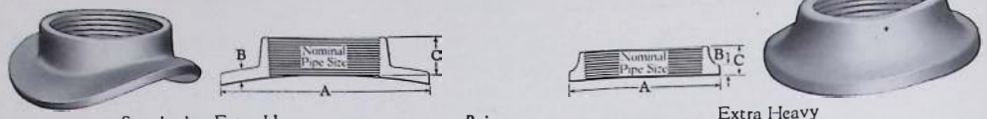
Extra Strong Grade A Seamless Steel Pipe
For Oil Piping Within Refinery Limits, Section 3, Code for Pressure Piping

Size of Pipe	*Wall Thickness	Temperature — Degrees Fahrenheit: 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
		Working Pressures, Pounds per Square Inch																		
1"	.179"	2915	2825	2740	2650	2560	2480	2380	2290	2205	2120	2035	1945	1870	1765	1620	1385	1135	770	405
1¼	.191	2540	2460	2385	2305	2230	2155	2075	1995	1920	1845	1770	1690	1630	1535	1410	1205	985	670	355
1½	.200	2375	2305	2230	2160	2085	2020	1940	1870	1795	1730	1655	1585	1525	1440	1320	1130	925	625	330
2	.218	2140	2075	2010	1945	1880	1820	1750	1685	1620	1560	1495	1430	1375	1295	1190	1015	835	565	300
2½	.276	2395	2320	2250	2175	2100	2035	1955	1880	1810	1740	1670	1595	1535	1450	1330	1135	930	630	335
3	.300	2180	2110	2045	1980	1910	1850	1780	1710	1645	1585	1520	1450	1400	1320	1210	1035	845	575	305
3½	.318	2050	1990	1925	1865	1800	1745	1675	1615	1550	1495	1430	1370	1315	1245	1140	975	800	540	285
4	.337	1960	1900	1840	1780	1720	1670	1600	1540	1480	1430	1370	1310	1260	1190	1090	930	765	520	275
5	.375	1800	1745	1690	1635	1580	1530	1470	1415	1360	1310	1255	1200	1155	1090	1000	855	700	475	250
6	.432	1780	1730	1675	1620	1565	1515	1455	1400	1345	1295	1240	1190	1145	1080	990	845	695	470	245
8	.500	1620	1570	1520	1470	1420	1375	1325	1275	1225	1180	1130	1080	1040	980	900	770	630	430	225
10	.500	1295	1255	1215	1175	1140	1100	1060	1020	980	945	905	865	830	785	720	615	505	340	180
12	.500	1100	1065	1030	995	965	935	895	865	830	800	765	730	705	665	610	520	425	290	155
14 OD	.500	990	960	930	900	870	840	810	780	750	720	690	660	635	600	550	470	385	260	140
16 OD	.500	865	840	810	785	760	735	705	680	655	630	600	575	555	525	480	410	335	230	120
18 OD	.500	775	750	725	705	680	660	635	610	585	565	540	515	495	470	430	370	300	205	110
20 OD	.500	700	680	660	640	615	595	575	550	530	510	490	470	450	425	390	335	275	185	100
24 OD	.500	575	560	540	525	505	490	470	455	435	420	400	385	370	350	320	275	225	150	80

*These are the nominal wall thicknesses; they correspond to the thickness of Standard and Extra Strong Butt-Welding Fittings.

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Kropp Forged Steel Boiler Flanges



Standard or Extra Heavy Boiler Flanges

Prices on application

Extra Heavy Welding Flange

Boiler flanges: Boiler flanges are fastened to boilers, pipe lines, tanks, and similar vessels by means of rivets. They are regularly furnished without rivet holes; when wanted drilled for rivets, specify whether for single, double, or staggered riveting, and give the pitch, spacing, and size of rivets.

The flanges regularly are furnished flat or are bent to standard diameter circles. Sizes 6-inch and smaller will be bent to circles as small as 18 inches; sizes 8-inch and larger will be bent to circles as small as 36 inches. The flanges can be bent to smaller diameter circles, and also to fit the center of dished head or spherical surfaces, at an added charge.

Welding flanges: Welding flanges are fastened to boilers, pipe lines, tanks, and similar vessels by welding around the outer edge of the flange. Regularly furnished flat, they can be bent to any reasonable radius at an added charge.

Dimensions, in Inches

Size	Standard Boiler Flange			Extra Heavy Boiler Flange			Extra Heavy Welding Flange		
	A	B	C	A	B	C	A	B	C
¾	6	5/16	1						
1	6	5/16	1	6	⅜	1 1/16	2¾	5/16	⅝
1¼	6½	5/16	1	6½	⅜	1 1/16	3	5/16	⅝
1½	7	⅜	1¼	7	½	1⅜	3½	⅜	¾
2	8	⅜	1¼	8	½	1⅜	4	⅜	¾
2½	8½	⅜	1½	8½	½	1⅝	4½	⅜	⅞
3	9	⅜	1½	9	½	1⅝	5	⅜	1
3½	9½	7/16	1½	9½	9/16	1⅝	5½	7/16	1
4	10	7/16	1¾	10	9/16	1⅞	6½	7/16	1¼
5	11½	½	2	11½	⅝	2⅛	7½	½	1½
6	12½	½	2	12½	⅝	2⅛	8½	½	1½
8	15	⅝	2½	15	¾	2⅝	10½	⅝	1¾
10	17½	¾	2½	17½	⅞	2⅝	13	¾	2
12	20	13/16	3	20	1	3 3/16	15	13/16	2

Other flanges: Double Hub, High Hub, Horseshoe, Offset, Marine, and other type flanges are also available; information furnished on request.

Other Products for Welding

In close association with the Crane line of Steel Butt-Welding and Socket-Welding Fittings shown on the preceding pages, is the wide variety of Butt-Welding and Socket-Welding Steel Valves and welding type Steel Flanges, available in a complete range of sizes and pressures.

Included in the line offered by Crane are materials to satisfy the needs of every welded installation.

The butt-welding and socket-welding steel valves and the welding type steel flanges illustrated on this page are representative of the products that make up the complete Crane welding line. For prices, see the pages indicated below the illustrations.



Butt-Welding Valves
(Globe illustrated)

Gate . . . . . see pages 210 and 229
Globe . . . . . see pages 213 and 246
Angle . . . . . see pages 213 and 246
Swing Check . . see pages 252 to 255



Welding Flanges
(Welding Neck Flange illustrated)

Welding Neck Flanges . . . see pages 291 to 298
Slip-On Welding Flanges . see pages 291 to 298
Cranelap Flanges . . . . . see pages 291 to 298
Stub Ends for use in combination with Cranelap Flanges . . see pages 280 to 283



Socket-Welding Valves
(Globe illustrated)

Gate . . see pages 210, and 223 to 225
Globe . . . . . see pages 213 and 239
Angle . . . . . see pages 213 and 239
Lift Check . . . . . see pages 250 and 251

Forged Steel Flanges

The Crane line of Forged Steel Flanges includes a complete assortment of types in a wide range of straight and reducing sizes. The flanges are regularly manufactured for the 150, 300, 400, 600, 900, 1500, and 2500-Pound pressure classes. Special flanges can be made to order; flanges listed and described in this section include:

Screwed Flanges — Reducing Screwed Flanges
Blind Flanges — Cranelap Flanges
Welding Neck Flanges — Slip-On Welding Flanges
Reducing Slip-On Welding Flanges

Pressure-Temperature Ratings . . . . . page 292
General Description . . . . . page 293

List Prices
150 and 300-Pound . . . . . page 294
400, 600, 900, and 1500-Pound . . . . . page 295

Dimensions
150, 300, and 400-Pound . . . . . page 296
600, 900, 1500, and 2500-Pound . . . . . page 297

Boring of Welding Neck Flanges . . . . . page 298

The Forged Steel Flanges listed above comprise only a part of the complete line of Crane steel products.

Other steel products are shown and described in detail in other sections of this catalog. Refer to the following pages:

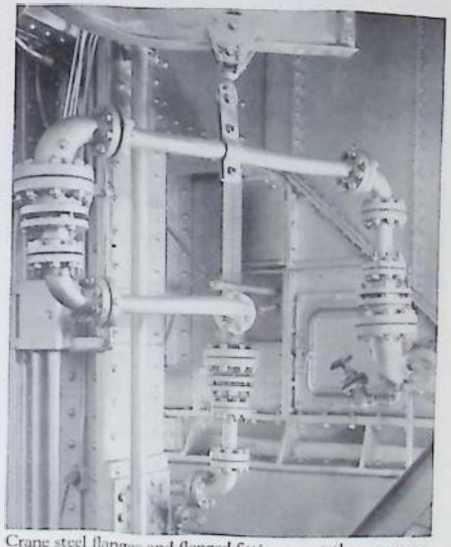
Steel Welding Fittings . . . . . pages 275 to 290
Steel Flanged Fittings . . . . . pages 267 to 274
Steel Screwed Fittings . . . . . pages 257 to 262
18-8 Mo. Flanges . . . . . page 383

Steel Couplings . . . . . page 170
Wrought Steel Nipples . . . . . pages 168 and 169
Forged Steel Unions . . . . . pages 263 and 264
Forged Steel Flange Unions . . . . . page 265

Steel Pressure-Seal Bonnet Valves . . . . . pages 205 to 217
Steel Lip-Seal Bonnet Valves . . . . . pages 218 and 219
Steel Gate Valves . . . . . pages 221 to 234
Steel Globe and Angle Valves . . . . . pages 235 to 248
Steel Check Valves . . . . . pages 249 to 256

Steel Stop-Check Valves . . . . . pages 304 and 305
Steel Safety Valves . . . . . page 324
Steel Relief Valves . . . . . pages 333 and 334
Steel Sediment Separators . . . . . page 356

Fabricated Piping . . . . . *pages 497 to 522*



Crane steel flanges and flanged fittings meet the severe requirements of high pressure, high temperature service.

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Forged Steel Flanges

Working Pressures, Pounds per Square Inch, Non-Shock
For Flanges Shown on pages 293 to 298

For Steam, Water, Oil, Oil Vapor, Gas, or Air

Temp.	Carbon Steel							No. 4 Carbon-Molybdenum Alloy Steel						[2]No. 5 Chrome-Molybdenum Alloy Steel (Made to order)					
Deg. F.	150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
	[1]Flanges with Standard Facings Other Than Ring Joint																		
100	230	600	800	1200	1800	3000	5000												
150	220	590	785	1180	1770	2950	4915												
200	210	580	770	1160	1740	2900	4830												
250	200	570	760	1140	1710	2850	4750												
300	190	560	740	1120	1680	2800	4660												
350	180	550	725	1095	1645	2740	4565	For temperatures up to 750° F., these ratings are the same as those for Carbon Steel Flanges, shown at the left.						For temperatures up to 750° F., these ratings are the same as those for Carbon Steel Flanges. For temperatures up to 900° F., the ratings are the same as those for No. 4 Carbon-Molybdenum Alloy Steel Flanges. (See ratings at left)					
400	170	540	710	1075	1615	2690	4475												
450	160	525	700	1050	1580	2630	4380												
500	**150**	500	665	1000	1500	2500	4165												
550	140	475	630	950	1420	2370	3950												
600	130	445	590	890	1330	2220	3700												
650	120	415	550	830	1240	2070	3450												
700	110	380	500	760	1140	1900	3160												
750	100	340	450	680	1020	1700	2830	360	475	720	1080	1800	2995						
800	92	**300**	**400**	**600**	**900**	**1500**	**2500**	340	450	680	1020	1700	2830						
850	82	245	330	490	740	1230	2050	320	425	640	960	1600	2665						
900	[2]70	[2]210	[2]280	[2]420	[2]630	[2]1050	[2]1750	**300**	**400**	**600**	**900**	**1500**	**2500**	310	410	620	930	1550	2580
950	[2]55	[2]165	[2]220	[2]330	[2]495	[2] 825	[2]1375	[2]265	[2]350	[2]530	[2]795	[2]1325	[2]2205	**300**	**400**	**600**	**900**	**1500**	**2500**
1000	[2]40	[2]120	[2]160	[2]240	[2]360	[2] 600	[2]1000	[2]190	[2]250	[2]380	[2]570	[2] 950	[2]1580	200	275	400	600	1000	1675
1050														135	180	270	405	675	1125
1100														90	120	180	270	450	750
	Flanges with Ring Joint Facing																		
100	275	720	960	1440	2160	3600	6000												
150	255	710	945	1420	2130	3550	5915												
200	240	700	930	1400	2100	3500	5830												
250	225	690	920	1380	2070	3450	5750												
300	210	680	910	1365	2050	3415	5690												
350	195	675	900	1350	2025	3375	5625												
400	180	665	890	1330	2000	3330	5550												
450	165	660	875	1320	1975	3295	5490												
500	**150**	625	835	1250	1875	3125	5210												
550	140	590	790	1180	1775	2955	4925												
600	130	555	740	1110	1660	2770	4620												
650	120	515	690	1030	1550	2580	4300												
700	110	470	635	940	1410	2350	3920												
750	100	425	575	850	1275	2125	3550												
800	92	365	490	730	1100	1830	3050	375	500	750	1125	1875	3125	400	525	800	1200	2000	3325
850	82	**300**	**400**	**600**	**900**	**1500**	**2500**	350	475	700	1050	1750	2925	375	500	750	1125	1875	3125
900	[2]70	[2]210	[2]280	[2]420	[2]630	[2]1050	[2]1750	325	425	650	975	1625	2700	350	475	700	1050	1750	2925
950	[2]55	[2]165	[2]220	[2]330	[2]495	[2] 825	[2]1375	**300**	**400**	**600**	**900**	**1500**	**2500**	325	425	650	975	1625	2700
1000	[2]40	[2]120	[2]160	[2]240	[2]360	[2] 600	[2]1000	[2]230	[2]310	[2]470	[2]700	[2]1170	[2]1950	**300**	**400**	**600**	**900**	**1500**	**2500**
1050								[2]135	[2]180	[2]270	[2]405	[2] 675	[2]1125	225	275	425	650	1075	1775
1100								[2] 90	[2]120	[2]180	[2]270	[2] 450	[2] 750	150	200	275	425	700	1175

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]These ratings apply only to oil or oil vapor service.

Flange facings: Unless otherwise ordered, 150 and 300-Pound Flanges are regularly furnished with a 1/16-inch raised face, and 400-Pound and higher pressure flanges are regularly furnished with a 1/4-inch male face.

Cold service: For temperatures between 0° and 100° F., the ratings for 100° F. apply. For sub-zero service, materials having a suitable impact resistance must be used; recommendations will be furnished on request.

Cranelap Flanges and Joints: These ratings also apply to Cranelap Flanges, the rating being dependent upon the type of facing applied to the lapped pipe end. Ratings for Cranelap Joints are contingent upon the use of pipe of proper material having an equal or higher rating.

Standards: Crane pressure-temperature ratings agree with those in Supplement No. 1 (ASA B16e6-1949) to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, and those in the American Petroleum Institute (API) Standard No. 600, Second Edition, 1951.

Forged Steel Flanges

For working pressures, see the preceding page.

A complete line: The Crane line of Forged Steel Flanges includes a complete assortment of types in a wide range of straight and reducing sizes for seven different pressure classes (150, 300, 400, 600, 900, 1500, and 2500-Pound). The flanges are made in a variety of materials and with various flange facings, providing flanges for every service requirement.

Materials: Flanges made of Crane Forged Carbon Steel will be furnished unless otherwise ordered. List prices are shown on the two pages following (list prices of 2500-Pound Flanges are furnished on application).

Flanges in 300-Pound and higher pressure classes, made of Crane No. 4 Carbon-Molybdenum or Crane No. 5 Chrome-Molybdenum Forged Steel, can be furnished when orders so specify. See the Crane Discount Sheet for prices.

When so ordered, 150 and 300-Pound Forged Carbon Steel Flanges can be furnished heat treated (normalized or annealed) to conform to A.S.T.M. Specification A 105; prices on request.

Drilling: Flanges of each pressure class are furnished faced, drilled, and spot faced (F.D. & S.F.) unless otherwise ordered. List prices include drilling to the corresponding pressure class of the American Standard. No deduction is made if flanges are ordered faced only.

Flange facings: The 150 and 300-Pound Forged Steel Screwed, Slip-On Welding, Welding Neck, and Blind Flanges are regularly furnished with an American Standard 1/16-inch raised face.

In the 400, 600, 900, 1500, and 2500-Pound pressure classes, these flanges are regularly furnished with an American Standard 1/4-inch male face (large male) or an American Standard 3/16-inch female face (large female); unless otherwise specified, flanges with large male face will be furnished.

When so ordered, the flanges can be furnished with other types of facing, such as ring joint, tongue, groove, etc. See the Crane Discount Sheet for prices.

Finish of flange faces: The 1/16-inch raised faces and the 1/4-inch large male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish. A smooth finish can be furnished on the raised or male faces, when so specified; refer to the Crane Discount Sheet for prices.

Large female faces have a smooth finish.

List prices of reducing flanges: The list prices of Reducing Screwed and Reducing Slip-On Welding Flanges apply to any reduction. The price is governed by the outside diameter of the flange.

Ordering reducing flanges: When ordering reducing flanges, the reduced size should be designated first, and then the outside diameter of the flange. For example, a 600-Pound Flange to connect a 6-inch pipe to a 10-inch valve or fitting (O.D. of flange, 20 inches) should be ordered:

6" x 20" Reducing Flange.

Reducing Welding Neck Flanges: Reducing Welding Neck Flanges can be made to order. For prices, see the Crane Discount Sheet.

Eccentric Reducing Flanges: Forged Steel Eccentric Reducing Screwed and Slip-On Welding Flanges can be made to order. For prices, see the Crane Discount Sheet.

Reducing Cranelap Flanges: Reducing Cranelap Flanges are not recommended or manufactured; another type of flanged joint or connection should be used.

American Standard: The dimensions and drilling of all flanges conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

The American Standard does not include 400, 600, 900, or 1500-Pound Slip-On Welding Flanges. Crane flanges of this type have the same dimensions as American Standard Steel Screwed Flanges, being bored instead of threaded.

3-inch 300 and 600-Pound Cranelap Joints: When 3-inch 300 or 600-Pound Flanges with ring joint facing are to be bolted to Cranelap joints, orders must so specify; they require a groove of special pitch diameter. See page 470 for dimensions.

List prices . . . . pages 294 and 295
Dimensions . . . . pages 296 and 297
Description of materials . . . pages 1 to 9
Templates for drilling . . . pages 461 to 463

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Forged Steel Flanges

For working pressures and description, see the preceding two pages.



Screwed Flange

No. 556, 150-Pound
No. 291 E, 300-Pound
No. 651 E, 400-Pound
No. 856 E, 600-Pound
No. 1266 E, 900-Pound
No. 1556 E, 1500-Pound



Reducing Screwed Flange
(See "Ordering Reducing Flanges", page 295.)

No. 558½, 150-Pound
No. 292 E, 300-Pound
No. 658 E, 400-Pound
No. 857 E, 600-Pound
No. 1263 E, 900-Pound
No. 1558 E, 1500-Pound



Blind Flange

No. 556½, 150-Pound
No. 297 E, 300-Pound
No. 657 E, 400-Pound
No. 858 E, 600-Pound
No. 1267 E, 900-Pound
No. 1557 E, 1500-Pound



Cranelap Flange

No. 572, 150-Pound
No. 496 E, 300-Pound
No. 664 E, 400-Pound
No. 862 E, 600-Pound
No. 1262 E, 900-Pound
No. 1562 E, 1500-Pound



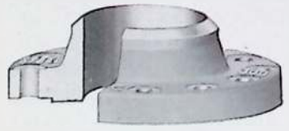
Slip-On Welding Flange

No. 554, 150-Pound
No. 294 E, 300-Pound
No. 694 E, 400-Pound
No. 854 E, 600-Pound
No. 1294 E, 900-Pound
No. 1594 E, 1500-Pound



Reducing
Slip-On Welding Flange
(See "Ordering Reducing Flanges", page 295.)

No. 554½, 150-Pound
No. 290 E, 300-Pound
No. 693 E, 400-Pound
No. 853 E, 600-Pound
No. 1295 E, 900-Pound
No. 1595 E, 1500-Pound



Welding Neck Flange
(For boring, see page 298.)

No. 568, 150-Pound
No. 296 E, 300-Pound
No. 656 E, 400-Pound
No. 855 E, 600-Pound
No. 1265 E, 900-Pound
No. 1565 E, 1500-Pound

List Prices, Each—Faced, Drilled, and Spot Faced

Class	Size of Pipe, Inches	Straight Size Flanges: Screwed, Cranelap, or Slip-On Welding	Straight Size Flanges: Welding Neck (For boring, see page 298.)	Straight Size Flanges: Blind	Reducing Flanges: Outside Diameter of Flange, Inches	Reducing Flanges: Screwed or Slip-On Welding
150 Pound	½	8.00	11.00	11.50		
	¾	8.00	11.00	11.50		
	1	8.00	11.00	11.50	4¼	16.00
	1¼	9.00	11.00	11.50	4⅝	18.00
	1½	10.00	11.00	11.50	5	20.00
	2	11.00	11.00	12.60	6	21.00
	2½	13.00	13.00	14.70	7	24.50
	3	15.00	15.00	17.05	7½	28.00
	3½	19.00	19.00	21.65	8½	35.00
	4	20.00	20.00	23.70	9	37.00
	5	24.00	24.00	28.20	10	44.00
	6	27.00	27.00	31.60	11	49.00
	8	35.00	44.00	42.00	13½	63.00
	10	48.00	62.00	58.00	16	86.00
	12	60.00	96.00	76.00	19	108.00
	14	80.00	130.00	126.00	21	144.00
	16	100.00	165.00	147.00	23½	180.00
	18	125.00	220.00	210.00	25	225.00
	20	150.00	290.00	252.00	27½	270.00
	24	240.00	380.00	320.00	32	380.00
300 Pound	½	8.00	11.00	11.50		
	¾	8.00	11.00	11.50		
	1	8.00	11.00	11.50	4⅞	16.00
	1¼	9.00	11.00	11.50	5¼	18.00
	1½	10.00	11.00	11.50	6⅛	20.00
	2	11.00	11.00	12.60	6½	21.00
	2½	13.00	13.00	14.70	7½	24.50
	*3	15.00	15.00	17.05	8¼	28.00
	3½	19.00	19.00	21.65	9	35.00
	4	20.00	20.00	23.70	10	37.00
	5	24.00	24.00	28.20	11	44.00
	6	27.00	27.00	31.60	12½	49.00
	8	35.00	44.00	42.00	15	63.00
	10	48.00	62.00	58.00	17½	86.00
	12	60.00	96.00	76.00	20½	108.00
	14	80.00	130.00	126.00	23	144.00
	16	100.00	165.00	147.00	25½	180.00
	18	125.00	220.00	210.00	28	225.00
	20	150.00	290.00	252.00	30½	270.00
	24	240.00	380.00	320.00	36	380.00

*3" 300-Pound flanges with ring joint facing to bolt against a Cranelap joint must be specially ordered; they require a groove of special pitch diameter. See page 470 for dimensions.

(Continued on the following page)

Galvanized Flanges . . . . page 476

Forged Steel Flanges

List Prices, Each—Faced, Drilled, and Spot Faced (Cont.)

Class	Size of Pipe, Inches	Straight Size Flanges: Screwed, Cranelap, or Slip-On Welding	Straight Size Flanges: Welding Neck (For boring see page 298.)	Straight Size Flanges: Blind	Reducing Flanges: Outside Diameter of Flange, Inches	Reducing Flanges: Screwed or Slip-On Welding
400 Pound. For smaller sizes, use 600 Pound.	4	20.00	20.00	23.70	10	37.00
	5	24.00	24.00	28.20	11	44.00
	6	27.00	27.00	31.60	12½	49.00
	8	35.00	44.00	42.00	15	63.00
	10	48.00	62.00	58.00	17½	86.00
	12	60.00	96.00	76.00	20½	108.00
	14	80.00	130.00	126.00	23	144.00
	16	100.00	165.00	147.00	25½	180.00
	18	125.00	220.00	210.00	28	225.00
	20	150.00	290.00	252.00	30½	270.00
	24	240.00	380.00	320.00	36	380.00
600 Pound	½	9.50	16.30	11.50		
	¾	9.50	16.30	11.50		
	1	10.00	16.30	11.50	4⅞	16.00
	1¼	10.75	16.30	11.50	5¼	18.00
	1½	11.75	16.30	11.50	6⅛	20.00
	2	13.00	16.30	12.60	6½	21.00
	2½	15.00	19.00	14.70	7½	24.50
	*3	18.50	23.00	17.05	8¼	28.00
	3½	22.50	29.00	21.65	9	35.00
	4	33.00	39.00	40.00	10¾	57.00
	5	46.00	53.50	56.00	13	79.00
	6	55.00	63.50	66.00	14	94.00
	8	80.00	90.00	96.00	16½	136.00
	10	125.00	138.00	150.00	20	212.50
	12	150.00	188.00	180.00	22	255.00
	14	180.00	200.00	216.00	23¾	306.00
	16	240.00	270.00	288.00	27	408.00
	18	300.00	330.00	360.00	29¼	510.00
	20	360.00	400.00	432.00	32	612.00
	24	540.00	590.00	648.00	37	918.00
900 Pound. For smaller sizes, use 1500 Pound.	3	29.00	35.00	35.00	9½	48.00
	4	51.00	62.00	62.00	11½	81.00
	5	71.00	85.00	85.00	13¾	113.00
	6	86.00	104.00	104.00	15	137.00
	8	155.00	190.00	190.00	18½	245.00
	10	225.00	270.00	270.00	21½	360.00
	12	300.00	360.00	360.00	24	480.00
	14	380.00	560.00	455.00	25¼	610.00
	16	460.00	690.00	555.00	27¾	740.00
	18	650.00	925.00	780.00	31	1040.00
	20	795.00	1160.00	955.00	33¾	1275.00
	24	1500.00	2100.00	1800.00	41	2400.00
1500 Pound (Prices of 14-inch Flanges on request)	½	14.00	27.00	17.00		
	¾	14.00	27.00	17.00		
	1	14.00	27.00	17.00	5⅞	22.00
	1¼	14.00	27.00	17.00	6¼	22.00
	1½	16.00	27.00	19.00	7	26.00
	2	22.00	27.00	27.00	8½	35.00
	2½	29.00	35.00	35.00	9⅝	48.00
	3	38.00	46.00	46.00	10½	60.00
	4	60.00	72.00	72.00	12¼	96.00
	5	105.00	125.00	125.00	14¾	170.00
	6	132.00	160.00	160.00	15½	210.00
	8	220.00	265.00	265.00	19	350.00
	10	365.00	440.00	440.00	23	565.00
	12	550.00	660.00	660.00	26½	800.00

Dimensions . . . . pages 296 and 297

Description . . . . page 293

Ordering Reducing Flanges

When ordering reducing flanges, the reduced size should be designated first, and then the outside diameter of the flange. For example, a 600-Pound Flange to connect a 6-inch pipe to a 10-inch valve or fitting (O.D. of flange, 20 inches) should be ordered:

6" x 20" Reducing Flange.

Facings

In the 150 and 300-Pound pressure classes, Screwed, Slip-On Welding, Welding Neck, and Blind Flanges are regularly furnished with a 1/16-inch raised face.

In the 400, 600, 900, and 1500-Pound pressure classes, the flanges are furnished with a ¼-inch large male or (if specified) a 3/16-inch large female face.

Other flange facings such as ring joint, tongue, groove, etc., can be furnished on order; see the Crane Discount Sheet for prices.

Welding Neck Flanges

For information on boring of Welding Neck Flanges, see page 298.

Cranelap Flanges

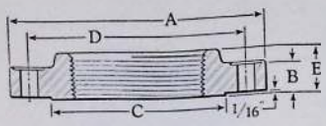
For information on complete Cranelap Joints, see page 505. Cranelap Flanges also are recommended for use in combination with Cranelap Stub Ends; see pages 280 to 283.

*3-inch Cranelap Joints (300 or 600-Pound)

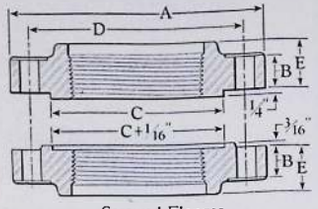
When 3-inch 300 or 600-Pound Flanges with ring joint facing are to be bolted to Cranelap joints, orders must so specify; they require a groove of special pitch diameter. See page 470 for dimensions.

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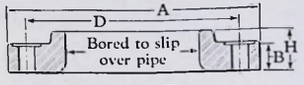
Forged Steel Flanges



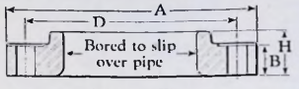
Screwed Flange
150 and 300-Pound



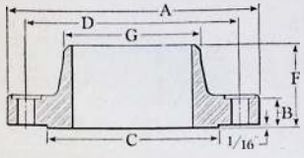
Screwed Flanges
400, 600, 900, 1500, and 2500-Pound



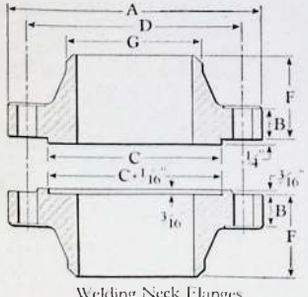
Cranelap Flange
150 and 300-Pound



Cranelap Flange
400, 600, 900, 1500, and 2500-Pound

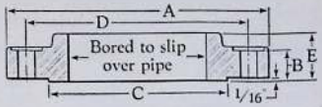


Welding Neck Flange
150 and 300-Pound
For boring, see page 298.

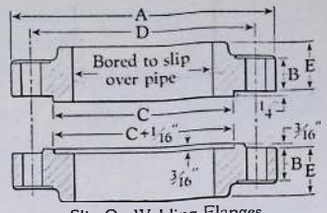


Welding Neck Flanges
400, 600, 900, 1500, and 2500-Pound
For boring, see page 298.

Dimensions, in Inches



Slip-On Welding Flange
150 and 300-Pound



Slip-On Welding Flanges
400, 600, 900, and 1500-Pound

Class	Pipe Size	A	B	C	D	Bolts No.	Bolts Dia.	E	F	G	H
150 Pound	1/2	3 1/2	7/16	1 3/8	2 3/8	4	1/2	5/8	1 7/8	0.84	5/8
	3/4	3 7/8	1/2	1 11/16	2 3/4	4	1/2	5/8	2 1/16	1.05	5/8
	1	4 1/4	9/16	2	3 1/8	4	1/2	11/16	2 3/16	1.32	11/16
	1 1/4	4 5/8	5/8	2 1/2	3 1/2	4	1/2	13/16	2 1/4	1.66	13/16
	1 1/2	5	11/16	2 7/8	3 7/8	4	1/2	7/8	2 7/16	1.90	7/8
	2	6	3/4	3 5/8	4 3/4	4	5/8	1	2 1/2	2.38	1
	2 1/2	7	7/8	4 1/8	5 1/2	4	5/8	1 1/8	2 3/4	2.88	1 1/8
	3	7 1/2	15/16	5	6	4	5/8	1 3/16	2 3/4	3.50	1 3/16
	3 1/2	8 1/2	15/16	5 1/2	7	8	5/8	1 1/4	2 13/16	4.00	1 1/4
	4	9	15/16	6 3/16	7 1/2	8	5/8	15/16	3	4.50	15/16
	5	10	15/16	7 5/16	8 1/2	8	3/4	1 7/16	3 1/2	5.56	1 7/16
	6	11	1	8 1/2	9 1/2	8	3/4	1 9/16	(3 1/2)	6.63	1 9/16
	8	13 1/2	1 1/8	10 5/8	11 3/4	8	3/4	1 3/4	4	8.63	1 3/4
	10	16	1 3/16	12 3/4	14 1/4	12	7/8	1 15/16	4	10.75	1 15/16
	12	19	1 1/4	15	17	12	7/8	2 3/16	4 1/2	12.75	2 3/16
	14	21	1 3/8	16 1/4	18 3/4	12	1	2 1/4	5	14.00	3 1/8
	16	23 1/2	1 7/16	18 1/2	21 1/4	16	1	2 1/2	5	16.00	3 7/16
	18	25	1 9/16	21	22 3/4	16	1 1/8	2 11/16	5 1/2	18.00	3 13/16
	20	27 1/2	1 11/16	23	25	20	1 1/8	2 7/8	5 11/16	20.00	4 1/16
	24	32	1 7/8	27 1/4	29 1/2	20	1 1/4	3 1/4	6	24.00	4 3/8
300 Pound	1/2	3 3/4	9/16	1 3/8	2 5/8	4	1/2	7/8	2 1/16	0.84	7/8
	3/4	4 5/8	5/8	1 11/16	3 1/4	4	5/8	1	2 1/4	1.05	1
	1	4 7/8	11/16	2	3 1/2	4	5/8	1 1/16	2 7/16	1.32	1 1/16
	1 1/4	5 1/4	3/4	2 1/2	3 7/8	4	5/8	1 1/16	2 9/16	1.66	1 1/16
	1 1/2	6 1/8	13/16	2 7/8	4 1/2	4	3/4	1 3/16	2 11/16	1.90	1 3/16
	2	6 1/2	7/8	3 5/8	5	8	5/8	1 5/16	2 3/4	2.38	1 5/16
	2 1/2	7 1/2	1	4 1/8	5 7/8	8	3/4	1 1/2	3	2.88	1 1/2
	3	8 1/4	1 1/8	5	6 5/8	8	3/4	1 11/16	3 1/8	3.50	1 11/16
	3 1/2	9	1 3/16	5 1/2	7 1/4	8	3/4	1 3/4	3 3/16	4.00	1 3/4
	4	10	1 1/4	6 3/16	7 7/8	8	3/4	1 7/8	3 3/8	4.50	1 7/8
	5	11	1 3/8	7 5/16	9 1/4	8	3/4	2	3 7/8	5.56	2
	6	12 1/2	1 7/16	8 1/2	10 5/8	12	3/4	2 1/16	3 7/8	6.63	2 1/16
	8	15	1 5/8	10 3/8	13	12	7/8	2 7/16	4 3/8	8.63	2 7/16
	10	17 1/2	1 7/8	12 3/4	15 1/4	16	1	2 5/8	4 5/8	10.75	3 3/4
	12	20 1/2	2	15	17 3/4	16	1 1/8	2 7/8	5 1/8	12.75	4
	14	23	2 1/8	16 1/4	20 1/4	20	1 1/8	3	5 5/8	14.00	4 3/8
	16	25 1/2	2 1/4	18 1/2	22 1/2	20	1 1/4	3 1/4	5 3/4	16.00	4 3/4
	18	28	2 3/8	21	24 3/4	24	1 1/4	3 1/2	6 1/4	18.00	5 1/8
	20	30 1/2	2 1/2	23	27	24	1 1/4	3 3/4	6 3/8	20.00	5 1/2
	24	36	2 3/4	27 1/4	32	24	1 1/2	4 3/16	6 5/8	24.00	6
400 Pound	4	10	1 3/8	6 3/16	7 7/8	8	7/8	2	3 1/2	4.50	2
	5	11	1 1/2	7 5/16	9 1/4	8	7/8	2 1/8	4	5.56	2 1/8
	6	12 1/2	1 5/8	8 1/2	10 5/8	12	7/8	2 1/4	4 1/16	6.63	2 1/4
	8	15	1 7/8	10 5/8	13	12	1	2 11/16	4 5/8	8.63	2 11/16
	10	17 1/2	2 1/8	12 3/4	15 1/4	16	1 1/8	2 7/8	4 7/8	10.75	4
	12	20 1/2	2 1/4	15	17 3/4	16	1 1/4	3 1/8	5 3/8	12.75	4 1/4
	14	23	2 3/8	16 1/4	20 1/4	20	1 1/4	3 5/16	5 7/8	14.00	4 5/8
	16	25 1/2	2 1/2	18 1/2	22 1/2	20	1 3/8	3 11/16	6	16.00	5
	18	28	2 5/8	21	24 3/4	24	1 3/8	3 7/8	6 1/2	18.00	5 3/8
	20	30 1/2	2 3/4	23	27	24	1 1/2	4	6 5/8	20.00	5 3/4
	24	36	3	27 1/4	32	24	1 3/4	4 1/2	6 7/8	24.00	6 1/4

Dimensions, in Inches (Cont.)

Class	Pipe Size	A	B	C	D	Bolts No.	Bolts Dia.	E	F	G	H
600 Pound	1/2	3 3/4	5/16	1 3/8	2 5/8	4	1/2	7/8	2 1/16	0.84	7/8
	3/4	4 5/8	5/8	1 11/16	3 1/4	4	5/8	1	2 1/4	1.05	1
	1	4 7/8	11/16	2	3 1/2	4	5/8	1 1/16	2 7/16	1.32	1 1/16
	1 1/4	5 1/4	13/16	2 1/2	3 7/8	4	5/8	1 1/8	2 5/8	1.66	1 1/8
	1 1/2	6 1/8	7/8	2 7/8	4 1/2	4	3/4	1 1/4	2 3/4	1.90	1 1/4
	2	6 1/2	1	3 5/8	5	8	5/8	1 7/16	2 7/8	2.38	1 7/16
	2 1/2	7 1/2	1 1/8	4 1/8	5 7/8	8	3/4	1 5/8	3 1/8	2.88	1 5/8
	3	8 1/4	1 1/4	5	6 5/8	8	3/4	1 13/16	3 1/4	3.50	1 13/16
	3 1/2	9	1 3/8	5 1/2	7 1/4	8	7/8	1 15/16	3 3/8	4.00	1 15/16
	4	10 3/4	1 1/2	6 5/16	8 1/2	8	7/8	2 1/8	4	4.50	2 1/8
	5	13	1 3/4	7 5/16	10 1/2	8	1	2 3/8	4 1/2	5.56	2 3/8
	6	14	1 7/8	8 1/2	11 1/2	12	1	2 5/8	4 5/8	6.63	2 5/8
	8	16 1/2	2 3/16	10 5/8	13 3/4	12	1 1/8	3	5 1/4	8.63	3
	10	20	2 1/2	12 3/4	17	16	1 1/4	3 3/8	6	10.75	4 3/8
	12	22	2 5/8	15	19 1/4	20	1 1/4	3 5/8	6 1/8	12.75	4 5/8
	14	23 3/4	2 3/4	16 1/4	20 3/4	20	1 3/8	3 11/16	6 1/2	14.00	5
	16	27	3	18 1/2	23 3/4	20	1 1/2	4 3/16	7	16.00	5 1/2
	18	29 1/4	3 1/4	21	25 3/4	20	1 5/8	4 5/8	7 1/4	18.00	6
	20	32	3 1/2	23	28 1/2	24	1 5/8	5	7 1/2	20.00	6 1/2
	24	37	4	27 1/4	33	24	1 7/8	5 1/2	8	24.00	7 1/4
900 Pound	3	9 1/2	1 1/2	5	7 1/2	8	7/8	2 1/8	4	3.50	2 1/8
	4	11 1/2	1 3/4	6 3/16	9 1/4	8	1 1/8	2 3/4	4 1/2	4.50	2 3/4
	5	13 3/4	2	7 5/16	11	8	1 1/4	3 1/8	5	5.56	3 1/8
	6	15	2 3/16	8 1/2	12 1/2	12	1 1/8	3 3/8	5 1/2	6.63	3 3/8
	8	18 1/2	2 1/2	10 5/8	15 1/2	12	1 3/8	4	6 3/8	8.63	4 1/2
	10	21 1/2	2 3/4	12 3/4	18 1/2	16	1 3/8	4 1/4	7 1/4	10.75	5
	12	24	3 1/4	15	21	20	1 3/8	4 5/8	7 7/8	12.75	5 5/8
	14	25 1/4	3 3/8	16 1/4	22	20	1 1/2	5 1/8	8 3/8	14.00	6 1/8
	16	27 3/4	3 1/2	18 1/2	24 1/4	20	1 5/8	5 1/4	8 1/2	16.00	6 1/2
	18	31	4	21	27	20	1 7/8	6	9	18.00	7 1/2
	20	33 3/4	4 1/4	23	29 1/2	20	2	6 1/4	9 3/4	20.00	8 1/4
	24	41	5 1/2	27 1/4	35 1/2	20	2 1/2	8	11 1/2	24.00	10 1/2
1500 Pound	1/2	4 3/4	7/8	1 3/8	3 1/4	4	3/4	1 1/4	2 3/8	0.84	1 1/4
	3/4	5 1/8	1	1 11/16	3 1/2	4	3/4	1 3/8	2 3/4	1.05	1 3/8
	1	5 7/8	1 1/8	2	4	4	7/8	1 5/8	2 7/8	1.32	1 5/8
	1 1/4	6 1/4	1 1/8	2 1/2	4 3/8	4	7/8	1 5/8	2 7/8	1.66	1 5/8
	1 1/2	7	1 1/4	2 7/8	4 7/8	4	1	1 3/4	3 1/4	1.90	1 3/4
	2	8 1/2	1 1/2	3 5/8	6 1/2	8	7/8	2 1/4	4	2.38	2 1/4
	2 1/2	9 5/8	1 5/8	4 1/8	7 1/2	8	1	2 1/2	4 1/8	2.88	2 1/2
	3	10 1/2	1 7/8	5	8	8	1 1/8	2 7/8	4 5/8	3.50	2 7/8
	4	12 1/4	2 1/8	6 3/16	9 1/2	8	1 1/4	3 9/16	4 7/8	4.50	3 9/16
	5	14 3/4	2 7/8	7 5/16	11 1/2	8	1 1/2	4 1/8	6 1/8	5.56	4 1/8
	6	15 1/2	3 1/4	8 1/2	12 1/2	12	1 3/8	4 11/16	6 3/4	6.63	4 11/16
	8	19	3 5/8	10 5/8	15 1/2	12	1 5/8	5 5/8	8 3/8	8.63	5 5/8
	10	23	4 1/4	12 3/4	19	12	1 7/8	6 1/4	10	10.75	7
	12	26 1/2	4 7/8	15	22 1/2	16	2	7 1/8	11 1/8	12.75	8 5/8
	14	29 1/2	5 1/4	16 1/4	25	16	2 1/4		11 3/4	14.00	9 1/2
2500 Pound	1/2	5 1/4	13/16	1 3/8	3 1/2	4	3/4	1 9/16	2 7/8	0.84	1 9/16
	3/4	5 1/2	1 1/4	1 11/16	3 3/4	4	3/4	1 11/16	3 1/8	1.05	1 11/16
	1	6 1/4	1 3/8	2	4 1/4	4	7/8	1 7/8	3 1/2	1.32	1 7/8
	1 1/4	7 1/4	1 1/2	2 1/2	5 1/8	4	1	2 1/16	3 3/4	1.66	2 1/16
	1 1/2	8	1 3/4	2 7/8	5 3/4	4	1 1/8	2 3/8	4 3/8	1.90	2 3/8
	2	9 1/4	2	3 5/8	6 3/4	8	1	2 3/4	5	2.38	2 3/4
	2 1/2	10 1/2	2 1/4	4 1/8	7 3/4	8	1 1/8	3 1/8	5 5/8	2.88	3 1/8
	3	12	2 5/8	5	9	8	1 1/4	3 5/8	6 5/8	3.50	3 5/8
	4	14	3	6 3/16	10 3/4	8	1 1/2	4 1/4	7 1/2	4.50	4 1/4
	5	16 1/2	3 5/8	7 5/16	12 3/4	8	1 3/4	5 1/8	9	5.56	5 1/8
	6	19	4 1/4	8 1/2	14 1/2	8	2	6	10 3/4	6.63	6
	8	21 3/4	5	10 5/8	17 1/4	12	2	7	12 1/2	8.63	7
	10	26 1/2	6 1/2	12 3/4	21 1/4	12	2 1/2	9	16 1/2	10.75	10
	12	30	7 1/4	15	24 3/8	12	2 3/4	10	18 1/4	12.75	10

Facings: In the 150 and 300-Pound pressure classes, Screwed, Slip-On Welding, Welding Neck, and Blind Flanges are regularly furnished with a 1/16-inch high raised face.

In the 400, 600, 900, 1500, and 2500-Pound pressure classes, the flanges are furnished with either a 1/4-inch large male or (if specified) a 3/16-inch large female face.

For description and dimensions of special facings, see pages 468 to 471.

Cranelap joints: Complete dimensions of Cranelap joints (except 2500-Pound) are shown on page 508.

Complete dimensions of 2500-Pound Cranelap Joints will be furnished on application. Requests should be accompanied by detailed specifications, including the thickness of the pipe, the kind of lap, and the type of facing required on the lap.

American Standard: The dimensions and drilling of flanges conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

The American Standard does not include 400, 600, 900, or 1500-Pound Slip-On Welding Flanges. Crane flanges of this type have the same dimensions as American Standard Steel Screwed Flanges, being bored instead of threaded.

Templates for drilling ..... *pages 461 to 463*
Special facings ..... *pages 468 to 471*
Boring of Welding Neck Flanges ..... *page 298*
Working pressures ..... *page 292*

List prices ..... *pages 294 and 295*
Description ..... *page 293*

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Boring of Welding Neck Flanges

Unless otherwise specified, Crane Forged Steel Welding Neck Flanges are regularly bored to match the inside diameter of the pipe listed in the table below:

Size of Pipe Inches	No. 568 150-Pound Flanges	No. 296 E 300-Pound Flanges	No. 656 E 400-Pound Flanges	No. 855 E 600-Pound Flanges	No. 1265 E 900-Pound Flanges	No. 1565 E 1500-Pound Flanges	Equivalent A.S.A. Schedule Numbers: For Standard Pipe	Equivalent A.S.A. Schedule Numbers: For Extra Strong Pipe
½	*Standard Pipe (Heaviest weight on 8, 10, and 12-inch sizes)		*Extra Strong Pipe		†Orders must specify diameter of bore. (900 and 1500-Pound Flanges not listed in 3½-inch size.)		Schedule 40	Schedule 80
¾								
1								
1¼								
1½								
2								
2½								
3								
3½								
4								
5								
6								
8								
10								Schedule 60
12							None	None
14	*O.D. Pipe ⅜-inch Thick		*O.D. Pipe ½-inch Thick	†Orders must specify diameter of bore.			‡ Schedule 30	§ None
16								Schedule 40
18							‡ None	§ None
20							‡ Schedule 20	§ Schedule 30
24								None

*An extra charge is made if any other bore is specified.
†An extra charge is made if a bore smaller than that listed in the left hand portion of the table below is specified.
‡This is O.D. Pipe, ⅜-inch thick. §This is O.D. Pipe, ½-inch thick.

All Dimensions Are In Inches

Size of Pipe Inches	***Smallest diameter to which Crane Welding Neck Flanges can be bored. 150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	Inside Diameter of Pipe (Included for convenient reference) "S"	"X"	"XX"	A.S.A. Schedule Numbers 10	20	30	40	60	80	100	120	140	160
½	**	**	.....	**	.....	**	.622	.546	.252				.622		.546				.466
¾	**	**	.....	**	.....	**	.824	.742	.434				.824		.742				.614
1	.91	.95	.....	.95	.....	**	1.049	.957	.599				1.049		.957				.815
1¼	1.25	1.27	.....	1.27	.....	**	1.380	1.278	.896				1.380		1.278				1.160
1½	1.50	1.46	.....	1.46	.....	**	1.610	1.500	1.100				1.610		1.500				1.338
2	1.93	1.91	.....	1.91	.....	1.46	2.067	1.939	1.503				2.067		1.939				1.689
2½	2.31	2.28	.....	2.31	.....	1.72	2.469	2.323	1.771				2.469		2.323				2.125
3	2.84	2.84	.....	2.87	2.59	2.22	3.068	2.900	2.300				3.068		2.900				2.626
3½	3.28	3.28	.....	3.28	.....	.....	3.548	3.364					3.548		3.364				
4	3.78	3.68	3.81	3.78	3.41	3.03	4.026	3.826	3.152				4.026		3.826		3.626		3.438
5	4.78	4.72	4.81	4.72	4.22	4.06	5.047	4.813	4.063				5.047		4.813		4.563		4.313
6	5.75	5.72	5.72	5.75	5.12	4.84	6.065	5.761	4.897				6.065		5.761		5.501		5.189
8	7.59	7.56	7.59	7.62	7.12	6.81	7.981	7.625	6.875		8.125	8.071	7.981	7.813	7.625	7.439	7.189	7.001	6.813
10	9.75	9.72	9.56	9.56	8.96	8.25	10.020	9.750			10.250	10.136	10.020	9.750	9.564	9.314	9.064	8.750	8.500
12	11.75	11.59	11.37	11.34	10.75	10.12	12.000	11.750			12.250	12.090	11.938	11.626	11.376	11.064	10.750	10.500	10.126
14	12.96	13.00	13.00	12.12	13.00	.....	13.250	13.000		13.500	13.376	13.250	13.126	12.814	12.500	12.126	11.814	11.500	11.188
16	14.96	15.00	15.00	13.93	15.00	.....	15.250	15.000		15.500	15.376	15.250	15.000	14.688	14.314	13.938	13.564	13.126	12.814
18	17.00	16.87	16.87	16.50	17.00	.....	17.250	17.000		17.500	17.376	17.126	16.876	16.500	16.125	15.688	15.250	14.876	14.438
20	19.00	18.81	18.81	18.50	19.00	.....	19.250	19.000		19.500	19.250	19.000	18.814	18.376	17.938	17.438	17.000	16.500	16.064
24	23.00	23.00	22.50	22.50	23.00	.....	23.250	23.000		23.500	23.250	22.876	22.626	22.064	21.564	20.938	20.376	19.876	19.314

"S" indicates Standard Pipe (heaviest weight on 8, 10, and 12-inch sizes and ⅜-inch thick O.D. Pipe on 14-inch and larger.)
"X" indicates Extra Strong Pipe (½-inch thick O.D. Pipe on sizes 14-inch and larger).
"XX" indicates Double Extra Strong Pipe.
**These flanges are forged solid. ***Flanges suitable for pipe with smaller inside diameter are entirely special; prices on application

Note: The actual diameter of bore in Crane Forged Steel Welding Neck Flanges is subject to the following tolerances as defined by the American Standard B16e-1939: sizes 10-inch and smaller plus or minus 1/32-inch; sizes 12 to 18-inch, inclusive, plus or minus 1/16-inch; and 20 and 24-inch sizes plus 1/8-inch or minus 1/16-inch.

List prices of flanges ..... *pages 294 and 295*
Dimensions of flanges ..... *pages 296 and 297*
Pressure-temperature ratings ..... *page 292*

Pulp Stock, Stop-Check, Blow-Off, Back Pressure, Lubricated Plug, and Float Valves

Pulp Stock Valves ..... page 300

Stop-Check Valves (Non-Return Valves)
Service and General Description ..... page 301
Features and Recommended Installation ..... page 302
Selecting the Proper Size ..... pages 306 and 307
Determining Pressure Drop ..... pages 306 and 307
250-Pound Ferrosteel ..... page 303
300-Pound Cast Steel ..... page 304
400-Pound Cast Steel ..... page 305
600-Pound Cast Steel ..... page 305

Blow-Off Valves ..... page 308
Locomotive Steam Heat End Valves ..... page 309
Exhaust Relief Valves ..... page 310
Back Pressure Valves ..... pages 310 and 311
Pressure Relief Valves ..... page 311

Nordstrom Lubricated Plug Valves ..... pages 312 and 313
Clayton Valves and Controls ..... pages 314 to 316
Klipfel Tank Float and Lever Valves ..... page 317
Backflow Preventers ..... page 318

For Stop-Check Valves for Higher Pressures, Use Crane Pressure-Seal Bonnet Valves; see pages 214 to 217

Nearly every piping installation requires the use of at least a few items which are generally called "specialties", or more specifically "special duty valves"—valves which are designed for only one particular service or which automatically perform a special function. The Crane line of such valves includes a wide assortment of types and sizes to fill all normal requirements.

For greater convenience in catalog use, the Crane line of special duty valves and of specialties has been divided into several groups. In addition to those indexed above, the line includes:

Safety and Relief Valves ..... pages 319 to 334
Pressure Regulators and Pressure Reducing Valves ..... pages 336 to 342
Steam Traps ..... pages 345 to 348
Steam and Oil Separators; Sediment Separators ..... pages 354 to 357
Expansion Joints ..... pages 350 to 352

Water Gauges and Accessories ..... pages 360 and 361
Whistles and Fusible Plugs ..... page 362
Flexible Joints ..... pages 363 to 365
Gauges and Thermometers ..... pages 366 and 367
Lubricators; Oilers; Injectors; Ejectors; Boiler Controls ..... pages 372 to 374

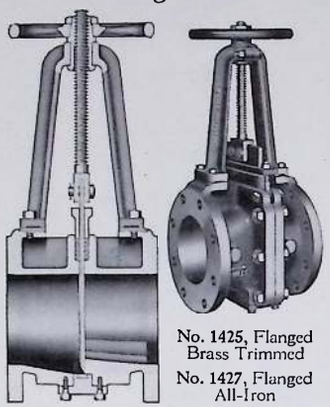
Brass Lever-Operated Quick-Opening Valves ..... pages 54 to 56
Brass Butterfly and Throttle Valves ..... page 57
Bronze Chronometer Valves ..... page 403
Iron Butterfly Valves ..... page 111

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Iron Body Pulp Stock Valves

Brass Trimmed or All-Iron

Outside Screw, Rising Stem



No. 1425, Flanged Brass Trimmed
No. 1427, Flanged All-Iron

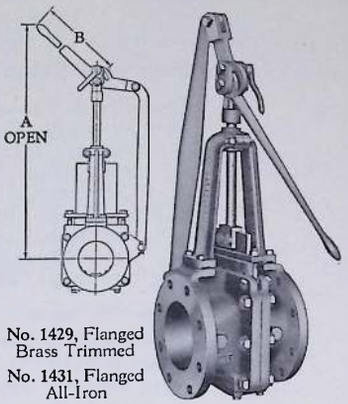
60 pounds
water working pressure

Self-Cleaning—Non-Clogging
Easy Operating—Full Port Area
Shearing Action

These valves are especially designed and recommended for pulp stock lines in pulp and paper mills. In this service they provide a tight shut-off because the wood pulp packs itself around the disc when the valve is closed and effectively seals it against leakage.

All-iron valves are used where the liquid would corrode brass but not iron.

Quick-Opening



No. 1429, Flanged Brass Trimmed
No. 1431, Flanged All-Iron

List Prices, and Dimensions, in Inches

Size		Inches	4	6	8	10	12	14	16	18	20	24
Price, Each F. & D.	No. 1425, Brass Trimmed		195.00	235.00	315.00	410.00	520.00	655.00	815.00	1100.00	1730.00	2450.00
	No. 1427, All-Iron		215.00	260.00	345.00	450.00	570.00	715.00	900.00	1200.00	1900.00	2700.00
	No. 1429, Brass Trimmed		215.00	265.00	355.00	460.00	580.00	735.00	920.00			
	No. 1431, All-Iron		235.00	290.00	385.00	500.00	630.00	795.00	1000.00			
Face to face			9	10½	11½	13	14	15	16	17	18	20
O. S. & Y.	Center to top, open		22¼	27½	34⅞	41	47¾	52⅝	58¼	64	72	85¼
	Diameter of wheel		10	10	12	14	16	16	18	20	20	30
Quick-Opening	A		33¼	43¼	57	68¾	80¾	90½	95			
	B		12	23	29	41	41	41	41			
Diameter of flanges			9	11	13½	16	19	21	23½	25	27½	32
Thickness of flanges			15/16	1	1⅛	1 3/16	1¼	1⅜	1 7/16	1 9/16	1 11/16	1⅞
Diameter of bolt circle			7½	9½	11¾	14¼	17	18¾	21¼	22¾	25	29½
No. and diameter of bolts			8-⅝	8-¾	8-¾	12-⅞	12-⅞	12-1	16-1	16-1⅛	20-1⅛	20-1¼

Body: The cast iron body is divided on the vertical centerline and bolted together. A special gasket in the joint prevents leakage. Circular end ports and rectangular shape at the center assure full area flow.

Disc: In brass trimmed valves, the disc is brass; in all-iron valves, it is Exelloy. Made in a rectangular shape with a sharp cutting edge at the bottom, the disc is fully guided by machined slots in the body.

Stem: The stem in all these valves is made of Crane Cast Manganese Bronze. It does not come in contact with the fluid in the line.

Seat: A lead filler in the bottom of the valve acts as a seat and protects the cutting edge of the disc at the point of closing.

Self-cleaning: The lower portion of the outlet half of the body has a series of notches which entrap small units of the pulp stock; large single accumulations are avoided in closing the valve, and the cutting edge of the disc easily shears the successive small units and also any stock lodged at the seat.

Cleanout: The disc-stop holder, which carries the lead seat, is fastened to the valve with cap screws. This holder can be removed to clean out the valve.

Stuffing box: A rectangular shaped stuffing box, equipped with a gland, completely surrounds the valve disc. It is unusually deep and is filled with a special packing which minimizes friction.

Bosses: Each valve body has six bosses, two on each side and two on the bottom. When specified, the bosses will be drilled, tapped, and plugged.

End flanges: End flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish. Prices include facing and drilling. No deduction is made for valves ordered faced only.

Face to face: These valves also conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1950). They will replace 125-Pound Wedge Gate Valves used on pulp stock lines without necessitating piping changes.

Gears, to facilitate operation of large size outside screw valves, can be made to order; prices on application.
Chain Wheels . . . . page 136 ***Motor Operators . . . . pages 126 to 129*** ***Floor Stands . . . . page 130***

Ferrosteel and Cast Steel Stop-Check Valves

Boiler Service and Fundamental Duties

The Crane line of Stop-Check Valves includes a complete range of sizes and types ideal for use on new or existing boiler installations. Stop-Check Valves are as essential to the safe operation of a boiler plant as are the safety valves or other safety devices attached to the boiler. They should be installed in the pipe line between each boiler and the main steam header, when more than one boiler is connected to the same header. These valves should always be placed so that the pressure in the boiler is under the disc.

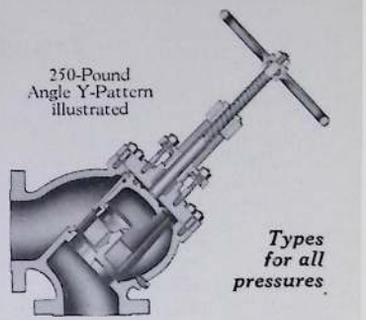
The Stop-Check Valve is intended to perform four important functions in boiler steam piping:

First: To act as an automatic non-return valve, preventing a back flow of steam from the main steam header to the boiler to which it is connected, in the event of a failure in that boiler.

Second: To assist, when ceasing to fire, in cutting out a boiler. In this case the disc will close automatically and prevent header pressure from entering the boiler.

Third: To assist in bringing a boiler into service after it has been shut down. This operation requires considerable care when performed manually, but the Stop-Check Valve performs this function automatically, without pressure fluctuations or disturbance of the water level.

Fourth: To act as a "safety first" valve in preventing back flow of steam from the header into a boiler which has been shut down for inspection or repair, should an attendant accidentally open the valve.



Types for all pressures

250-Pound Ferrosteel: Available with flanged ends in either the Straight-Way or Angle Y-Pattern. See page 303.

300-Pound Cast Steel: Available with flanged or butt-welding ends in either the Straight-Way or Angle Y-Pattern. See page 304.

400-Pound Cast Steel: Available with flanged or butt-welding ends in either the globe or angle pattern. See page 305.

600-Pound Cast Steel: Available with flanged or butt-welding ends in either the globe or angle pattern. See page 305.

General Description

Construction: In design and construction, these valves are unusually simple, strong, and rugged. Made with but one moving part, the disc, and embodying only carefully selected materials, they are durably built for long, reliable service.

Simplicity of design: Because of the simplicity of design, all internal parts are easily accessible, and when the occasion arises, replacements can be made without removing the valve from the line.

Manual operation: These valves are equipped with a handwheel which permits them to be closed while under pressure, or if they are already closed automatically, to hold the disc in the closed position. No mechanical connection is made between the disc and the stem, and when the stem is raised by the handwheel, only the boiler pressure can lift the disc.

This equipment for manual operation of the valves is of the outside screw and yoke type, wherein the stem threads are not directly exposed to the high temperature of the steam.

Bonnet joint: The 250-Pound Ferrosteel and 300-Pound Cast Steel Valves have a male and female bonnet joint, bolted with studs driven into the body. The 250-Pound Valves are fitted with a Cranite gasket, and the 300-Pound Valves, with a corrugated soft iron gasket.

The 400 and 600-Pound Cast Steel Valves have ring joint bonnet facing, a soft steel ring joint gasket, and Crane Templex Steel through type bolt-studs. Tightness and liberal strength are assured.

Body seat ring: The body seat ring is of the shoulder seated type. It is held in place by the removable liner in Ferrosteel Valves and is screwed into the body in Cast Steel Valves.

Piston type disc: The piston type disc, operating in the removable liner, is the only pressure actuated part in the valve; see the following page for features and full description of the internal parts of the valve.

Stuffing box: All Cast Steel Valves have a lantern type stuffing box equipped with an Ihrigized steel ball type gland and a steel gland flange. Packing above and below the lantern assures tight sealing. The lantern provides space for a cooling chamber, which is tapped and fitted with a steel plug.

Ferrosteel Valves have an exceptionally deep stuffing box, filled with a high grade packing, and fitted with a two-piece gland and gland flange.

Repacking: All Stop-Check Valves, when the stem is in the wide open position, can be repacked while under pressure.

Code conformance: Crane Ferrosteel and Steel Stop-Check Valves conform to the A.S.M.E. Boiler Construction Code for Non-Return Stop Valves.

Closing tight against boiler test pressures: All of these Crane Stop-Check Valves can be closed tight against boiler test pressure (one and one-half times the recommended working pressure). For this purpose, 8 and 10-inch 250-Pound Ferrosteel and 300-Pound Steel, 8, 10, and 12-inch 400-Pound Steel, and 6, 8, 10, and 12-inch 600-Pound Steel Valves are regularly equipped with a hammer-blow handwheel.

Added description, prices, etc. . . . pages 302 to 305 ***Selecting the proper size . . . . pages 306 and 307***

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Ferrosteel and Cast Steel Stop-Check Valves

Features of Crane Stop-Check Valves

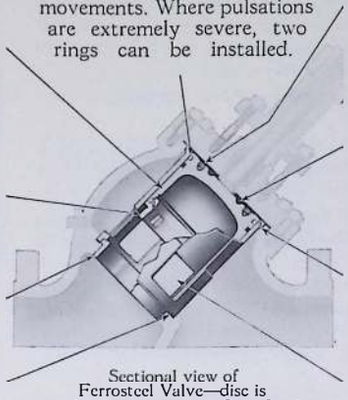
Cylindrical-shaped disc is the one moving part. Light in weight with ample guiding surface, it is specially designed to produce a maximum lift at minimum velocities. There are no wing guides to cause "spinning" and rapid wear.

Long throttling lip on disc retards flow when seating position is approached. Disc chattering is prevented and wiredrawing of seating surfaces is reduced.

Flat seats, accurately machined, facilitate true seating.

Removable liner guides the disc throughout the full travel. Being entirely independent of the body, it is not subject to distortion by expansion strains.

Piston ring adds to dashpot's ability to avoid rapid disc movements. Where pulsations are extremely severe, two rings can be installed.



Sectional view of Ferrosteel Valve—disc is in the open position. Cast Steel Valves feature the same design.

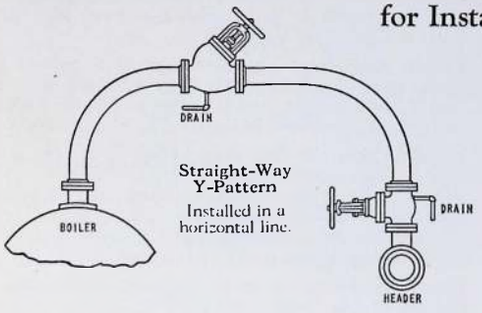
Easy regrinding—tapped bosses on top of the disc permit inserting nipples or eye bolts to facilitate quick removal of the disc and regrinding.

Dashpot is self-contained in the liner. It provides an effective cushion for the disc to prevent pipe line vibrations or hammering on the seat at low velocities or on pulsating loads.

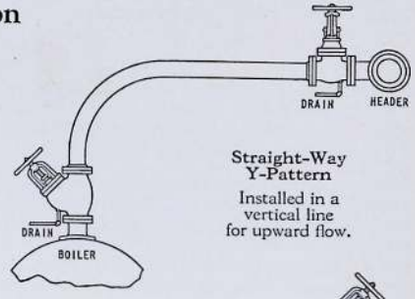
Dashpot vent acts as a governor to control the disc speed and to assure smooth action and operation of the valve.

Large port areas in the liner produce only a minimum of pressure drop through the valve and assure unrestricted movement of the disc.

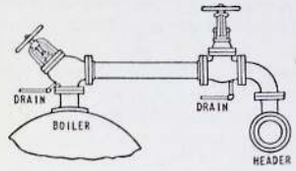
Recommendations for Installation



Straight-Way Y-Pattern
Installed in a horizontal line.



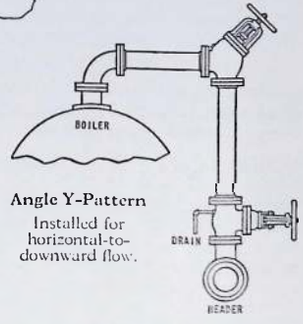
Straight-Way Y-Pattern
Installed in a vertical line for upward flow.



Angle Y-Pattern
Installed for upward-to-horizontal flow.

Crane 250-Pound Ferrosteel and 300-Pound Cast Steel Stop-Check Valves are available in two styles, the Straight-Way Y-Pattern and the Angle Y-Pattern. Each style can be used in two positions in a boiler installation as illustrated in the diagrams.

The proper method for draining is shown for each position.



Angle Y-Pattern
Installed for horizontal-to-downward flow.

For additional description, see page 301.

For list prices and dimensions, see pages 303 to 305.

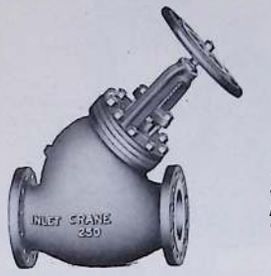
For selection of proper size, see pages 306 and 307.

250-Pound Ferrosteel Stop-Check Valves

WORKING PRESSURE
250 pounds steam, 450° F. maximum temperature

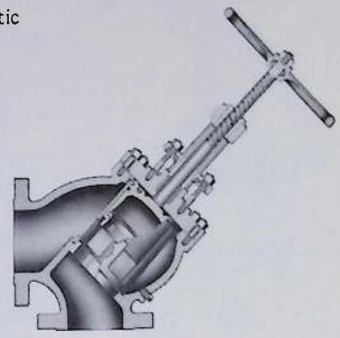
TEST PRESSURE
Shell test — 500 pounds hydrostatic

These valves are suitable for boiler test conditions one and one-half times the nominal rating to comply with the A.S.M.E. Boiler Code.



No. 28 E
Straight-Way Y-Pattern

Important
The size of a stop-check valve should be based on the boiler capacity, rather than on the size of the boiler outlet or existing piping. "Selecting the Proper Size Stop-Check Valve" is explained on pages 306 and 307.



Cross Section
No. 30 E
Angle Y-Pattern

List Prices

Size		Inches	2½	3	4	5	6	8	10
Flanged, F. & D.	No. 28 E	Each	169.00	188.00	225.00	300.00	356.00	544.00	900.00
	No. 30 E	Each	169.00	188.00	225.00	300.00	356.00	544.00	900.00

Service recommendations: Crane Stop-Check Valves are recommended for use in the pipe line between each boiler and the main steam header, when more than one boiler supplies the same header. For complete explanation of this service, see page 301.

In addition, these valves render excellent service in discharge lines from boiler feed pumps or from other high pressure pumps where a high quality check valve is desired.

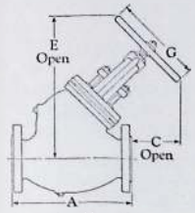
Straight-Way Valves may be used in horizontal lines or in vertical lines for upward flow. Angle Valves are suited for horizontal-to-downward flow or for upward-to-horizontal flow. For recommendations on installation, see page 302.

Materials and construction: These valves have a Ferrosteel body, bonnet, and yoke. Their renewable liner is made of cast iron. The stem is cold rolled steel, nickel-plated. The seat ring in all sizes and the disc in sizes 5-inch and smaller are made of Crane Special Bronze, a high grade leaded tin bronze; in sizes 6-inch and larger, the disc is iron with a Crane Special Bronze seating face and throttling lip. 8 and 10-inch valves have a hammer-blow handwheel.

Flange dimensions and drilling: The end flanges on these valves conform to the American Cast Iron Flange Standard, Class 250 (B16b-1944). They are furnished faced and drilled unless otherwise ordered.

List prices include facing and drilling to this Standard, and no deduction is made if valves are ordered faced only.

Flange facing: The valves are regularly furnished with an American Standard 1/16-inch raised face on the end flanges, finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

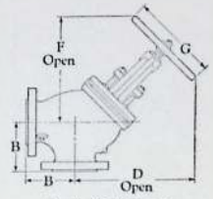


Straight-Way Y-Pattern

Dimensions, in Inches

Size	2½	3	4	5	6	8	10
*A	13	14¾	17	19	21½	26	30
*B	5¾	6¼	7	7⅞	8¾	10½	12¼
C	5	7¼	7¾	10½	11¾	16¼	17¾
D	14½	16½	18½	22	25½	33¼	37¾
E	15¾	19¾	21¾	25¾	29¼	36¾	41¾
F	13¼	14¾	16¼	19½	22½	28¾	32½
G	9	10	10	14	16	20	20

*Dimensions "A" and "B" include the 1/16-inch raised face on the end flanges.



Angle Y-Pattern

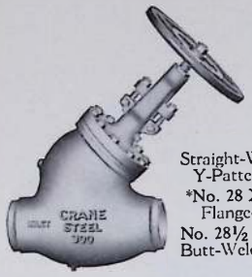
General description and features . . . . pages 301 and 302

Dimensions of end flanges . . . page 460

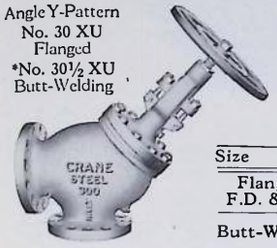
Templates for drilling . . . page 460

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300-Pound Cast Steel Stop-Check Valves



Straight-Way Y-Pattern
*No. 28 XU Flanged
No. 28½ XU Butt-Welding



Angle Y-Pattern
No. 30 XU Flanged
*No. 30½ XU Butt-Welding

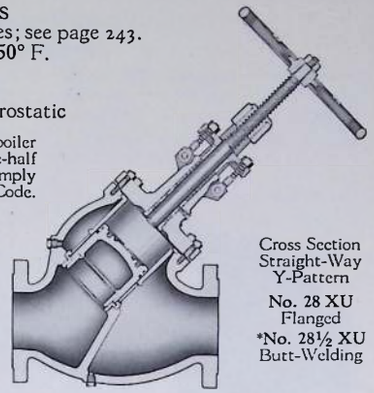
WORKING PRESSURES
Same as Steel Globe and Angle Valves; see page 243.
Maximum temperature, 850° F.

TEST PRESSURE
Shell test — 900 pounds hydrostatic

These valves are suitable for boiler test conditions one and one-half times the nominal rating to comply with the A.S.M.E. Boiler Code.

Tested 100 pounds air-under-water

Important
The size of a stop-check valve should be based on the boiler capacity, rather than on the size of the boiler outlet or existing piping. "Selecting the Proper Size Stop-Check Valve" is explained on pages 306 and 307.



Cross Section Straight-Way Y-Pattern
No. 28 XU Flanged
*No. 28½ XU Butt-Welding

*Asterisk indicates valve is not illustrated.

List Prices

Size		Inches	2½	†3	4	5	6	8	10
Flanged, F.D. & S.F.	No. 28 XU	Each	428.00	523.00	700.00	855.00	1070.00	1607.00	2417.00
	No. 30 XU	Each	428.00	523.00	700.00	855.00	1070.00	1607.00	2417.00
Butt-Welding	No. 28½ XU	Each	428.00	523.00	700.00	855.00	1070.00	1607.00	2417.00
	No. 30½ XU	Each	428.00	523.00	700.00	855.00	1070.00	1607.00	2417.00

Service recommendations: Crane 300-Pound Cast Steel Stop-Check Valves perform all the duties of a non-return boiler stop valve efficiently and completely. For explanation, see page 301.

Wherever check valves of outstanding quality are desired, such as in discharge lines from boiler feed pumps or from other high pressure pumps, these valves render excellent service.

Straight-Way Valves may be used in horizontal lines or in vertical lines for upward flow. Angle Valves may be used for upward-horizontal flow or for horizontal-downward flow. See page 302 for installation.

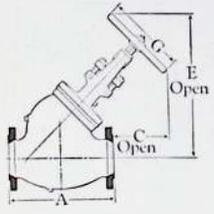
Materials and construction: These valves have high quality materials throughout. The body, bonnet, and removable liner are Crane No. 4 Carbon-Molybdenum Alloy Steel; the stem and the seat ring are Exelloy; the disc is Stellite faced No. 4 Steel; and the yoke bushing is cast manganese bronze. Triplex Steel studs equip the bonnet joint; 8 and 10-inch sizes have a hammer-blow handwheel.

Flanged valves: The end flanges on flanged valves conform to the American Standard for 300-Pound Steel Pipe Flanges and Flanged Fittings, B16e-1939. They are furnished faced, drilled, and spot faced (F.D. & S.F.), having an American Standard 1/16-inch raised face, finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish on the 1/16-inch raised face or ring joint, male, female, or other types of facing can be furnished when so ordered; see the Crane Discount Sheet for prices.

†3-inch Cranelap Joints: When 3-inch 300-Pound Valves with ring joint facing are to be bolted to Cranelap Joints, orders must so specify. They require a groove of special diameter; see page 470 for dimensions.

Butt-welding valves: Butt-welding valves have the ends bored to match the inside diameter of Standard pipe (heaviest weight on 8 and 10-inch sizes).



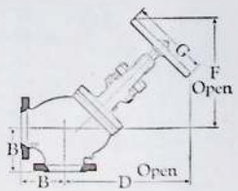
Straight-Way Y-Pattern
Flanged or Butt-Welding

Dimensions, in Inches

Size	2½	3	4	5	6	8	10
‡A	13	14¾	17	19	21½	26	30
‡B	5¾	6¼	7	7⅞	8¾	10½	12¼
C	9½	9½	12½	13½	16	20	23
D	17½	18½	23	25	29½	36½	43
E	20½	21½	26½	29	33½	40½	47½
F	16	16½	21	22½	26½	32	38
G	10	10	14	16	18	20	20

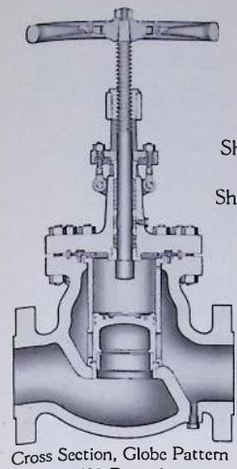
‡"A" and "B" include the 1/16 inch raised face on the end flanges.

General description and features ..... *pages 301 and 302*
Dimensions of end flanges ..... *page 461*
Templates for drilling ..... *page 461*



Angle Y-Pattern
Flanged or Butt-Welding

400 and 600-Pound Cast Steel Stop-Check Valves



Cross Section, Globe Pattern
400-Pound
No. 164 U, Flanged
*No. 164½ U, Butt-Welding
600-Pound
No. 179 U, Flanged
*No. 179½ U, Butt-Welding

WORKING PRESSURES
Same as Steel Globe and Angle Valves; see page 243.
Maximum temperature, 950° F.

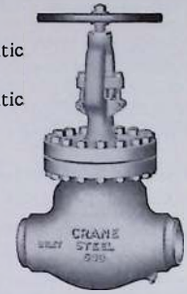
TEST PRESSURES
400-Pound Valves
Shell test — 1200 pounds hydrostatic
600-Pound Valves
Shell test — 1800 pounds hydrostatic

400 and 600-Pound Valves are suitable for boiler test conditions one and one-half times the nominal rating to comply with the A.S.M.E. Boiler Code.

All valves are tested 100 pounds air-under-water

Important
The size of a stop-check valve should be based upon the boiler capacity, rather than on the size of the boiler outlet or existing piping.
"Selecting the Proper Size Stop-Check Valve" is explained on pages 306 and 307.

*Valve is not illustrated.



400-Pound Globe Pattern
*No. 164 U, Flanged
*No. 164½ U, Butt-Welding
600-Pound Globe Pattern
*No. 179 U, Flanged
No. 179½ U, Butt-Welding



400-Pound Angle Pattern
*No. 166 U, Flanged
*No. 166½ U, Butt-Welding
600-Pound Angle Pattern
No. 180 U, Flanged
*No. 180½ U, Butt-Welding

For proper operation, valves must be installed with the stem in a vertical position.

List Prices, Each, and Dimensions

Size			Inches	2½	†3	4	5	6	8	10	12
Flanged, F.D. & S.F.	Nos. 164 U or 166 U, 400-Pound					803.00	1056.00	1228.00	1802.00	2907.00	4790.00
	Nos. 179 U or 180 U, 600-Pound			532.00	606.00	983.00	1294.00	1507.00	2227.00	4037.00	5977.00
Butt-Welding	Nos. 164½ U or 166½ U, 400-Pound					803.00	1056.00	1228.00	1802.00	2907.00	4790.00
	Nos. 179½ U or 180½ U, 600-Pound			532.00	606.00	983.00	1294.00	1507.00	2227.00	4037.00	5977.00
Dimensions, in Inches	Globe	‡Face to face, or end to end		13	14	18	20½	23	28	32½	42
		Center to top, open		24	26¼	28¾	33	37½	47½	56½	66¾
	Angle	‡Center to face, or center to end		6½	7	9	10¼	11½	14	16¼	21
		Center to top, open		23¾	26	28	32	36	44¾	53½	63½
	Diameter of wheel			10	12	14	16	20	26	30	30

‡Face to face and center to face dimensions include the 1/4-inch male face on the end flanges.

Materials and construction: The materials from which the parts of these valves are made are of exceptionally high quality. Crane No. 4 Carbon-Molybdenum Alloy Steel body, bonnet, and liner; Stellite faced No. 4 Alloy seat and disc; and Exelloy stem. The bonnet joint utilizes a soft steel ring joint gasket and Crane Templex Steel bolt-studs.

The general construction of these valves follows those described on pages 301 and 302, except for the stem position, the bonnet joint, and the materials. 400-Pound Valves 8-inch and larger and 600-Pound Valves 6-inch and larger have a hammer-blow handwheel.

Flanged valves: The end flanges on 400 and 600-Pound Flanged Valves conform respectively to the 400 and 600-Pound American Standards for Steel Pipe Flanges and Flanged Fittings, B16e-1939. The valves are furnished faced, drilled, and spot faced (F.D. & S.F.), and have an American Standard 1/4-inch male face (large male) on the end flanges, finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish or ring joint, female, or other types of facing can be furnished; see the Crane Discount Sheet for prices.

†3-inch Cranelap Joints: When 3-inch 600-Pound Valves with ring joint facing are to be bolted to Cranelap Joints, orders must specify; they require a groove of special diameter (dimensions on page 470).

Butt-welding valves: Orders for butt-welding valves must specify the inside diameter of the pipe or its wall thickness so that the valve ends can be bored to match the pipe.

900 and 1500-Pound Pressure-Seal Bonnet Alloy Cast Steel Stop-Check Valves

For higher pressures, Crane has developed the Pressure-Seal Bonnet Valve. For complete description, see pages 214 and 215.

General description and features ..... *pages 301 and 302*
Templates for drilling ..... *page 462*
Dimensions of end flanges ..... *page 462*

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Crane Bolted Bonnet Stop-Check Valves
Selecting the Proper Size—Determining Pressure Drop

A problem confronting the power piping designer is the selection of the best size of stop-check valve for his service conditions. This type valve has a floating disc member, hence it is important the valve be sized to provide full disc lift under conditions prevailing during the major portion of the service life of the installation. If the valve is too large, the disc will float in a partially open position; this may result in fluttering of the disc and rapid wear of valve parts. Conversely, if the valve is too small, pressure drop will be excessive.

Crane has conducted numerous tests both in the laboratory and in the field over a period of many years to establish the flow characteristics of Crane Stop-Check Valves. As a result, Crane Engineers have developed the chart shown on the opposite page. The chart is a graphical solution of the flow formula and incorporates the valve flow factors which were determined by test. Its use offers a simple and direct method of determining the best size of stop-check valve, as well as the pressure drop under varying conditions of flow, without any computation.

How to Use the Chart Shown on the Opposite Page

Given: Steam Pressure.....300 pounds per sq. in., gauge
Steam Temperature....750° F.
Flow Rate.....100,000 pounds per hour, maximum

Find: Valve Catalog No. and best size for above installation.

Solution: Reference to the pressure-temperature ratings on page 243 indicates a valve of the 300-pound pressure class will be required. Therefore, the following valves may be used:

Globe...No. 28 XU, Flanged or No. 28½ XU, Butt-Welding
Angle...No. 30 XU, Flanged or No. 30½ XU, Butt-Welding

The choice between the globe and angle, as well as between flanged and butt-welding ends depends, of course, upon the piping arrangement and local conditions. *Now, follow the text below and proceed as indicated by the arrows on the chart.*

1. Enter the chart at the lower left at a temperature of 750° F. Move vertically upward to the curved line for 300 psi gauge pressure, then horizontally to the right to establish a point on the specific volume line. From this point, draw a diagonal line through the flow rate being investigated (100,000 pounds per hour) and establish a point on Index 1.

2. From the point on Index 1, draw another diagonal line through any assumed valve size, for example the 8-inch size, and establish a point on Index 2. Now move horizontally to the diagonal line in the right hand portion of the chart which represents the pressure drop through the valve being investigated. Where these lines intersect, read the pressure drop as 9 psi for the 8-inch 300-Pound Globe Valve and 10 psi for the 8-inch 300-Pound Angle Valve.

Chart solutions resulting in a point on Index 2 that falls below the Line A-A for 250 and 300-Pound Valves, or below Line B-B for 400 and 600-Pound Valves, indicate the valve disc will not be fully lifted under the flow conditions used. Operation under such conditions is not recommended but, at times, must be tolerated for short periods during the low load portion of the operating cycle.

3. Enter the chart where Line A-A intersects Index 2. Move diagonally upward through the size being investigated (8-inch) and establish a second point on Index 1. From this point, extend a line to the specific volume established in Step 1, and at its intersection with the flow rate line, read 42,000 pounds per hour as the minimum flow rate at which the disc will be in the fully lifted position. The pressure drop at this flow rate is 1.9 psi for globe and 2.1 psi for angle valves. At all flow rates less than 42,000 pounds per hour through 8-inch valves, the pressure drop may be expressed as "less than 1.9 psi" for globe and "less than 2.1 psi" for angle valves.

4. Repeat Steps 2 and 3 for all other probable sizes and determine the pressure drop and minimum flow rate for the wide open position. Results are shown at the right.

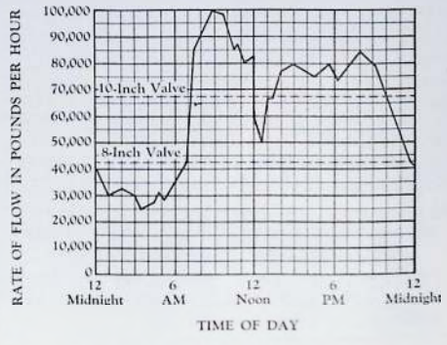
Valve Size	Pressure Drop at Maximum Flow Rate of 100,000 lbs. per hour (In Psi)		Minimum Flow Rate for Wide Open Valve
Inches	Globe	Angle	Lbs. per hour
6	24	26	24,000
8	9	10	42,000
10	3.8	4.2	68,000
12	2.1	2.3	95,000

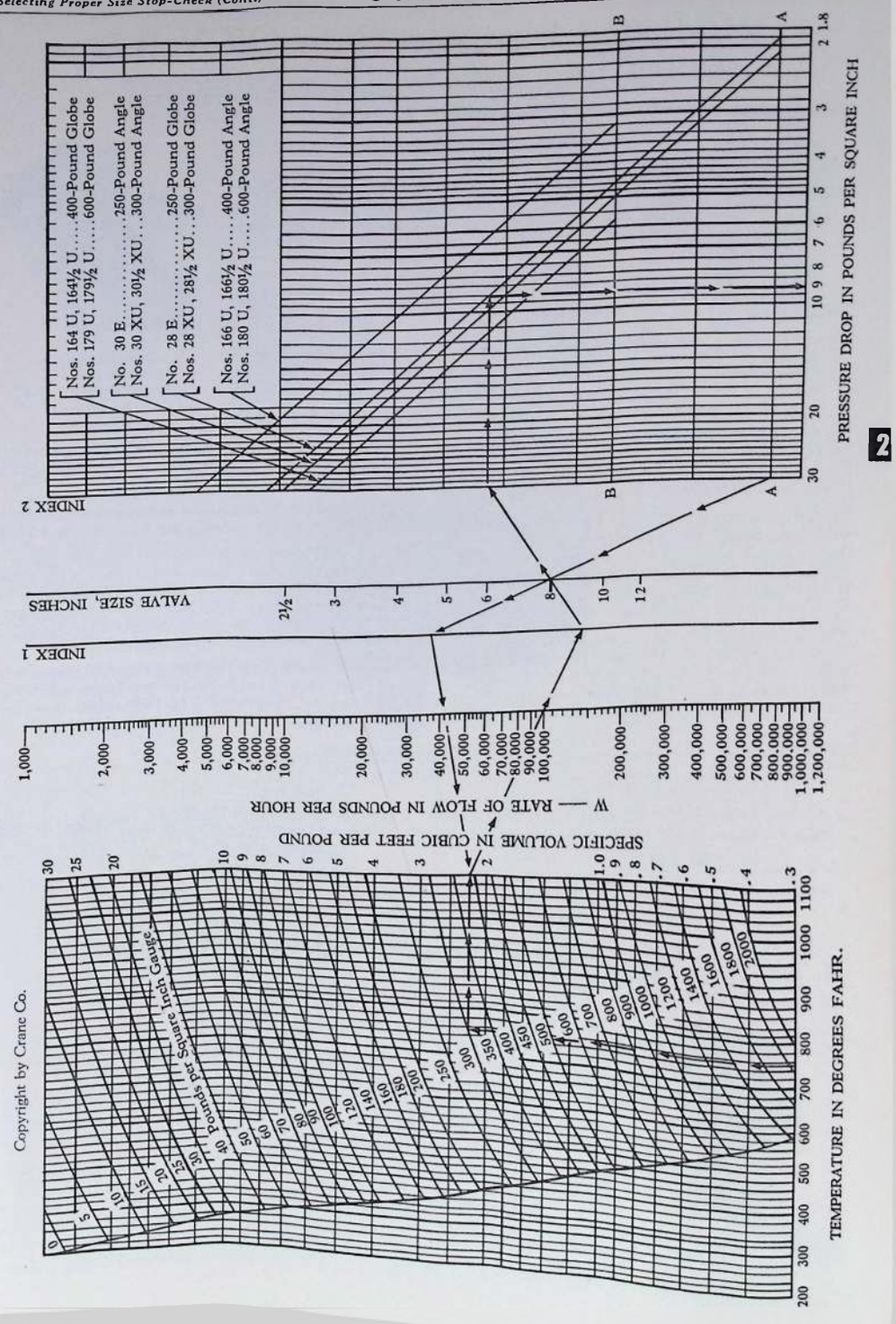
5. Since the flow rate of 100,000 pounds per hour is designated as maximum, it may be assumed the boiler will frequently be operated at lower flow rates. On this basis, the 12-inch size would obviously be too large and pressure drop through the 6-inch valve would probably be considered excessive. The choice between the 8 or 10-inch size depends upon the load-demand curve, and the final selection rests with the piping designer.

6. A typical daily load-demand curve, shown in the chart below, indicates the advisable size is 10-inch. Minimum flow rates for a fully lifted disc for both 8 and 10-inch sizes are shown in the chart. The disc will not be fully lifted for about 7 hours in the 8-inch valve and for about 10½ hours in the 10-inch valve. However, since the pressure drop for the 10-inch is so much lower during high-load operation, it appears to be a better choice than the 8-inch.

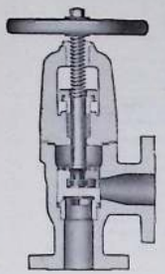
Pressure drop for any intermediate flow condition can be determined as outlined in Steps 1 and 2.

Typical Daily Load-Demand Curve





250-Pound Ferrosteel Blow-Off Valves



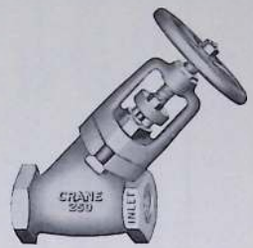
Angle Valves
No. 390
Screwed
No. 391
Flanged

WORKING PRESSURE
250 pounds boiler blow-off service

HYDROSTATIC TEST PRESSURES
550 pounds seat — 800 pounds shell

BOILER CODE REQUIREMENTS

Nos. 393 and 393½ Y-Pattern Valves do not comply with the requirements of the 1946 edition of the A.S.M.E. Boiler Code. Nos. 390 and 391 Valves comply with the Code for bottom blow-off, except that the maximum allowable working pressure under the Code is 200 pounds instead of 250.



Y-Pattern Valves
No. 393
Screwed
No. 393½
Flanged

List Prices, Each

Size		Inches	1½	2	2½
Angle	No. 390, Screwed		36.50	45.50	61.00
	No. 391, Flanged, F. & D.		40.00	50.00	67.00
Y-Pattern	No. 393, Screwed		36.50	45.50	61.00
	No. 393½, Flanged, F. & D.		40.00	50.00	67.00
Replacement Parts	Body Seat Ring		2.00	2.70	3.50
	Disc		4.40	5.20	6.00

Service recommendations: These valves have been particularly designed for boiler blow-off service, but are also well suited for blow-off service on tanks or receivers where dirty, gritty water is to be handled.

Features of construction: The valves are made with a renewable seat and slip-on disc, in order to permit quick repair. Contrary to ordinary globe valve construction, the seating surface in these valves is on the outside of the seat ring where it is protected from the cutting effect of the water passing the seat.

The bonnet is held to the body with two bolts, which facilitates dismantling the valve for inspection and repair. The outside screw and yoke construction keeps the stem threads outside the flow of water; it improves the life of the stem threads and prevents the valves from becoming inoperative due to scale and foreign matter jamming the threads. All parts of these valves are sturdily constructed.

The stuffing box is unusually deep and holds ample high grade packing, eliminating frequent repacking.

Materials: The body and bonnet are Ferrosteel, a high grade cast iron. Cast iron, proven very satisfactory for blow-off service, is used also for the disc and body seat ring. The stem is Cast Manganese Bronze. The two-piece gland consists of an Ihrigized steel gland and a malleable iron gland flange.

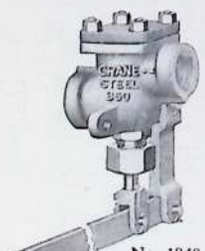
Flanged valves: End flanges conform to the American Cast Iron Flange Standard, Class 250 (No. B-16b-1944). They have a 1/16-inch raised face, and are furnished faced and drilled (F. & D.).

Dimensions, in Inches

Size		1½	2	2½	Size		1½	2	2½
Angle Valves	Center to end, No. 390	4	4½	5	Y-Pattern Valves	End to end, No. 393	7¼	8	9⅛
	Center to face, No. 391	4½	5	5¾		Face to face, No. 393½	9⅞	11	12¼
	Center to top, open	12½	13¾	15½		Center to rim of wheel, open	12¾	14	15¾
	Diameter of wheel	8	9	10		Diameter of wheel	8	9	10

Templates for drilling and flange dimensions . . . . page 460

Cast Steel Sliding Stem Blow-Off Valve



No. 1848
Screwed
Cast Steel Body
Exelloy Seat—Steel Stem
Stellite Faced Steel Disc

WORKING PRESSURE
350 pounds saturated steam

The No. 1848 Valve is recommended for blow-off lines on high pressure oil or gas field boilers such as are used for deep well drilling operations.

The long lever and sliding stem construction enable the user to open the valve quickly and easily. The valve closes automatically with the pressure when the lever is released. The body is made of cast steel. The body seat ring is made of Exelloy and is renewable.

List Price and Dimensions

Size	Inches	2
No. 1848, Screwed	Each	146.00
End to end	Inches	6⅝
Center of stem to end of lever	Inches	17⅛

The cap and the one-piece disc and stem are made of forged steel. The disc is faced with Stellite and the lower end of the stem is nickel-plated.

300-Pound Steel

Locomotive Steam Heat End Valves

(Patent Pending)



No. 1815 P
Straight-Way
With Ring Joint
Faced Flanges for
Quick Coupling Adaptation

WORKING PRESSURE
300 pounds steam, 600° F. max. temp.

TEST PRESSURES
Shell — 600 pounds hydrostatic
Seats — 300 pounds hydrostatic

These valves are designed for easy manual operation and dependability under severe operating conditions. Rugged construction, specialized two-disc design, and high grade materials assure efficient performance, whether the requirements are to shut off flow, to provide full flow, or to effect a reduction in flow (bleed).



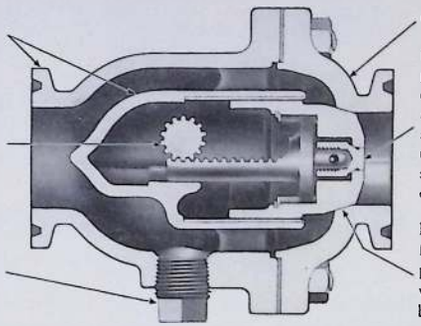
No. 1816 P
Angle
With Screwed Female
Inlet and Outlet

Two-Disc Design Provides Three-Position Operation

Inlet body has an integral cylinder forming a piston chamber in which the main disc rides.

Pinion gear, integral with stem, engages the rack. As the stem is rotated clockwise, the rack lifts the pilot disc, and subsequently, the main disc from their seats.

Removal of plug on straight-way valve permits installation of a steam trap to drain condensation. Angle valve drains automatically when valve is open.



Outlet body has integral seats.

Pilot disc is held closed by the pressure load. It can be lifted off its seat to a bleed position by a 25° clockwise rotation of the stem. This position is retained until further rotation of the stem, up to 180°, opens the main disc for full flow.

Main disc has plug type seating face. It is held closed by the pressure load and remains closed while the pilot disc is in the bleed position.

Section of Straight-Way Valve in horizontal position with main and pilot discs closed.

Bleed position: To avoid freezing of lines and valves during cold weather, a low rate of flow is required to provide rapid movement of steam and evacuation of condensate. To accomplish this function, the stem is rotated clockwise approximately 25°; this lifts the pilot disc from its seat and permits restricted flow; the main disc remains closed. At this point, a detent cam at the end of the stem presents a depression into which a spring-actuated roller snaps, retaining the pilot disc in the bleed position until further rotation of the stem is effected.

Open position: Additional clockwise rotation of the stem (25° to 180°) causes the detent cam to leave its position, lifts the pilot disc so that flow through its seat opening is no longer restricted, and lifts the main disc to permit full flow. When the valve is wide open, the detent cam once again presents a depression into which the spring-actuated roller snaps, retaining the main disc in the wide open position.

Closed position: A 180° counter-clockwise rotation of the stem closes the valve completely.

Materials: The valves have a cast steel inlet body with an internal, integral cylinder. The outlet body is made of Exelloy and has integral seating faces. The stem and rack are aluminum bronze; the external end of the stem is machined for an AAR Universal Joint connection. Both main disc and pilot disc are made of Crane No. 49 Nickel Alloy. The cover, made of cast steel, is held in place by means of Triplex Steel studs and is fitted with a Cranite gasket.

Installation: The valves should be installed with the pressure above the discs; an arrow cast on the body indicates the correct direction of flow.

Blowing new lines clear before installing the valves will assure proper action. Where excessive dirt, pipe scale, etc., are encountered, the use of a sediment separator is recommended; see pages 356 and 357.

List Prices, Each

Size	Inches	2½
No. 1815 P, Straight-Way		312.50
No. 1816 P, Angle		312.50

These valves are furnished without a handle; their stem end is machined for an AAR Universal Joint connection.

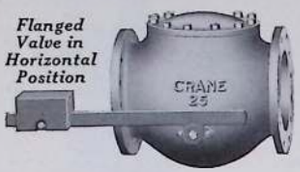
600-Pound Steel Valves for Locomotive Service . . . page 240

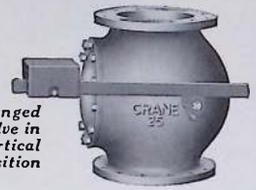
Dimensions will be furnished on application.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 176 of 314
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asbestosclaims.law/library/21276/176

Iron Body Back Pressure Valves

Weighted for back pressures up to 5 pounds



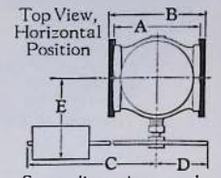


No. 384, Screwed (Not Illustrated)
No. 385, Flanged (Illustrated)

Screwed valves are used only in a vertical position. Flanged valves can be used in a horizontal or vertical position (the vertical position is preferred because wear is reduced).

Service recommendations: These valves are ideal for use on non-condensing engine installations, where the exhaust steam is largely used for heating, and where the valve, therefore, is not called upon to operate frequently. For vacuum service, use Spring Loaded Valves shown below.

Construction: The valves have an iron body, cap, and weight, and a brass seat and disc or disc face. The lever, made of malleable iron, and an adjustable weight are mounted on the cap on screwed valves (not illustrated), and on the side of the valve body on flanged valves.



Same dimensions apply for vertical position.

Dimensions of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish. Prices of flanged valves include facing and drilling to the 25-Pound American Tentative Cast Iron Flange Standard. No deduction is made for valves ordered faced only.

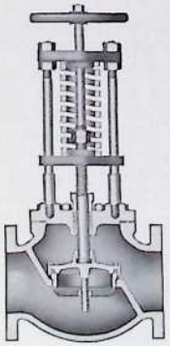
List Prices, Each, and Dimensions

Size	Inches	2	2½	3	4	5	6	8
No. 384, Screwed		40.50	47.50	55.00				
No. 385, Flanged, F. & D.					95.00	135.00	172.00	328.00
Dimensions in Inches	A	6½	7	8				
	B				11½	13	14	19½
	C	12½	14¼	16¼	18¾	20½	24	26¼
	D	4	4½	5¼	7	7½	7½	9¼
	E	6½	6¾	7¾	9½	10½	11¾	14

Iron Body Relief and Back Pressure Valves

Spring Loaded

Service recommendations: These valves are used as back pressure valves between the exhaust from auxiliary engines and condensers, and as exhaust relief valves on condensers to protect the equipment if the vacuum is lost. Although they are primarily intended for marine service, they are also suitable for stationary plants.



Cross Section
No. 4387, Horizontal

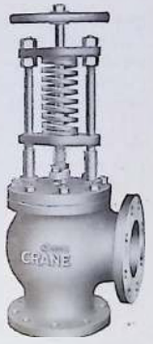
Materials: The body and bonnet are cast iron; the seat, disc, stem, gland, and stem hole bushing are brass.

Features of design: These valves have a deep stuffing box, an adjustable popping chamber which assures a high disc lift, large discharging capacity, and definite opening and closing pressures. The blow-down of pressure can be regulated without dismantling the valve.

When desired, the valves can be manually opened and left in that position; turning the handwheel to the left gradually releases the spring tension, and when the spring is no longer under compression, the disc is lifted from its seat.

Pressure setting: When relieving to atmosphere, the valves are set at any specified pressure from 10 to 35 pounds gauge. They can be used for discharging into a vacuum but are then set at a lower gauge pressure of from 1 to 20 pounds to compensate for the vacuum on the outlet side.

Information required: Orders and inquiries should specify the pressure on the inlet side, the pressure or inches of vacuum on the outlet, and the back pressure to be maintained. Capacities will be furnished on application.



No. 4389, Angle

List Prices and Dimensions

Size	Inches	2½	3	4	5	6	8
No. 4387 or No. 4389, F. & D.	Each	255.00	285.00	370.00	505.00	600.00	900.00
Center to face	Inches	4¼	4¾	5¾	6½	7	9¾
Center to top, open	Inches	14	16	21	25½	28	34
Diameter of wheel	Inches	6	7	9	10	10	12

Templates for drilling . . . page 459

End flanges: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Flanges are plain faced, with a smooth finish.

McAlear

Back Pressure and Atmospheric Relief Valves

Weight Loaded

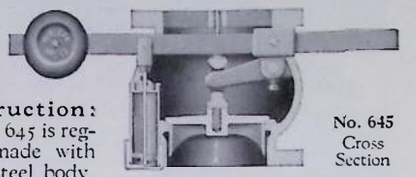
Service recommendations: The No. 645 Back Pressure Valve is of the single-seated vertical type, and is recommended for operation with condensing and non-condensing engines.

When used in connection with condensing engines, the valve will be equipped with water sealed, vacuum-tight seat rings.

When used with non-condensing engines, it will maintain automatically, within the pressure limits indicated below, any desired back pressure on the exhaust line so that the steam may be used for heating or any other low pressure service.

This valve also operates dependably as an atmospheric relief valve. When specified for this service, the valve is furnished with scale weights, in addition to the ball weight. These scale weights are placed on the opposite end of the lever so that the valve will open automatically and permit the exhaust steam to escape to atmosphere.

Operating pressures: The body of this valve will withstand steam working pressures up to 125 pounds. In sizes 2 to 8 inches it will maintain a back pressure up to 10 pounds; larger sizes, up to 6 pounds.



No. 645
Cross Section

Construction: The No. 645 is regularly made with a semi-steel body, brass trim, and flanged ends. Sizes 2 to 24-inch are available (12 to 24-inch with flanged door only).

Noiseless, steadied operation upon closing is assured by an outside oil dashpot.

When ordering: Specify the catalog number and size; whether the valve is for use in connection with condensing or non-condensing engines, and whether for back pressure or atmospheric relief. If for back pressure, specify the pressure to be maintained and the service for which the exhaust steam is to be used.

Companion flanges are extra and are furnished only when ordered.

Face to Face, in Inches

Size	2	2½	3	4	6	8	10	12	14	16
Face to face	7½	7½	8½	8¾	10¼	12¼	15	15	17¼	18

Fisher Pressure Relief Valves

Spring Loaded

Service recommendations: The No. 555 Pressure Relief Valve is used to automatically maintain a constant upstream or back pressure. It is designed for throttling relief service on water, oil, steam, air, gas, and other fluids.

A wide range of diaphragm sizes and springs allows adaptation to many back pressure installations.

Construction: The double port and balanced inner valve has beveled ground seats and is connected to the valve stem by a patented "Flexaline" connection.

Single seated bodies, with either a composition disc or with a bevel seated inner valve, are also available.

The extra heavy enclosed yoke protects the spring from dirt and weather. A long, high quality steel spring assures freedom from any change in the control point.

Installation: The valves can be installed with the diaphragm either above or below the pipe line. The inner valve is inverted; the body can be easily turned over for conversion to a reducing valve.



No. 555
Cross Section

Types Available, Range of Sizes, and Ratings

Types Available			Range of Sizes	Working Pressures Psi	Deg. F.	Psi	Deg. F.
High-Tensile Iron Body with Bronze or Stainless Steel Trim	Screwed		½ to 2-inch	250	410°	400	100°
	Flanged	125-Pound	1 to 8-inch	125	360°	175	100°
		250-Pound	1 to 8-inch	250	410°	400	100°
Cast Steel Body with Stainless Steel Trim	Screwed		½ to 2-inch	600	800°	1200	100°
	Flanged	150-Pound	1 to 8-inch	150	500°	230	100°
		300-Pound	1 to 8-inch	300	800°	600	100°
		400-Pound	1 to 8-inch	400	800°	800	100°
		600-Pound	1 to 8-inch	600	800°	1200	100°

Prices on application

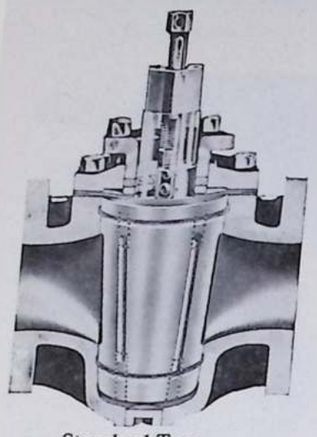
Relief Pressure Ranges
Nominally Standard

½ to 2	psi
1 to 4	psi
2 to 5	psi
3 to 10	psi
5 to 15	psi
10 to 35	psi
20 to 55	psi
30 to 75	psi
40 to 100	psi

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Nordstrom Lubricated Plug Valves

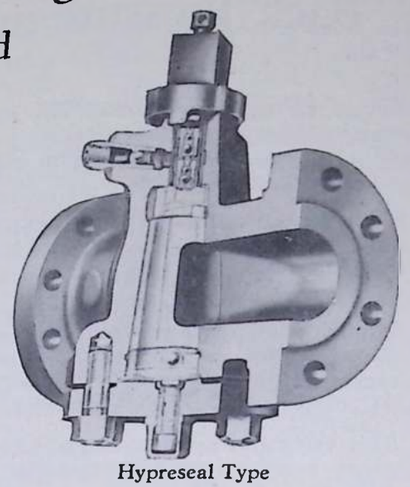
Pressure Lubricated



Standard Type

Nordstrom lubricated plug valves meet the demands of the piping industry, particularly in the petroleum, refining, gas, and chemical fields. The valves are suitable for an extreme range of working pressures.

The functions of pressure lubrication in Nordstrom valves are: (1) hydraulic action, keeping plug in free working condition; (2) maintain positive seal against internal and external leakage; (3) free turning, even of the largest sizes and against heavy differential pressure; (4) protection of working surfaces from wear and corrosion.



Hypreseal Type

Standard type: These valves are for industrial services and are furnished for working pressures of 200 pounds and higher. They are available in semi-steel and Nordco steel, with a bolted gland in the larger sizes and a screwed gland in the smaller sizes; with screwed or flanged ends; wrench or gear operation; and regular, venturi, gate valve replacement, or multiport patterns.

Hypreseal type: This valve has an inverted, full-floating plug, with separate adjusting and rotating members located at opposite ends of the plug. The stem is independent of the plug, except that the two parts are coupled as to rotation by a floating equalizer ring. A plastic packing, injected under pressure, applies a plastic seal on stem threads. This valve can be repacked under full working pressure.



No. 142



No. 143



*No. 143



*No. 149



No. 114



No. 115



No. 167



No. 305



No. 524



No. 525

Features

Non-sticking plug: In all Nordstrom valves, lubricant forced in under pressure produces a momentary unseating movement of the plug, which overcomes any adhesion and, because of the taper, creates space for a lubricant film between plug and body. The unseating occurs only at the time of lubrication; therefore, the seat is not exposed to line fluid.

The tapered form of plug and seat provides an intimate fit, regardless of the absence of a lubricant or of the thickness of lubricant film.

Positive rotary action: These valves are built on the tapered rotary principle. The taper of the plug and seat maintains an intimate working contact between the two parts at all times. Since the valve is opened and closed by rotation only, and not by raising and lowering the movable valve member, the vital seating surfaces are self-protecting and self-cleaning.

Semi-Steel Valves

No.	Size Inches	Ends	Working Pressure Pounds SWP	Working Pressure Pounds WOG	Test Pressure Pounds	Operation
142	1 to 4	Screwed		175	350	Wrench
143	1 to 4	Flanged		175	350	Wrench
*143	6 to 12	Flanged	125	200	400	Wrench
*149	6 to 12	Flanged	125	200	400	Worm Gear
114	½ to 3	Screwed	125	200	400	Wrench
115	1 to 4	Flanged	125	200	400	Wrench
167	4 to 12	Flanged	125	200	400	Spur Gear
167	14 and 16	Flanged	125	175	350	Worm Gear
214	½ to 3	Screwed	250	400	800	Wrench
305	2 to 4	Flanged	250	400	800	Wrench
524	½ to 4	Screwed	250	500	1000	Wrench
824	½ to 4	Screwed		800	1600	Wrench
†2815	1 to 3	Flanged		150	300	Wrench
†2965	4 and 6	Flanged		250	500	Wrench
23141	2 to 4	Dresser		175	350	Wrench
24191	6 and 8	Dresser		200	400	Wrench

*Short Venturi Pattern. †Steam-Jacketed.

Prices on application

Nordstrom Lubricated Plug Valves (Cont.)



No. 824



No. 2815



No. 2965



No. 23141



No. 24191



No. 1924



No. 1925

Steel Valves

No.	Size, Inches	Ends	Steel	A.S.A. Rating	Operation
1924	2 to 4	Screwed	Carbon	150	Wrench
1925	1 to 4	Flanged	Carbon	150	Wrench
1985	6 and 8	Flanged	Carbon	150	Worm Gear
1989	6 to 12	Flanged	Carbon	150	Worm Gear
*4169	10 to 24	Flanged	Carbon	150	Wrench
2024	½ to 4	Screwed	Carbon	300	Wrench
2025	1 to 4	Flanged	Carbon	300	Wrench
‡1945	2 to 6	Flanged	Carbon	150	Worm Gear
‡1949	6 to 12	Flanged	Carbon	150	Worm Gear
*‡4249	10 to 16	Flanged	Carbon	300	Worm Gear

*Venturi Pattern. ‡Hypreseal.



No. 1985



No. 1989



No. 4169



No. 2024

Semi-Steel Multiport Valves

No.	Size Inches	Ends	Working Pressure Pounds SWP	Working Pressure Pounds WOG	Test Pressure Pounds	Port	Operation
3402	½ to 2½	Screwed	125	200	400	3-way, 2-port	Wrench
3412	½ to 2½	Screwed	125	200	400	3-way, 3-port	Wrench
3422	½ to 2½	Screwed	125	200	400	4-way	Wrench
3403	1½ to 2½	Flanged	125	200	400	3-way, 3-port	Wrench
3413	1½ to 2½	Flanged	125	200	400	3-way, 3-port	Wrench
3423	1½ to 2½	Flanged	125	200	400	4-way	Wrench
3469	6 to 12	Flanged	125	200	400	3-way, 2-port	Worm Gear
	16	Flanged	125	175	350	3-way, 2-port	Worm Gear
3479	6 to 12	Flanged	125	200	400	3-way, 3-port	Worm Gear
	16	Flanged	125	175	350	3-way, 3-port	Worm Gear
3489	6 to 12	Flanged	125	200	400	4-way	Worm Gear
	16	Flanged	125	175	350	4-way	Worm Gear



No. 2025



No. 1945



No. 1949



No. 4249

Carbon Steel Multiport Valves

No.	Size, Inches	Ends	A.S.A. Rating	Port	Operation
4802	½ to 2½	Screwed	300	3-way, 2-port	Wrench
4812	½ to 2½	Screwed	300	3-way, 3-port	Wrench
4822	½ to 2½	Screwed	300	4-way	Wrench
4803	1½ to 2½	Flanged	300	3-way, 2-port	Wrench
4813	1½ to 2½	Flanged	300	3-way, 3-port	Wrench
4823	1½ to 2½	Flanged	300	4-way	Wrench



No. 3402
No. 3412
No. 3422



No. 3403
No. 3413
No. 3423



No. 3469
No. 3479
No. 3489



No. 4802
No. 4812
No. 4822

Air, Meter, Gauge, and Service Cocks

No.	Type	Size Inches	Ends	Working Pressure Pounds WOG	Operation
1018	Meter & Air Cocks	½, ¾, 1	Screwed	125	Wrench
1004	Service Cocks	¾ to 1½	Screwed	40	Wrench
1036	Service Cocks	¾ to 2	Dresser	40	Wrench
2222	Gauge Cocks	¼, ⅜, ½	Screwed	2000	Wrench



No. 1018



No. 1004



No. 1036



No. 2222

Nordstrom Valve Lubricants

Nordstrom valve lubricants are compounded in various consistencies and formulas to obtain the best results in specific services. Information and recommendations will be furnished on request. Two basic types are available:

Nordcoseal—the standard non-compressible type of lubricant.
Hypermatic—the miracle lubricant. Converts Nordstrom Valves to automatic lubrication.

Both lubricants are available in stick or in bulk form. Users should closely follow the recommendations and instructions pertaining to each lubricant.

Prices on application

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Clayton Valves

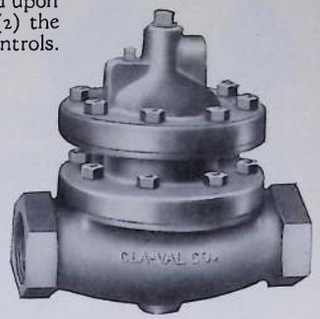


No. 100 Hy-Trol Valve

The Clayton line of valve equipment is founded upon three main elements: (1) the Hy-Trol Valve; (2) the Power-Trol Valve; and (3) Feather-Touch Controls.

The Hy-Trol is the basic valve which can be furnished with a variety of Feather-Touch Controls to simplify the control of liquids or gases for almost any application within the temperature limits of 200° F. and pressures in either the 150 or 300-pound class.

The Power-Trol, also basic, has numerous applications when used with one or more Feather-Touch Controls.

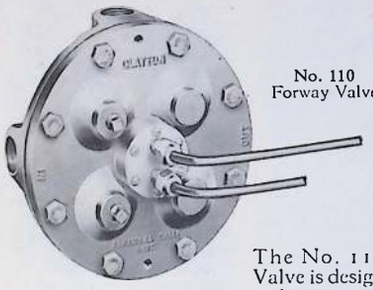


No. 100-P Power-Trol Valve

Hy-Trol Valve: The No. 100 Hy-Trol Valve is of a modified globe design, employing a diaphragm as the means of operation. It may be operated hydraulically or pneumatically, and may be installed in a horizontal, vertical, or inverted position. The Hy-Trol Valve is designed to handle water, oil, or gas, with either direct or remote control.

Power-Trol Valve: The No. 100-P Power-Trol Valve is designed primarily for gasoline, aromatic liquids, oils, or gases, where an independent source of pressure for both opening and closing is desirable. The pressure of the operating medium, either water or air, need be no greater than the line pressure. This valve is also used on low pressure service.

Hydraulic Forway Valve



No. 110
Forway Valve

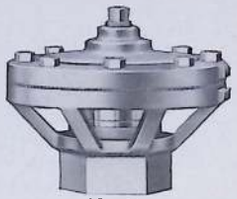
The No. 110 Forway Valve is designed to control operation of fluid motors, hydraulic cylinders, pistons, and similar power devices. It operates efficiently on either air or water at pressures up to 300 pounds per square inch, and is made in the ¾-inch pipe size only.

The Forway is actually four Hy-Trol Valves combined in one brass housing. The valve seats are brass; the diaphragm and discs are synthetic rubber.

Cla-Val pilot controls, such as the Manual, Solenoid, Float or Float Chamber, and Pressure Differential, are used to actuate the valve. The valve and pilot control provide an easy, dependable means of greatly increasing the operations that can be efficiently handled by remote hydraulic control.

The Forway Valve is installed on or near the power device, and the pilot control at a convenient remote location. The controlling fluid, transmitted by means of copper tubing, may be the same line pressure as handled by the Forway or an independent source of air or water under pressure.

Vacuum Relief Valve



No. 31
Vacuum Relief Valve

The No. 31 Vacuum Relief Valve is of the pressure type design for operation on the supply side of a control valve. The stem of the valve has a tubular opening through which pressure flows to the cover chamber, forcing the diaphragm and disc assembly to the closed position.

The valve remains closed under normal pressure. It will open as soon as the pressure drops below zero, and as the water flows out of the valve cover into the line, atmospheric pressure forces the valve open to admit air.

The inlet ports are designed to admit the full capacity of the valve seat area without restriction.

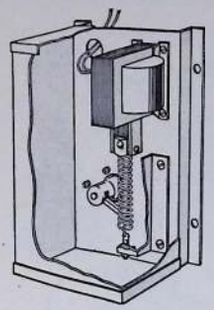
The No. 31 Valve is available in the 1-inch size of all brass construction. In the 2-inch size, the valve is of cast iron construction and is equipped with brass working parts.

The disc and diaphragm are made of a special non-metallic material which will not stick or vulcanize to the seat.

Prices on application

Clayton Valves

Remote Controls



Type CS Solenoid

Type CS Solenoid Controls are used extensively for automatic operation of valves in pump lines, sprinkler systems, and automatic fire protection equipment. The electric actuator may be a float or pressure switch, time clock, or thermostat. The control is available in 110, 220, or 440 volt A.C., 50 or 60 cycles, and in a variety of D.C. voltages.

The Solenoid, ruggedly constructed for service, is housed in a steel case. Installation may be directly on the valve or at any convenient remote location.

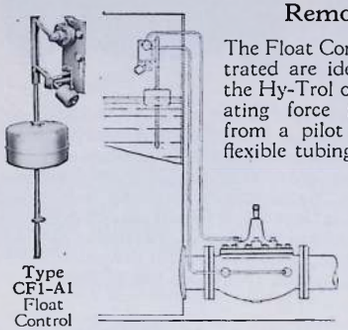
Type CM Controls, known as Clayton Feather-Touch Controls. permit remote control of flow on Clayton Hy-Trol or Power-Trol Valves. The controls, small multi-port pilot valves, equipped with various types of actuators, are designed to transmit the flow of non-corrosive liquids or gases for hydraulic or pneumatic operation of valves.



Type CM
Manual Controls

Type CM Controls are actuated manually, electrically, hydraulically, or by means of a float. These controls are available with as many as twelve outlets.

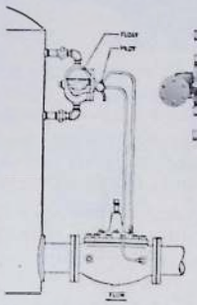
Remote Controls for Float Valves



Type
CF1-A1
Float
Control

The Float Control and Float Chamber illustrated are ideal for the remote control of the Hy-Trol or Power-Trol Valve. An actuating force is hydraulically transmitted from a pilot control by means of either flexible tubing or small pipe. Line pressure is generally used for operation; however, an independent source of pressure may be used.

The controls are furnished with tubing for installing valves at a 12-foot distance.

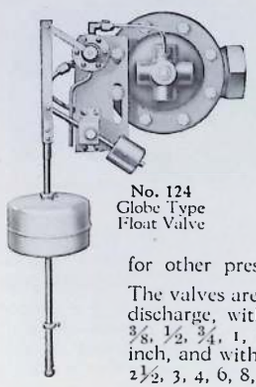


Type
CFC2-A1
Float
Chamber

Type CF1-A1 Float Control regulates the Hy-Trol Valve for open tank service. The control is mounted in the tanks; the valve is installed in the line either above or below the control. Any level differential up to 24 inches can be maintained by adjusting the upper and lower stop collars on the float rod.

Type CFC2-A1 Float Chamber is designed for use with the Hy-Trol Valve, where an external installation is desired. The vertical distance is limited by flowing pressure at the valve inlet, which is popular on feed water heaters, closed surge tanks, etc. The control is tapped for 1-inch pipe connections.

Automatic Valves



No. 124
Globe Type
Float Valve

No. 124 Float Valves, completely hydraulic in operation, automatically maintain maximum and minimum levels at any desired point. They are used for water service at moderate temperatures for pressures from 10 to 150 pounds; valves for other pressures made to order.

The valves are available for horizontal discharge, with screwed ends in sizes ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, and 3-inch, and with flanged ends in sizes 2, 2½, 3, 4, 6, 8, 10, 12, 14, and 16-inch.

No. 95 Pressure Reducing Valves handle relatively small volumes of water, oil, and some gases within extremely close limits such as on drinking fountains, water coolers, humidifiers, and gas refrigerators. One inlet and two discharge outlets for straight or angle installation permit their use where gauge attachments are required.



No. 95
Pressure
Reducing Valve

The valve is spring-loaded, direct acting, with a good working area. The bronze body has a stainless steel seat.

The large diaphragm and disc are synthetic rubber. Initial pressures to 200 pounds and delivery pressures from 30 to 110 pounds are available; when not specified, the set delivery pressure is 60 pounds. Sizes ¼ and ⅜-inch are available.

Prices on application

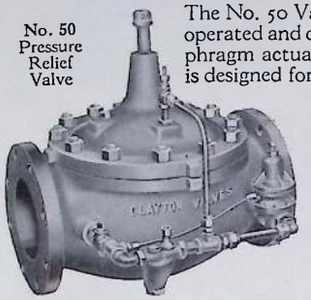
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Clayton Valves

Automatic

These valves are of a modified globe design, employing a diaphragm as the operating means. They are designed to handle water, oil, and some gases. Installation may be in a horizontal, vertical, or inverted position, with either direct or remote control. They can be either hydraulically or pneumatically operated.

Pressure Relief Valves



The No. 50 Valve, hydraulically operated and controlled by a diaphragm actuated pressure pilot, is designed for automatic service for relief or back-pressure duty, and will open at the pressure for which the control is set. It opens and closes without shock.

The valve may be installed so that the discharge is to atmosphere, a zone of lower pressure, a tank; or in the case of a pump installation, it may discharge into the pump suction.

This valve is set to open at 60 pounds pressure unless otherwise ordered; it can be furnished in a range of operating pressures from 5 to 300 pounds.

Available sizes are: screwed ends in sizes 1¼, 1½, 2, 2½, and 3-inch; flanged ends in sizes 2, 2½, 3, 4, 6, 8, 10, 12, 14, and 16-inch.

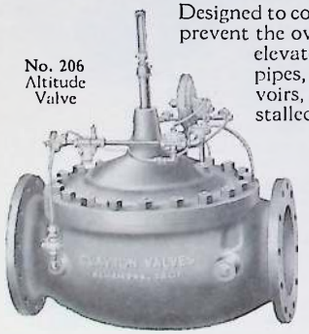
No-Slam Check Valves



Designed for water, oil, and air. Can be equipped with special discs and diaphragm material for other fluids. Widely used for installations with turbine or centrifugal pumps where shock must be minimized. It opens and closes at a controlled rate of speed; if desired, use a speed control or needle valve to vary the speed.

The valve uses the full line pressure to open and close. Positive pipe line protection against water hammer is assured—there are no hinged parts to stick or break; no fast moving parts to "flutter" and cause line pulsations; no outside stuffing box or packing gland to cause leakage. Install horizontally or vertically. Screwed ends available in sizes ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, and 3-inch; flanged ends, in sizes 2, 2½, 3, 4, 6, 8, 10, 12, 14, and 16-inch.

Altitude Valves

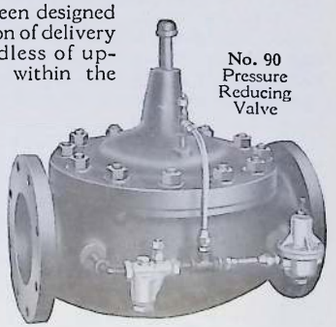


Designed to control the level and prevent the overflow of water in elevated tanks, standpipes, or storage reservoirs, this valve is installed in the tank filling line; it automatically closes when the water reaches a predetermined level. Depending upon the type of valve, water may be withdrawn from the storage tank through a check valve, in a by-pass line around the Altitude Valve, through a separate discharge line, or, may flow back into the system through the Altitude Valve.

A hydraulic balance type of control, virtually frictionless, assures efficient control in elevated tanks or ground storage reservoirs. The valve functions dependably on low or high pressures. Available sizes are the same as those listed for the No. 50 above.

Pressure Reducing Valves

This valve has been designed for close regulation of delivery pressure regardless of upstream pressure within the operation limits of the valve.



The valve is particularly suited for use in water distribution systems, or in a "closed" system, since it will close tight on dead-end service without any build-up in discharge.

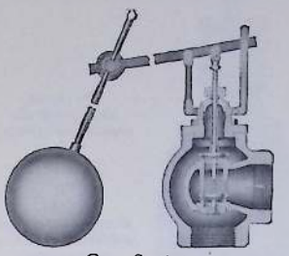
Pilot Control springs provide a wide range of delivery pressure. Unless otherwise specified, valves are factory set at 60 pounds with a delivery pressure range of 30 to 110 pounds.

Available sizes are: screwed ends in sizes 2½ and 3-inch; flanged ends in sizes 2½, 3, 4, 6, 8, 10, 12, 14, and 16-inch.

Prices on application

Klipfel Tank Float Valves and Lever Valves

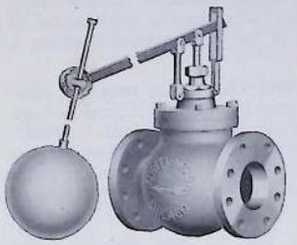
Balanced Type



Cross Section

Tank Float Valve
No. 27, Angle

Lever Valve
No. 62, Angle
(Same as No. 27, less float parts)



Tank Float Valve
No. 27, Globe

Lever Valve
No. 62, Globe
(Same as No. 27, less float parts)

Service recommendations: Balanced type valves are recommended to control the flow of hot or cold water to open tanks where a perfectly tight seating valve is not required.

Single seated valves are designed to maintain the water level in open tanks where a tight closing valve is needed to prevent waste and overflow.

For automatic control, use the Tank Float Valves; for manual control, use the Lever Valves.

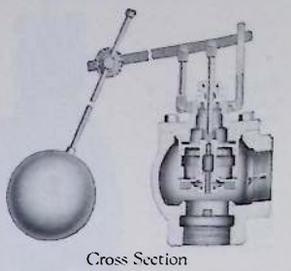
Materials and construction: The valves are furnished with integral seats and bronze bodies on sizes 1½-inch and smaller; larger sizes have screwed-in renewable seat and semi-steel bodies. Except for the rubber composition discs, all internal parts are brass.

Balanced type valves have two beveled discs which close on correspondingly beveled seats to provide a practically balanced construction.

Single seated valves have an internal piston, a disc holder, and a pilot valve. The lower end of the piston forms a holder in which the composition disc is retained by a disc nut. The pilot valve, actuated by the valve stem, controls the water pressure above the piston. As the stem is loosely attached to the piston, movements of the float also serve to operate the main valve.

No. 77 and No. 773 Valves are equipped with a leather cup piston seal.

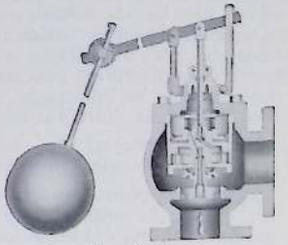
Single Seated Type



Cross Section

Tank Float Valves
No. 7, Globe or Angle
(Angle illustrated)

Lever Valves
No. 73, Globe or Angle
(Same as No. 7, less float parts)



Cross Section

Tank Float Valves
No. 77, Globe or Angle
(Angle illustrated)

Lever Valves
No. 773, Globe or Angle
(Same as No. 77, less float parts)

Installation: All valve bodies are marked to indicate the correct direction of flow.

When ordering: Specify the catalog number, pipe size, angle or globe pattern, screwed ends, 125-pound or 250-pound flanges, inlet pressure, outlet pressure unless zero, capacity required, kind of liquid, and approximate temperature unless below 125° F.

Other types of float valves: Other valves and mechanisms such as the following are available for unusual services or irregular installations. Prices and detailed information furnished on application.

No. 177—Equipped with a separate pilot valve for remote operation. Sizes 2 to 8-inch.

No. 20—Float mechanism only. Consists of the float, shaft, packing box, and lever.

Type and Sizes Available

Catalog Numbers		Valve Ends	Sizes Available, in Inches												
Tank Float Valves	Lever Valves														
No. 27 Globe or Angle	No. 62 Globe or Angle	Screwed	½	¾	1	1¼	1½	2	2½	3					
		125-Pound Flanged, F. & D.						2	2½	3	4	5	6	8	10	12
		250-Pound Flanged, F. & D.						2	2½	3	4	5	6	8	10	12
No. 7 Globe or Angle	No. 73 Globe or Angle	Screwed		¾	1	1¼	1½	2								
		125-Pound Flanged, F. & D.						2								
		250-Pound Flanged, F. & D.						2								
No. 77 Globe or Angle	No. 773 Globe or Angle	Screwed						2	2½	3						
		125-Pound Flanged, F. & D.						2	2½	3	4	5	6	8		
		250-Pound Flanged, F. & D.						2	2½	3	4	5	6	8		

Prices on application

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Crane-Line Reduced Pressure Backflow Preventers

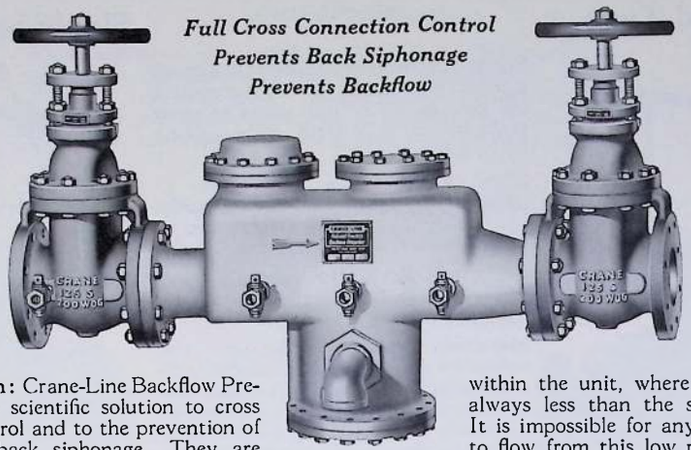
Full Cross Connection Control
Prevents Back Siphonage
Prevents Backflow

Used wherever water creates health hazards.

Prevents and controls water pollution.

Complete unit includes Crane valves, cocks, and fittings.

Prices, dimensions, and additional data on request.



Full protection: Crane-Line Backflow Preventers are the scientific solution to cross connection control and to the prevention of backflow and back siphonage. They are widely used for the control and prevention of water pollution in various types of cross connections and inter-connections in piping systems common to manufacturing, processing, and food plants, public buildings, hospitals, laboratories, cooling towers, oil wells, and similar installations.

In certain systems, the units will economically replace costly booster pumps and tanks.

Automatic operation: Crane-Line Backflow Preventers operate automatically by means of the line pressure; no manual attention is required. Under ordinary usage, they will give years of trouble-free service with minimum maintenance.

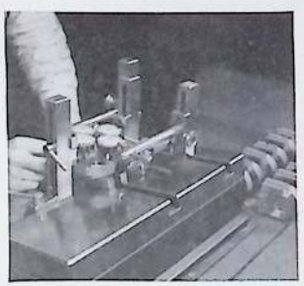
Size for size, the units are the same in operating principle and differ only in external appearance. They combine double check protection and an air gap break to atmosphere with the "reduced pressure" principle. This design provides a zone, within the unit, where the pressure is always less than the supply pressure. It is impossible for any polluted water to flow from this low pressure zone to a zone of higher pressure. In the event of failure to any part vital to the prevention of backflow, the relief valve automatically emits a continuous discharge.

High grade materials: A typical unit, as illustrated above, includes high quality Crane valves, fittings, and cocks as part of the standard assembly. The backflow device as well as the accessories are of rugged, durable construction. All parts are made of high grade materials to withstand long, rigorous service.

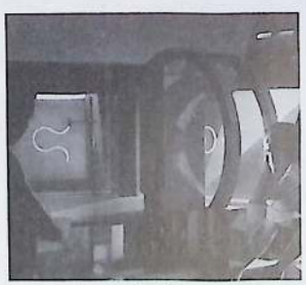
Easy repairs: Any moving part can be easily removed and replaced without taking the backflow preventer unit out of the line.

Sizes available: Crane-Line Backflow Preventers are available for 1, 1½, 2, 2½, 3, 4, 6, 8, 10, and 12-inch pipe lines. Prices, dimensions, and additional information will be furnished on request.

If It's a Crane Product—It's a Tested Product!



Checking disc taper. Parts, like finished products, are thoroughly checked.



Stress distribution is revealed photoelastically.



Metal structure is examined through a metallographic microscope.

Safety and Relief Valves

Pop Safety Valves

Brass, for Saturated Steam.....page 320
Brass, for Air and Gas.....page 321
Brass, for Heating Boilers, Low Pressure.....page 323

Iron, for Heating Boilers, Low Pressure.....page 322
Iron, for Air and Gas.....page 323
Iron, for Steam—Crosby.....page 324

Steel, for Steam—Crosby.....page 324

Lever and Weight Safety Valves.....page 325

Relief Valves

Brass, Small Sizes, for Steam, Water, and Air.....page 326
Brass, for Vacuum Service.....page 327
Brass, for Water Heaters.....page 327
Brass, for Steam, Water, and Oil.....page 328
Brass, for Air and Gas.....page 329
Brass, for Gasoline or Noxious Gases.....page 329
Brass, for Hydraulic Services, High Pressure.....page 330

All-Iron, for Ammonia, Air, and Gas.....page 331

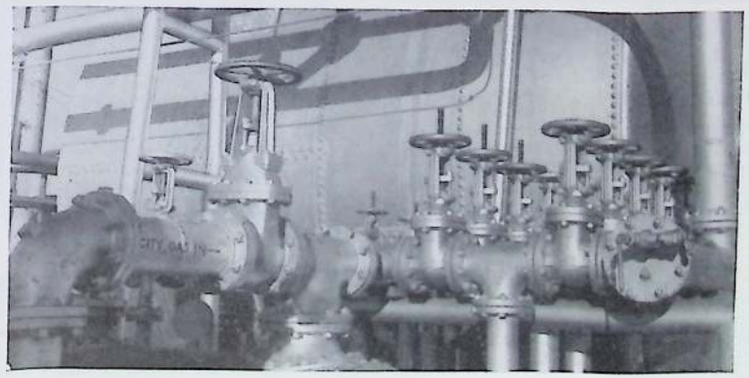
Iron, Inside Spring, for Water and Oil.....page 331
Iron, Outside Spring, for Steam, Water, Oil, and Gas..page 332
Iron—Crosby.....page 334

Steel, Outside Spring, for Steam, Water, Oil, and Gas..page 333
Steel—Crosby.....page 334

Cast Iron Drip Pan Elbows.....page 325

Crane Safety and Relief Valves are shown on the pages referred to above. For other Crane special duty valves and for specialities, see pages 299 to 318 and pages 335 to 374.

For Corrosion-Resistant Alloy Relief Valves, see page 382.

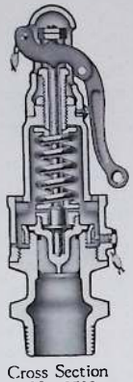


A natural gas installation.....Crane-equipped.

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Brass Pop Safety Valves

For Saturated Steam



Cross Section
No. 2500



No. 2500
Top Outlet
With Wire Seal

Set at any specified pressure
from 3 to 250 pounds

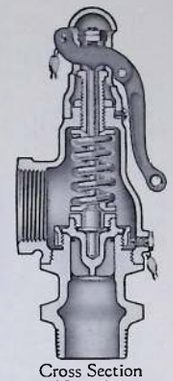
Orders must specify the set pressure as well as the catalog number.

SERVICE RECOMMENDATIONS

Crane Brass Pop Safety Valves are recommended for saturated steam for use on boilers, miniature boilers, and on unfired pressure vessels, such as receivers, pipe lines, etc.



No. 2501
Side Outlet
With Wire Seal



Cross Section
No. 2501

List Prices, Each

Size — Inches	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
No. 2500, Top Outlet	15.50	15.50	17.00	20.00	23.00	29.00	40.00	57.50
No. 2501, Side Outlet	16.00	16.00	17.50	21.00	24.00	30.50	42.50	63.00

Boiler Code requirements: Valves ½-inch and larger comply with the 1946 A.S.M.E. Construction Codes for Power Boilers up to 250 pounds, for Miniature Boilers up to 100 pounds, and for Unfired Pressure Vessels, from 15 to 250 pounds.

Pressure setting: The screwed regulating sleeve adjustment for the main spring permits the set pressure of these valves to be increased or decreased 10 per cent; however, this maximum variation in the set pressure must be strictly observed as one spring cannot cover the complete range of pressures at which the valve may be set.

A wire seal prevents tampering with adjustments after the valves have been set at the factory.

Design: The valves are of the single disc type. All sizes except the ⅜-inch have blow-back regulating rings which permit readjustment of the blow-back when the set pressure is changed.

Materials: The valves have a brass body, base, and disc and a malleable iron lifting lever. The spring, spring washer, and stem are made of steel.

Installation: The valves should be installed in an upright position directly on the apparatus to be protected. Horizontal or angular installation may result in damage to the seating surfaces.

Piping should be carefully planned. Outlet piping should be as short as possible, with a minimum number of turns, and never smaller in size than the outlet of the valve. Inlet piping, if any is necessary, should be full size and not longer than an extra heavy fitting of equal nominal pipe size.

Lifting lever: The lifting lever is reversible and can be arranged for pull-up operation (illustrated) or reversed for push-or-pull-down operation. When installing, ample clearance should be allowed. Complete rotation of the lever is possible without disturbing the setting of the valve.

Maintenance: It is recommended that these valves be manually operated at regular intervals to assure proper action. This operation should be performed only when there is sufficient pressure available within the boiler, pressure vessel, or line to blow any accumulated foreign matter clear of the seating surfaces, particularly when starting up a new boiler.

Capacities in Pounds of Steam per Hour

90° Actual Discharge Capacity at 3% Above Set Pressure

Set Pressure	Valve Size, Inches ½	¾	1	1 1/4	1 1/2	2	2 1/2
10	45	96	171	180	238	387	415
20	72	148	256	279	378	549	675
25	82	169	290	317	441	630	785
30	92	189	324	351	495	711	900
40	113	225	387	423	594	874	1105
50	135	256	414	460	646	957	1191
60	148	288	465	532	748	1100	1329
70	162	332	527	604	849	1246	1508
75	169	360	558	640	899	1246	1597
80	176	369	589	675	950	1301	1687
90	192	369	651	747	1050	1411	1866
100	210	377	683	810	1170	1466	2095
125	241	495	738	855	1440	1718	2487
150	278	559	814	1080	1440	1922	2880
175	308	603	945	1080	1561	2032	3240
200	342	621	1020	1260	1716	2301	3600
225	367	702	1095	1440	1871	2569	3960
250	392	810	1170	1620	2025	2838	4320

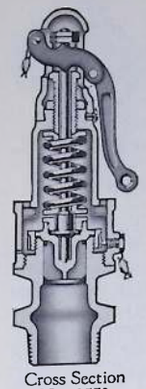
Capacities for other set pressures are furnished on application.

Dimensions, in Inches

Size (Size of inlet)	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Size of outlet (No. 2501 Valve)	1/2	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Over-all height to top of cap	6	6	6 1/2	7 7/8	7 7/8	9 1/8	10 5/8	12 3/4
Center to top of cap	3 3/4	3 3/4	3 3/4	4 5/8	4 3/8	5 1/4	6 1/8	7 3/4
Center to end of male inlet	2 1/4	2 1/4	2 3/4	3 1/4	3 1/2	3 7/8	4 1/2	5
Center to end of side outlet	1 1/8	1 1/8	1 3/8	1 5/8	1 3/4	2 1/8	2 7/16	2 7/8

Brass Safety Valves

For Air and Gas



Cross Section
No. 2550



No. 2550
Top Outlet
With Wire Seal

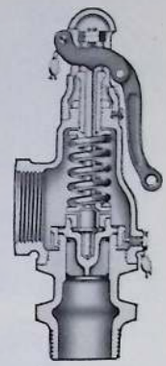
Set at any specified pressure
from 3 to 250 pounds, 450° F. max.

SERVICE RECOMMENDATIONS

These valves are recommended for receivers, tanks, pipe lines, and similar vessels, on temperatures not exceeding 450° F. For air, either top or side outlet valves are suitable, but for gases, the side outlet type is generally used, the discharge being piped away.



No. 2551
Side Outlet
With Wire Seal



Cross Section
No. 2551

Orders must specify the set pressure as well as the catalog number.

List Prices, Each

Size — Inches	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
No. 2550, Top Outlet, with Wire Seal	18.50	18.50	20.00	24.00	27.00	34.00	47.50	68.00
No. 2551, Side Outlet, with Wire Seal	19.00	19.00	20.50	25.00	28.50	36.00	50.50	75.00

Pressure setting: These valves can be set at any pressure between 3 and 250 pounds. Safety valves for air and gas service always should be set 25 per cent higher than the normal operating pressure.

The main spring regulating adjustment permits increasing or decreasing the set pressure 10 per cent. This must be strictly observed as one spring cannot cover the complete range of pressures at which the valve may be set. A wire seal, inserted in the pin of the lifting lever at the factory, prevents tampering with the adjustment of the set pressure.

Design: Of the single disc type, the valves except in the ⅜-inch size have blow-back regulating rings to permit readjustment of the blow-back when the set pressure is changed. Seating surfaces are carefully prepared by grinding to assure audible tightness at all pressures up to 80 per cent of the set pressure.

Materials: The body, base, and disc are brass. The lifting lever is malleable iron. The spring, spring washer, and stem are steel.

Lifting lever: The reversible type lifting lever is illustrated above in the pull-up position; it can be reversed for push-or-pull-down operation. Complete rotation of the lever is possible without disturbing the set pressure of the valve.

Installation: Safety valves should be installed with the stem in a vertical position and preferably inverted to allow moisture to collect and seal the seating surfaces. Best results are obtained by mounting the valve directly on the apparatus to be protected without any intervening pipe or fittings between the vessel and the safety valve.

Code requirements: These valves comply with the requirements of the 1946 A.S.M.E. Code for Unfired Pressure Vessels for pressures above 15 pounds.

Capacities: Capacities are furnished on application. Inquiries should advise size, catalog number, air or gas pressure, and set pressure desired.

Maintenance: It is recommended that these valves be manually operated at regular intervals to assure proper action. This operation should be performed only when there is sufficient pressure available within the vessel or line to blow any accumulation of foreign matter clear of the seating surfaces, particularly when starting up a new installation.

Noxious gases: For noxious or inflammable gases, side outlet valves having a pressure tight outlet side are recommended. They are made to order; prices on application. Brass relief valves with side outlet are made regularly for such services; see page 320.

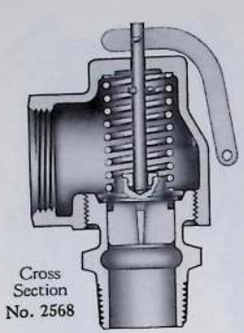
Dimensions, in Inches

Size (Size of inlet)	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Size of outlet (No. 2551 Valve)	1/2	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Over-all height to top of cap	6	6	6 1/2	7 7/8	7 7/8	9 1/8	10 5/8	12 3/4
Center to top of cap	3 3/4	3 3/4	3 3/4	4 5/8	4 3/8	5 1/4	6 1/8	7 3/4
Center to end of male inlet	2 1/4	2 1/4	2 3/4	3 1/4	3 1/2	3 7/8	4 1/2	5
Center to end of side outlet	1 1/8	1 1/8	1 3/8	1 5/8	1 3/4	2 1/8	2 7/16	2 7/8

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Low Pressure Iron Body Pop Safety Valves

For Steam Heating Boilers



Cross Section
No. 2568

Set Pressures—Non-Adjustable
5, 10, or 15 pounds, as specified

On special order, valves can be furnished for any other set pressure between 5 and 15 pounds, at an increased price.

Important: The valves are non-adjustable. They are set at the factory and sealed by means of a sealing pin. The popping pressure cannot be altered nor can valves be taken apart without breaking the seal, thereby showing evidence of tampering. An attached identification plate indicates the setting.



No. 2567
Top Discharge



No. 2568
Side Outlet

A New, Advanced Line—High capacity, tested design, and sturdy construction make these the ideal valves for use on low pressure steam heating boilers, or on receivers, tanks, piping, and other apparatus carrying steam pressures not exceeding 15 pounds.

Efficiency through high capacity: Because safety valves used on steam heating boilers should have a relieving capacity sufficient to discharge all of the steam generated, their selection is based on capacity rather than size.

Crane's high capacity valves permit the use of smaller sizes, and frequently, fewer valves. The result is a saving in size and number of boiler openings, in discharge piping, and in over-all cost.

Features: These are flat seat valves. The seat, and a recess which forms a huddling chamber, are machined in the top surface of the base. The disc has wing guides to assure accurate guidance in the seat opening; a lip on the outer edge of the disc forms the top of the huddling chamber. This construction provides the desired "popping" action.

A long, flexible spring contributes to the high disc-lift so necessary to high relieving capacity. The spring, compressed within the body, bears down on the top of the disc. The body is screwed on the top of the base and locked in place by the sealing pin.

Materials and finish: To resist corrosion, the base and all internal parts except the spring are brass. Valves 1¼-inch and smaller have a stainless steel spring and a brass lever; on larger valves, the spring is carbon steel, cadmium-plated and the lever is malleable iron. All valves have a cast iron body.

The body and malleable iron lever have an attractive black enamel finish.

Blow-back: The blow-back pressure, fixed and non-adjustable, is about 2 pounds for settings from 5 to 10 and 3 pounds for settings from 10 to 15. Thus, a valve set at 10, "pops" open when the inlet pressure mounts to 10 pounds, and closes when the pressure drops to about 8 pounds.

Proper installation: Always install valves with the stem vertical and the lifting lever at the top. When side outlet valves are used, the discharge piping should be independent of the valve. It should be supported close to the valve and sloped slightly downward so as to drain away condensate. Full instructions accompany each valve.

Maintenance: To assure proper action, manually operate the valves at regular intervals. Do this only when sufficient pressure is available within the boiler or pressure vessel to blow any accumulated foreign matter clear of the seating surfaces. This applies particularly when a new boiler is started up.

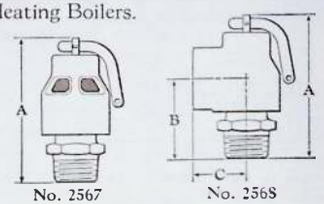
Code conformance: At settings from 5 to 15 pounds, these valves comply with requirements of the 1949 A.S.M.E. Code for Low Pressure Heating Boilers.

List Prices, Capacities, and Dimensions

Valve No.	Size of Male Inlet, Inches	List Prices, Each	*Capacity Lbs. of Steam Per Hr.	Dimensions, in Inches A	B	C	Size of Outlet No. 2568
No. 2567	1	8.50	510	4¾			
	1¼	10.00	735	5⅜			
	1½	12.00	1025	6⅛			
	2	16.00	1930	7¼			
No. 2568	¾	7.50	360	4¼	2½	1½	1
	1	8.50	580	4¾	2¾	1¾	1¼
	1¼	10.00	870	5⅜	3⅛	2	1½
	1½	12.00	1125	6⅛	3½	2¼	2
	2	16.00	2140	7¼	4⅛	3	2½
	2½	27.00	3485	9	5⅛	3 9/16	3
	3	35.50	4865	10½	6¼	4 1/16	3½

*Capacities apply to any setting from 5 to 15 pounds.

Specify catalog number, inlet size, and set pressure desired.



No. 2567 No. 2568

Low Pressure Brass Pop Safety Valves

For Steam Heating Boilers



No. 2565
Open Discharge

Set Pressure — Non-Adjustable
Regularly set at 15 pounds pressure.



Cross Section

List Prices, Dimensions, and Capacities

Size (Size of Inlet) Inches	¾	1	1¼	1½	2
No. 2565 Each	3.30	3.70	4.50	6.00	8.20
Overall height, open Inches	3⅜	3⅝	4	4⅜	5¼
Capacity in pounds steam per hour	212	374	571	656	954

No. 2565 Brass Pop Safety Valves are especially recommended for use on low pressure steam heating boilers. They are also used on tanks, receivers, pipe lines, etc., where safety valves set at 15 pounds are required.

Features: The valves, although relatively inexpensive, are particularly compact and sturdy. Made of all brass except for a steel spring, they will give excellent service if properly installed and maintained.

Pressure setting: The valves are non-adjustable. After they have been adjusted for pressure in the factory, they are permanently locked by indenting the cap into a recess in the body threads. The indentation is made with a steel stamp bearing the word "SEAL"; the valves cannot be taken apart or readjusted.

Maintenance: The valves should be manually operated at regular intervals to assure proper action. The operation should be performed only when sufficient pressure is available within the boiler to blow any accumulated foreign matter clear of the seating surfaces. This applies particularly when a new boiler is started up.

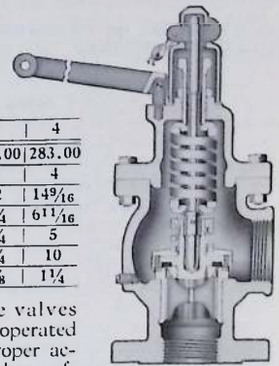
Code conformance: They comply with the requirements of the A.S.M.E. Code for Low Pressure Heating Boilers, and bear the Code cloverleaf symbol.

Iron Body Pop Safety Valves

For Air and Gas

No. 1102 Pop Safety Valves are especially designed for use on air and gas receivers, pipe lines, etc., where pressures do not exceed 150 pounds.

Set at any specified pressure
from 5 to 150 pounds



Cross Section
No. 1102
Combination Screwed and Flanged Inlet
Screwed Side Outlet
Renewable Composition Disc

List Prices and Dimensions

Size (Size of Inlet) Inches	2½	3	4
No. 1102 (Inlet flange F. & D.) Each	167.00	193.00	283.00
Size of outlet Inches	2½	3	4
Center to top of cap Inches	11	12	14 9/16
Center to face of inlet Inches	5¼	5¾	6 11/16
Center to end of outlet Inches	3⅞	4¼	5
Diameter of flange Inches	7½	8¼	10
Thickness of flange Inches	1	1⅛	1¼

Features of design: The valves have a renewable type Crane medium-hard composition disc to assure tight seating. A patented Crane auxiliary disc, installed directly above and acting against the main disc holder, enables the valve to accommodate large capacities with a small blow-back. Two springs control the action of this valve—a large spring for the main valve and a smaller spring for the auxiliary valve.

Pressure setting: The valves are set at any pressure specified between 5 and 150 pounds. The set pressure should be 25 per cent above the normal working pressure in the system. Orders must specify the set pressure wanted.

After the pressure is set at the factory, a wire seal is installed through the stem key to prevent removal of the cap and tampering with the adjustment.

Code conformance: No. 1102 Valves comply with requirements of the A.S.M.E. Code for Unfired Pressure Vessels for pressures above 30 pounds.

Maintenance: The valves should be manually operated regularly to assure proper action, and then, only when sufficient pressure is available within the receiver or pipe line to blow any accumulated foreign matter clear of the seating surface. This applies particularly when starting up a new installation.

Inlet flange; drilling: The inlet flange conforms to the American Cast Iron Flange Standard, Class 250 (B16b-1944). The flange has a 1/16-inch raised face finished with concentric grooves, about 16 per inch, known as a "serrated" finish. Prices include drilling to the American Standard; no deduction is made for valves ordered "faced only".

Templates for drilling . . . . page 460

Capacities on application

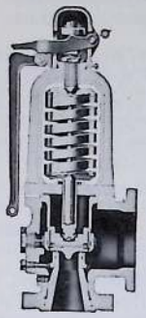
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Crosby Nozzle Safety Valves

High Capacity Valves for Steam Service



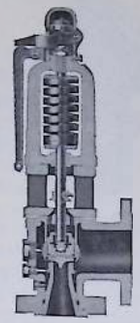
Style HR
Style HO



Industrial Service
Styles HN and HS



*Marine Service
Styles HN and HS



Style HNA
Style HSA

*Depending on orifice size, Styles HN and HS can be furnished with spring cover and test clamp suitable for marine boiler service.

30

These high capacity Safety Valves are recommended for steam only. They are ideally suited for the protection of boilers, superheaters, turbines, and pipe lines, and for general service in marine and industrial power plants and central stations.

Crosby Nozzle Safety Valves have been tested and approved by the National Board of Boiler and Pressure Vessel Inspectors.

All flanges are drilled and spot-faced according to American Standards.

The valves feature the Venturi Nozzle design, assuring smooth operation. The full throat nozzle on the steel valves provides maximum strength and freedom from distortion, with no possibility of leakage between the body and nozzle.

The disc on these valves is guided from above the seating surfaces, permitting free flow of the fluid. The nozzle and disc seating surfaces are flat and of the same width, providing absolute tightness and easy maintenance.

Prices and additional information will be furnished on request.

Style HR Valve body is made of cast iron and is available with inlet size range 2 to 4 inches, an outlet size range 2½ to 4 inches, and an inlet pressure limit of 250 pounds at 450° F. Furnished with a semi-exposed spring and regular lifting gear. A closed bonnet is furnished if specified. The semi-nozzle and disc are made either of bronze or forged stainless steel, as specified.

Style HN Valve body is made of cast carbon steel and is available with inlet size range 1½ to 4 inches, an outlet size range 2½ to 6 inches, and an inlet pressure of 600 pounds or 900 pounds at 650°-750° F. Furnished with a fully exposed spring test clamp, and regular lifting gear. The full-throat nozzle and disc insert are made of forged stainless steel. The disc holder is made of Nicoloy.

Style HNA Valve body is made of cast carbon steel or cast alloy steel depending upon temperature rating. This valve is available with inlet size range 1½ to 4 inches, an outlet size range 2 to 6 inches, and an inlet pressure limit of 600 to 2000 pounds at 650°-1000° F. Furnished with a fully exposed spring, test clamp, and regular lifting gear. The full-throat nozzle and disc insert are made of forged stainless steel. The disc holder is made of Nicoloy or Monel.

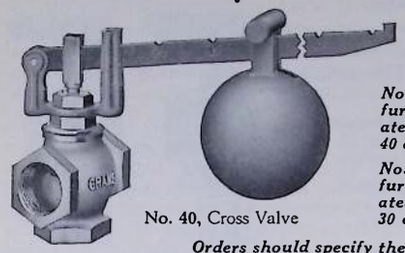
Style HO Valve body is made of cast iron and is available with inlet size range 1½ to 6 inches, an outlet size range 2 to 8 inches, and an inlet pressure limit of 250 pounds at 450° F. Furnished with a semi-exposed spring and regular lifting gear. A closed bonnet is furnished if specified. The semi-nozzle and disc are made either of bronze or forged stainless steel, as specified.

Style HS Valve body is made of cast carbon steel and is available with inlet size range 1 to 6 inches, an outlet size range 2 to 8 inches, and an inlet pressure limit of 300, 450, or 600 pounds at 650° F. Furnished with a fully exposed spring and regular lifting gear. The full-throat nozzle and disc insert are made of forged stainless steel. The disc holder is made of Nicoloy.

Style HSA Valve body is made of cast carbon steel or cast alloy steel depending upon temperature rating. This valve is available with inlet size range 1 to 6 inches, an outlet size range 2 to 8 inches, and an inlet pressure limit of 300, 450, or 600 pounds at 750°-900° F. Furnished with a fully exposed spring and regular lifting gear. The full-throat nozzle and disc insert are made of forged stainless steel. The disc holder is made of Nicoloy.

Lever and Weight Safety Valves

Brass Body



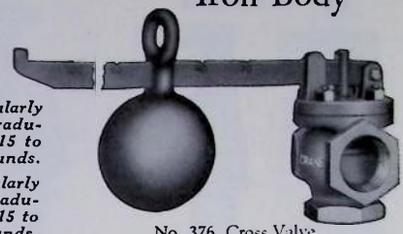
No. 40, Cross Valve

Pressure Range
15 to 100
pounds steam

No. 40 Valves are regularly furnished with levers graduated for pressures from 15 to 40 or from 41 to 100 pounds.

No. 376 Valves are regularly furnished with levers graduated for pressures from 15 to 30 or from 31 to 100 pounds.

Iron Body



No. 376, Cross Valve

Orders should specify the pressure range as well as the catalog number.

List Prices, Each, and Dimensions, in Inches

Size			Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
No. 40 Valve	With Lever and Weight	For 41 to 100 pounds		6.20	7.00	9.10	10.90	13.20						
		For 15 to 40 pounds		7.70	8.40	9.00	10.80	12.60						
	Without Lever and Weight			4.50	5.20	7.00	8.40	9.80						
No. 376 Valve	With Lever and Weight	For 31 to 100 pounds							15.50	18.00	24.20	41.00	53.50	89.00
		For 15 to 30 pounds							13.20	15.70	20.50	31.80	40.30	72.00
	Without Lever and Weight								9.30	10.90	13.50	22.50	28.70	45.70
Center to end of valve				13/16	15/16	1⅛	1⅜	1⅝	2	2⅜	3¼	3½	4	5
Center to end of lever	No. 40	41 to 100 pounds		8 1/16	9 13/16	10 3/16	10 11/16	16 7/16						
		15 to 40 pounds		5¾	9 9/16	8⅝	10 15/16	11¾						
	No. 376								18	22¼	21 3/16	27 5/8	35½	42 5/8

For price of Levers and Weights, deduct price for "valve only" from price of "valve with lever and weight".

These valves are used for ordinary low pressure steam relief service where simple, inexpensive valves are wanted; they should not be used on air or gas.

Unlike spring-loaded pop safety and relief valves, they have large blowdown of pressure, low capacity, and no positive opening or closing point.

Pressure settings should be at least 20 per cent above the normal working pressure in the system to avoid continual leakage past the disc.

Installation: The valves have two inlet openings and one outlet. They can be installed on vertical lines with the side inlet plugged or on horizontal lines with the bottom inlet plugged. In either case, the stem must be vertical and the lever horizontal.

Materials: All parts of the No. 40 Valves are brass except the cast iron yoke and weight (japanned maroon) and the steel lever.

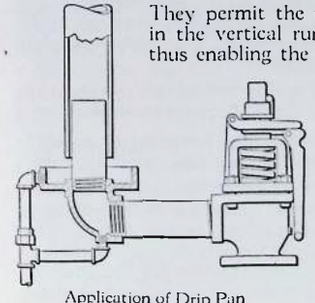
No. 376 Valves have a cast iron body and weight, a brass disc, and a steel lever. Sizes 1¼ and 1½-inch have an integral seat; larger sizes have a brass seat ring. Sizes 2-inch and smaller have a brass screwed bonnet and a brass stem; larger sizes have a bolted type cast iron bonnet and a steel stem.

Cast Iron Drip Pan Elbows

These elbows have been especially designed for use in the vent piping from the outlets of boiler safety valves discharging to atmosphere.

They permit the use of a slip joint in the vertical run of outlet piping, thus enabling the weight of the vertical piping to be supported independently. Unnecessary strains on the body of the valve are avoided and possible seat distortion is eliminated. They provide means for collecting and removing condensate and rain water from the outlet piping.

When more than one safety valve discharges into the same outlet piping, the leakage of vapor from the drip pan will indicate if any one of the valves requires attention.



Application of Drip Pan Elbow to Safety Valve Piping



No. 1100
Drip Pan
Elbow

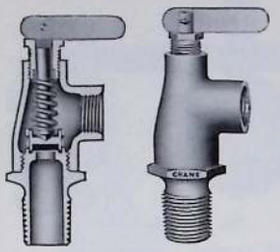
List Prices and Dimensions

Size	Inches	2	2½	3	3½	4	5
No. 1100	Each	11.00	12.00	13.50	15.50	18.00	22.50
Center to inlet end	Inches	2¼	2 11/16	3⅛	3 7/16	3¾	4 7/16
Center to top of pan	Inches	4¾	5¼	5⅝	6 3/16	6¾	7 7/16
Diameter of pan	Inches	5	7	7½	8½	9	11
Size of drain tappings	Inches	¾	¾	¾	¾	¾	¾
Length, outlet nipple	Inches	9	9	9	9	9	9

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Brass Relief Valves

For Hot Water



No. 1131

Set at following pressures:

Non-Adjustable Valves

*No. 1131—50, 75, 100, or 125 pounds

*No. 1133½—50, 75, 100, or 125 pounds

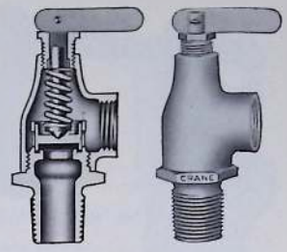
Adjustable Valves

No. A1131—25, 50, 75, or 125 pounds
Adjustable through ranges of 10 to 25 26 to 50, 51 to 75, and 76 to 125 pounds.

No. 1133—25, 75, or 125 pounds
Adjustable through ranges of 10 to 25, 30 to 75, and 80 to 125 pounds.

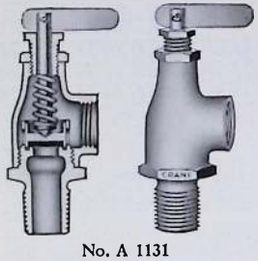
All orders must specify the set pressure and catalog number.

For Cold Water



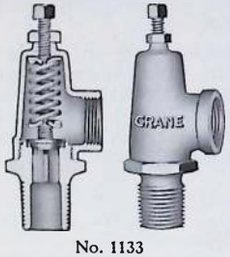
No. 1133½

For Air



No. A 1131

For Steam



No. 1133

List Prices and Dimensions

Size (Size of inlet)			Inches	⅜	½	¾	1
List Prices	No. 1131, for Hot Water		Each		8.50	10.30	12.00
	No. A 1131, for Air		Each	10.60	10.60	13.00	
	No. 1133, for Steam		Each		8.50	10.30	
	No. 1133½, for Cold Water		Each		8.50	10.30	
Dimensions, in Inches	No. 1131	Size of outlet			⅜	½	¾
		Over-all height, closed			4 1/16	4¾	5⅛
		Center to inlet			1⅞	2 5/16	2 11/16
		Center to outlet			⅞	1 1/16	1¼
	No. A 1131	Size of outlet		⅜	½	¾	
		Over-all height, closed		4 1/16	4 9/16	4 15/16	
		Center to inlet		1¾	2	2⅜	
		Center to outlet		⅞	1 1/16	1¼	
	No. 1133	Size of outlet			½	¾	
		Over-all height			3⅞	5⅛	
		Center to inlet			1⅞	2¼	
		Center to outlet			1	1 3/16	
	No. 1133½	Size of outlet			½	¾	
		Over-all height, closed			4 7/16	4 13/16	
		Center to inlet			2	2⅜	
		Center to outlet			1 1/16	1¼	

*These valves, while non-adjustable, can be made to order set at any pressure between 10 and 125 pounds; prices on application.

Recommendations: No. 1131 Valves are especially designed for use on domestic hot water heaters, but will give excellent service on any hot water line. They should not be used on steam, air, or cold water service.

No. A 1131 Valves are used on air compressors in garages, service stations, etc. where economy is wanted. They should not be used on steam or water service.

No. 1133 Valves can be recommended for steam lines when metal disc valves without lifting levers are wanted. They should not be used on air or water.

No. 1133½ Valves are particularly designed for domestic water pumping systems, and will give excellent service on cold water lines. They should not be used on hot water, steam, or air service.

Pressure setting: Nos. 1131 and 1133½ are non-adjustable and cannot be re-set in the field.

The Nos. A 1131 and 1133 are adjustable, and although regularly set at the factory, they can be re-set in the field through a definite range.

Materials and design: These valves are made of high grade materials throughout. Simple in design and inexpensive in initial cost, they will give excellent service under all ordinary conditions.

No. 1133 Valves have a brass disc; they do not have a lifting lever. The other valves are furnished with a composition disc especially selected for the specified recommended service and have a lifting lever so that the disc may be raised from the seat manually. The disc alone is not readily renewable; however, in the event replacement is necessary, disc holders complete with disc can be furnished

Except for the steel spring in Nos. A 1131 and 1133 and for composition discs, all parts are brass.

Capacities: Capacities are furnished on application. Inquiries should advise size, catalog number, type of service, and set pressure.

Maintenance: Manual operation of the valves at regular intervals will assure proper action. This operation should be performed only when there is sufficient pressure available to blow any accumulated foreign matter clear of the seating surfaces, particularly when starting up a new installation.

Brass Vacuum Relief Valves

Service recommendations: This valve is designed for use as a vacuum breaker on light, low pressure tanks, steam jacketed kettles, and similar apparatus where there is a possibility of a vacuum forming which might cause injury to the apparatus because of the effect of atmospheric pressure upon it.

In service, the disc of the valve is normally held to its seat, both by spring tension and by the pressure in the apparatus to which the valve is attached. When the pressure in the vessel falls below atmosphere, the spring tension is overcome, and the disc is forced from its seat. Air is then admitted through the valve, thus preventing the vacuum from reaching a dangerous point.

Pressure setting: These valves are regularly furnished with springs for 10 inches of vacuum. They are set to open at 5 inches of vacuum but are adjustable for higher or lower vacuums. Valves are regularly tested for tightness at the seat with 50 pounds water pressure.



No. 1155 V Vacuum Relief Valve

The body, seat bushing, and disc are made of brass.



List Prices

Size	Inches	½	¾	1	1¼	1½
No. 1155 V	Each	20.50	20.50	22.00	28.00	37.00
Height	Inches	2⅞	3	3 3/8	3 1/2	4 1/4

Construction: The No. 1155 V Valve is made with a two-piece body and seat bushing which removes the seat from the influence of body distortion when the valve is being installed.

Brass Relief Valves for Water Heaters

Can be set at any specified pressure within the following range:

5 to 250 pounds pressure. Maximum temperature 400° F.

Orders must specify the set pressure and the catalog number.



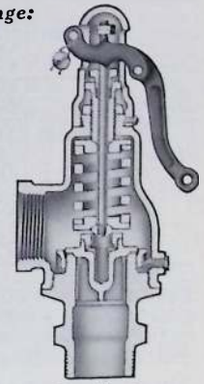
No. 2606 Male Inlet Side Outlet

Service recommendations: This high grade and sturdy brass relief valve is especially recommended for use on water heaters, where a valve of outstanding quality is desired.

Features: The No. 2606 Valve has a pop chamber and blow-back regulating ring, which enables it to operate with the same positive action of a pop safety valve, should steam develop in the water heater. A stuffing box around the stem prevents leakage of hot water from the valve top.

List Prices and Dimensions

Size (Inlet and Outlet)		Inches	½	¾	1	1¼	1½	2
No. 2606	List Prices	Each	15.80	17.20	21.00	24.00	30.50	42.50
	Center to top	Inches	3¾	3¾	4⅝	5¼	6⅛	7¾
	Center to male inlet	Inches	2¼	2¾	3¼	3¾	4⅜	4½
	Center to outlet	Inches	1⅛	1⅜	1⅝	2 1/16	2 7/16	2¾



Cross Section

Construction: This brass relief valve has a bottom guide for the disc and is similar in design to the relief valves shown on page 328, except that it has a lifting lever, cap, and wire seal. The lever, japanned maroon, is suitable for up-pull operation, or when reversed, for down-pull.

Maintenance: The stuffing box gland should be pulled up only to "finger tightness". Excessive tightness on the packing is apt to interfere with the operation of the valve.

It is recommended that this valve be manually opened at regular intervals to assure proper action. This operation should be performed only when there is sufficient pressure available within the tank to flush any accumulated scale or foreign matter clear of the seating surfaces, particularly when starting up a new heater installation.

Pressure setting: Relief valves on liquid service should always be set 25 per cent above the normal working pressure of the system to avoid waste due to minor fluctuations of pressure.

These valves can be set for any pressure within the range of 5 to 250 pounds. Orders must specify the set pressure and the catalog number.

The original setting of the valve may be readjusted for pressures 10 per cent higher or lower, but not exceeding the maximum range stated above. For greater changes in set pressures, new springs may be required, since one spring cannot cover the entire range of pressures at which the valve can be set.

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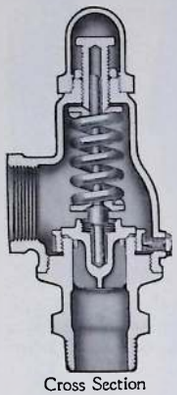
Brass Relief Valves

For Steam, Water, or Oil

Set at any specified pressure within the following ranges:

⅜ to 2½-inch — 5 to 250 pounds steam, water, or oil, 400° F.
251 to 300 pounds water or oil, 100° F.
3-inch — 5 to 200 pounds steam, water, or oil, 400° F.
201 to 250 pounds water or oil, 100° F.

Specify the set pressure and catalog number.


Cross Section


No. 2601
Male Inlet
Side Outlet
With Cap

These valves are recommended for pipe lines, presses, pumps, cylinders, etc., where a blow-back or pressure drop of 10% is permissible. Relief valves are intended to relieve excessive pressures; they should not be used in an attempt to relieve shock pressures in hydraulic lines. When a pressure drop smaller than 10% is required on steam service, use pop safety valves.

The side outlet valves are pressure tight on the outlet and can discharge against low head pressures.


No. 2602
Male Inlet
Side Outlet
With Wheel


No. 2604
Female Inlet
Side Outlet
With Cap

List Prices and Dimensions

Size (Size of Inlet)		Inches	⅜	½	¾	1	1¼	1½	2	2½	3
List Prices	No. 2601	Each	14.00	14.00	15.40	18.70	21.50	27.20	38.00		
	No. 2602	Each	13.80	13.80	15.00	18.00	20.50	25.50	36.00		
	No. 2604	Each		14.00	15.40	18.70	21.50	27.20	38.00	56.50	113.00
Dimensions in Inches	No. 2601	Size of outlet	½	½	¾	1	1¼	1½	2		
		Overall height	5⅜	5⅜	6	6⅞	8	9¾	11⅞		
		Center to inlet	2¼	2¼	2¾	3¼	3¾	4⅜	4½		
		Center to outlet	1⅛	1⅛	1⅜	1⅝	2 1/16	2 7/16	2¾		
	No. 2602	Size of outlet	½	½	¾	1	1¼	1½	2		
		Overall height	5⅝	5⅝	6⅛	7⅛	8⅛	9½	11¼		
		Center to inlet	2¼	2¼	2¾	3¼	3¾	4⅜	4½		
		Center to outlet	1⅛	1⅛	1⅜	1⅝	2 1/16	2 7/16	2¾		
		Diameter of wheel	2 9/16	2 9/16	2 9/16	3 1/16	3⅝	4 1/16	4¾		
	No. 2604	Size of outlet		½	¾	1	1¼	1½	2	2½	3
		Overall height		5⅛	5⅝	6⅜	7⅝	9¼	11	12½	13 11/16
		Center to inlet		2	2⅜	2¾	3⅜	3⅞	4⅜	4⅞	5 3/16
		Center to outlet		1⅛	1⅜	1⅝	2 1/16	2 7/16	2¾	3	3½

Features of design: To assure true seating, the single disc has a long bottom guide which operates in the finished bore of the base. The seat is integral with the base of the valve.

These valves except in ⅜, 2½, and 3-inch sizes are equipped with adjustable blow-back regulating rings around the seat, which provide a means of adjusting the blow-down of pressure when changing or regulating the set pressure. The adjustment of this ring may be made from the outside of the valve without interfering with the pressure setting. A locking plug screwed into, and projecting through, the wall of the body prevents the regulating ring from loosening once it has been set for blow-down.

A stuffing box filled with asbestos packing and surrounding the main spring adjusting screw under the locknut forms an effective seal for the body.

Installation: Relief valves should always be installed with the stem in a vertical position, in order to insure proper seating of the disc.

Materials: The base, body, and disc of all of these valves are made of a high grade brass. The spring is steel; the stem is either steel with the stem point casehardened, or is made of bronze.

Fire protection service: Relief valves used in connection with fire protection installations ordinarily must comply with various Underwriters' specifications. Before ordering valves for this service, a careful study should be made of all such specifications applying to the locality in which the valves will be used so that suitable valves are obtained.

Pressure setting: These valves can be set at any pressure within the ranges specified above. On steam service, relief valves should be set at least 10% higher than the normal working pressure in the system; on water or oil service, 25% higher.

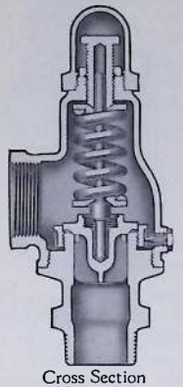
Pressure adjustment: The set pressure of these valves can be adjusted after installation to any pressure within a range of 10% above or below the original factory setting, but not exceeding the maximum pressure for which the valve is recommended.

Capacities on application

Brass Relief Valves

For Air or Gas

250-Pound


Cross Section
No. 2651


No. 2651
Male Inlet
Side Outlet

500-Pound

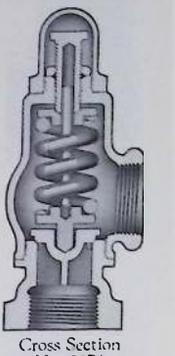
Set at any specified pressure within the following ranges:

250-Pound Valves—10 to 250 pounds
300-Pound Valves—10 to 300 pounds
500-Pound Valves—301 to 500 pounds

Maximum temperature — 400° F.

Orders must specify the set pressure and the catalog number.


No. 2674
Female Inlet
Side Outlet

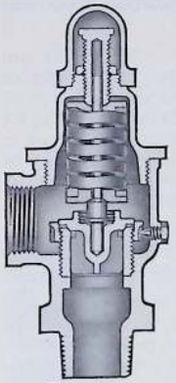

Cross Section
No. 2674

SERVICE RECOMMENDATIONS

The valves shown on this page are recommended for air or gas compressors, cylinders, pipe lines, etc., where a blow-back or pressure drop of 10% is permissible. When a pressure drop smaller than 10% is required, pop safety valves should be used.

The valves are pressure tight on the outlet and may discharge against low back pressures. The No. 2668 Valve is especially suitable for gasoline and noxious gases. It can be dismantled without disturbing the piping connections.

300-Pound


Cross Section
No. 2668


No. 2668
Male Inlet
Side Outlet
For Gasoline
or Noxious
Gases

List Prices and Dimensions

Size (Size of Inlet)		Inches	⅜	½	¾	1	1¼	1½	2
List Prices	No. 2651	Each	17.50	17.50	19.00	23.00	26.50	33.50	46.50
	No. 2668	Each	18.70	18.70	20.50	25.00	28.50	36.00	50.50
	No. 2674	Each		20.50	22.30	27.20	31.20	39.50	55.00
Dimensions in Inches	No. 2651	Size of outlet	½	½	¾	1	1¼	1½	2
		Center to top	3⅛	3⅛	3¼	3⅝	4¼	5⅜	6⅝
		Ctr. to male inlet	2¼	2¼	2¾	3¼	3¾	4⅜	4½
		Center to outlet	1⅛	1⅛	1⅜	1⅝	2 1/16	2 7/16	2¾
	No. 2668	Size of outlet	½	½	¾	1	1¼	1½	2
		Center to top	3 5/16	3 5/16	3⅜	4	4⅞	6¼	7⅜
		Ctr. to male inlet	2 5/16	2 7/16	2⅞	3 3/16	3 11/16	4	4 11/16
		Center to outlet	1 1/16	1 1/16	1 5/16	1⅝	2 1/16	2⅜	2¾
	No. 2674	Size of outlet		½	¾	1	1¼	1½	2
		Center to top		3¼	3¼	3½	4¼	5⅜	6¼
		Ctr. to female inlet		2⅛	2⅛	2½	2 15/16	3⅛	3⅝
		Center to outlet		1⅜	1⅜	1⅝	1¾	2	2½

Features of design: The valves are of the single disc type with bottom guide to assure proper seating. No. 2651 and No. 2668 in sizes ½-inch and larger have blow-back regulating rings which enable the user to adjust the blow-down when changing or regulating the set pressure. A stuffing box around the spring adjusting screw is filled with asbestos packing to form an effective seal for the body.

The No. 2668 have a screwed-in seat bushing; the seat is integral with the base on the other types.

Materials: The base, body, and disc are brass. All valves have a steel spring and stem, the stem point being casehardened.

Pressure setting: Relief valves used on air or gas should be set at least 25% higher than the normal working pressure in the system. Orders must specify the set pressure as well as the catalog number.

Pressure adjustment: The set pressure of these valves can be adjusted after installation to any pressure within a range of 10% above or below the original factory setting, but should not exceed the maximum pressure for which the valve is recommended.

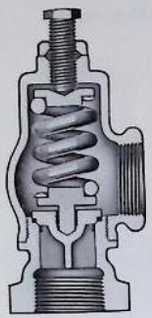
Seat tightness: The seating surfaces are carefully ground to insure audible tightness at all pressures up to 80 per cent of the set pressure.

Installation: Relief valves should always be installed with the stem in a vertical position. For air and gas service, these valves should preferably be installed inverted to allow moisture to collect and seal the seating surfaces.

Capacities on application

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Brass Hydraulic Relief Valves



Cross Section
No. 1128



No. 1128

Set at any specified pressure within the following ranges:

No. 1128 Valves

All sizes.....300 to 600 pounds

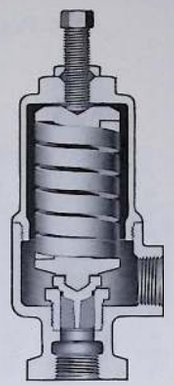
No. 1130 Valves

½-inch.....800 to 8000 pounds
¾-inch.....800 to 6000 pounds
1-inch.....800 to 4500 pounds
1¼-inch.....800 to 4000 pounds
1½-inch.....800 to 2600 pounds
2-inch.....800 to 2600 pounds

Orders for valves must specify the set pressure and catalog number.



No. 1130



Cross Section
No. 1130

List Prices

Size	Inches	½	¾	1	1¼	1½	2
No. 1128	Each	33.50	36.00	43.50	50.00	62.50	87.50
No. 1130	Each	74.50	74.50	81.50	126.00	134.00	193.00

Recommendations: These valves are particularly designed to safeguard high pressure oil lines, hydraulic apparatus operating at high pressures such as hydraulic presses and elevators, or high pressure pumping systems. The valves are to be used at atmospheric temperatures and for services discharging to atmosphere.

Hydraulic Relief Valves should never be used as unloading valves or in an attempt to relieve shock in hydraulic systems.

Features: This line of valves is characterized by rugged construction, simplicity of design, and the use of high grade materials.

The No. 1128 Valves have a base and disc cast in Crane Special Bronze, a strong, hard, leaded tin bronze; the body seat ring is integral with the base. The bonnet is made of brass.

On No. 1130 Valves, the base and bonnet are brass. The disc is Exelloy on ½ and ¾-inch sizes and Crane 18-8 Mo Alloy Steel on larger sizes. The renewable, screwed-in body seat ring is made of Crane No. 49 Nickel Alloy.

Both valves feature an exceptionally long spring made of the best quality steel. The valves have an adjusting screw with a hexagon end for wrench engagement. A lock nut is provided so that the adjusting screw may be locked at the desired set pressure.

The valves are pressure tight on discharge. A stuffing box around the adjusting screw, and under the lock nut, is filled with high grade packing to seal the top end of the valve.

Pressure setting: All hydraulic relief valves can be readjusted for pressures 10 per cent above or below the original set pressure, but should never be set at pressures in excess of the maximum rating for which the valve is designed. If a greater change in the set pressure is to be made, a new spring may be required, since one spring will not cover the entire range of pressures at which the valve can be set.

Relief valves should be set at least 25 per cent higher than the normal working pressure in the system in order to avoid wasting water or oil in discharges due to minor fluctuations of pressures.

The function of these valves is to safeguard the apparatus and the piping against excessive pressures, and they should not be used in an attempt to maintain pressure at a maximum point. Operating pressures maintained continuously close to the set pressure of the valve will tend to cause leakage and maintenance difficulties.

Orders for relief valves must specify the set pressure desired and the catalog number.

Dimensions, in Inches

Size (Size of Inlet)		½	¾	1	1¼	1½	2
No. 1128	Size of outlet	½	¾	1	1¼	1½	2
	Center to top	2⅞	2⅞	3⅝	3⅞	4½	5⅝
	Center to inlet	2⅛	2⅛	2½	2 15/16	3⅛	3⅝
	Center to outlet	1⅜	1⅜	1⅝	1¾	2	2½
No. 1130	Size of outlet	1	1	1	1½	1½	2
	Center to top	7¼	7¼	7¼	9½	9½	11¾
	Center to inlet	3	3	3	3⅝	3⅝	4⅛
	Center to outlet	2 11/16	2 11/16	2 11/16	3 3/16	3 3/16	3 13/16

Capacities on application

All-Iron Relief Valves

For Ammonia, Air, or Gas



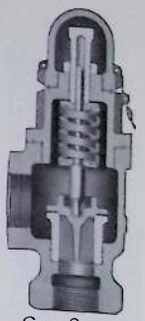
No. 1118
Screwed Inlet
and Outlet

Can be set at any specified pressure within the following range:
10 to 300 pounds Maximum temperature 400° F.

This relief valve has been particularly designed for ammonia service, but may also be used wherever all-iron construction is preferred because of conditions corrosive to brass. For air or gas service, the seat should be oil-sealed. Service temperatures should not exceed 400° F.

Valves ½ to 1¼-inch have a screwed bonnet; sizes 1½ and 2-inch have a bolted bonnet. The bonnet and cap joint are sealed with a lead gasket.

Features: The No. 1118 Valve is of sturdy construction and simple design. The body and bonnet are Crane Ferrosteel, the body seat ring and disc are steel, and the stem is steel with a casehardened point. Seating surfaces are easily reground; pipe threads tapped into the top of the disc permit insertion of a pipe nipple for rotating the disc.



Cross Section

Pressure setting: Relief valves should always be set at least 25 per cent above the normal working pressure in the system in order to prevent wastage of fluid when minor fluctuations of pressure occur. The pressure setting can be readjusted to per cent above or below the original set pressure, but not in excess of the maximum given above.

List Prices and Dimensions

Size (Size of Inlet)		Inches	½	¾	1	1¼	1½	2
No. 1118	List Prices	Each	41.50	44.00	52.50	62.50	92.50	113.00
	Size of outlet	Inches	¾	1	1¼	1½	2	2½
	Center to top	Inches	3⅜	4¼	5⅜	6¾	6⅞	7½
	Center to end of inlet	Inches	2¼	2⅝	3⅛	3¾	3 5/16	4⅜
	Center to end of outlet	Inches	1⅜	1⅝	2	2½	3	3 15/16

Capacities on application
Orders must specify the set pressure and catalog number.

Inside Spring
Iron Body Relief Valves

For Water or Oil



No. 1123

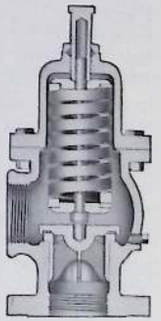
Orders must specify set pressure and Catalog No.

Can be set at any specified pressure within the following range:
10 to 300 pounds Maximum temperature 200° F.
Outlet pressures are not to exceed 20 pounds gauge.

This relief valve is designed for service on water or oil, where the temperature does not exceed 200° F. It is commonly used on pump discharge lines, on standpipes, pipe lines, cylinders, oil lines, etc. The valve should not be used as an unloading valve or to relieve shock from hydraulic lines.

Pressure setting: Relief valves on liquid service should be set 25 per cent above the normal working pressure of the system to assure tightness at the seat. They may be readjusted for pressures 10 per cent above or below the original set pressure, but not exceeding the maximum given above.

Materials: The No. 1123 Valve has an iron body and bonnet, a steel spring, and a brass stem. The seat and disc are regularly made of brass.



Cross Section

Construction: The valve is of the inside spring type with a flanged bonnet securely bolted to the body, making a pressure tight joint. A machined recess filled with packing is provided around the adjusting screw to seal this point and render the valve pressure tight on discharge.

The inlet connection is suitable for a flanged or a screwed joint. The outlet connection is screwed.

Flange dimensions and facing: The dimensions and drilling of the inlet flange conforms to the American Cast Iron Flange Standard, Class 250 (B16b-1944). It has a 1/16-inch raised face finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

Drilling: List prices include facing and drilling (F. & D.) of the inlet flange to the American Cast Iron Flange Standard, Class 250. No deduction is made when valves are ordered faced only.

List Prices and Dimensions

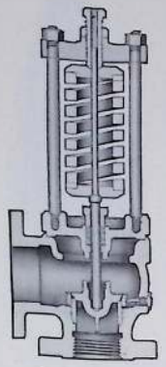
Size (Size of Inlet and Outlet)		Inches	2½	3	4
	List Prices	Each	92.50	110.00	165.00
No. 1123 F. & D.	Center to top	Inches	11	11½	12½
	Center to face of inlet	Inches	5¼	5¾	6 11/16
	Center to end of outlet	Inches	3⅞	4¼	5

Capacities on application

Templates for drilling....page 460

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Outside Spring
Iron Body Relief Valves



Cross Section

WORKING PRESSURE — 250 pounds
MAXIMUM SET PRESSURE — 300 pounds

For steam, gas, hot water, or oil
Maximum temperature 450° F.

Outlet pressures not to exceed 20 pounds gauge.

Order must specify the set pressure and catalog number.

If order does not specify fluid on which valve is to be used, valves for steam will be furnished.



No. 1113
Flanged Inlet
Flanged Outlet



No. 1114
Flanged Inlet
Screwed Outlet

Recommendations: Nos. 1113 and 1114 Valves are recommended for steam, gas, hot water, or oil services at working pressures up to 250 pounds and temperatures up to 450° F. They may be set for a maximum pressure of 300 pounds and are suitable for outlet pressures not exceeding 20 pounds gauge.

List Prices and Dimensions

Size (Size of Inlet)			2	2½	3	4
List Prices, F. & D.	No. 1113	Each				400.00
	No. 1114	Each	170.00	227.00	270.00	
Dimensions, Inches	Size of outlet		2½	3	4	5
	Center to top		12½	15½	19	24½
	Center to face of inlet		6½	7	7½	9½
	Center to end of outlet		3 15/16	4½	4 7/8	
	Center to face of outlet					7

Construction: These valves are of the outside spring and yoke construction, in which the spring is not directly exposed to the temperature of the fluid within the body. They have a bolted bonnet equipped with a stuffing box. The seat bushing is renewable.

The valves are pressure tight on the outlet side and are suitable for use when discharging into a line operating under low head pressures, or for handling noxious or inflammable fluids.

In addition, these valves have a pop chamber and an adjustable blow-back regulating ring which, on steam and gas service, give them an action more positive than ordinary relief valves, as well as a means of regulating the blowdown of pressure.

The inlet of these valves is regularly made with a combination flanged and screwed connection.

Seat and disc: The seat and disc are made of Crane Special Bronze, a hard, leaded tin bronze.

Pressure setting: To insure tight seating of relief valves, they should be set at slightly higher pressures than the normal working pressure of the installation. Valves for steam or gas should be set at least 10 per cent higher, and valves for water or oil, 25 per cent above the normal working pressure.

These valves may be readjusted for pressures 10 per cent above or below the original set pressure, but not exceeding the maximum given above.

Flange dimensions and facing: The dimensions of the inlet flange conforms to the American Cast Iron Flange Standard, Class 250 (B16b-1944). It has a 1/16-inch raised face, finished with concentric grooves, approximately 16 grooves per inch, known as a "serrated" finish.

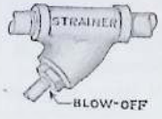
The outlet flange of the No. 1113 Valve conforms to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). This flange is plain faced and has a smooth finish.

Drilling: List prices include facing and drilling (F. & D.) to the particular Standard applying, as indicated in the preceding paragraphs. No deduction is made when valves are ordered faced only.

Dirt in Piping

Pipe scale and dirt in piping systems are the greatest enemies of valves, regulators, meters, and other mechanical devices. They cause endless trouble and frequently serious damage. Such foreign matter lodges on valve seats and starts leakage; it gets into automatic devices with close-fitting, moving parts and prevents proper operation; and it collects at points of low velocity, obstructing the passage of flow.

Regardless of how clean piping materials are when being installed, a generous use of strainers or sediment separators is a sound but small investment, considering the protection provided. For the Crane line, see pages 350 and 357.

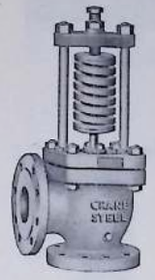


Be sure to blow out the accumulated sediment at regular intervals.

Capacities on application

Templates for drilling . . . pages 459 and 460

Outside Spring
Alloy Cast Steel Relief Valves



No. 1113 LX

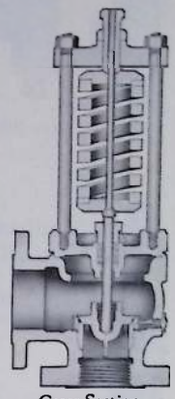
WORKING PRESSURE — 300 pounds
MAXIMUM SET PRESSURE — 360 pounds

For steam, hot water, oil, or gas; maximum temperature 900° F.
Outlet pressure not to exceed 20 pounds gauge.

When ordering be sure to specify set pressure and catalog number.

If order does not specify fluid on which valve is to be used, valves for steam will be furnished.

Pressure setting: This valve, when used for steam or gas, should be set at least 10 per cent higher than the normal working pressure, and when used for water or oil, at least 25 per cent higher. It may be readjusted for pressures 10 per cent above or below the original set pressure, but not exceeding the maximum given above. For a greater adjustment, new springs may be required, since one spring will not cover the entire range of pressures at which this valve can be set.



Cross Section

List Prices and Dimensions

Size (Size of Inlet)		Inches	2	2½	3	4
No. 1113 LX, Flanged, F.D.& S.F.		Each	307.00	375.00	455.00	717.00
Dimensions, in Inches	Size of outlet		2½	3	4	5
	Diameter of seat opening		2	2½	3	4
	Center to top		12½	15½	19	24½
	*Center to face of inlet		6½	7	7½	9½
	*Center to face of outlet		4¾	5½	6	7

*Includes 1/16-inch raised face.

Service recommendations: The Crane No. 1113LX Alloy Steel Relief Valve is recommended for high temperature service on steam, hot water, oil, and gases (maximum temperature not to exceed 900° F). It is suitable for outlet pressures up to 20 pounds gauge.

Construction: This valve is of the outside spring and yoke construction, in which the spring is not directly exposed to the temperature of the fluid within the body. It has a bolted bonnet equipped with a stuffing box. The seat bushing is renewable.

The valve is pressure tight on the outlet side and is suitable for use when discharging into a line operating under low head pressures, or for handling noxious or inflammable gases and fluids.

In addition, the No. 1113 LX Valve has an adjustable blow-back regulating ring which, on steam and gas service, provides a means for adjusting the blowdown of pressure when changing or regulating the set pressure.

Materials: The body is made of Crane No. 4 Carbon-Molybdenum Steel; the bonnet, of Carbon Cast Steel; and the disc and stem, of Exelloy. The seat bushing is Crane 18-8 Mo Alloy; and the spring, a high grade alloy steel. The bonnet bolt-studs are Triplex Steel.

Flange dimensions and facing: The end flanges conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939.

The inlet flange conforms to the 300-Pound Standard; the outlet flange, to the 150-Pound Standard.

End flanges are furnished faced, drilled, and spot faced (F.D.& S.F.) and have an American Standard 1/16-inch raised face, finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish.

A smooth finish can be furnished on raised or male faces. Ring joint, male, female, or other types of facing can also be furnished. See the Crane Discount Sheet for prices.

Capacities on application

Templates for drilling . . . page 461

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Crosby Nozzle Relief Valves

Low Capacity



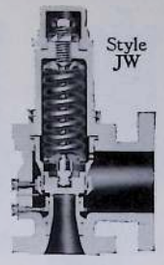
Style JR

Medium Capacity



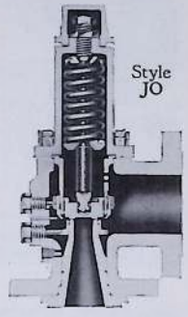
Style JMB

Medium-High Capacity



Style JW

High Capacity



Style JO

Styles, Sizes, Pressure Limits, and Materials

Capacity	Style No.	Size Range (Inches)		*Pressure-Temperature Limits at Inlet		Materials See Note
		Inlet	Outlet	Psi-Fahr.	Psi-Fahr.	
Low	JR-c	½-1	1	2000 @ 400°	—	Note 1
	JR-t	½-1	1	2000 @ 750°	—	
Medium	JMB-c	¾-1	1-1½	5000 @ 400°	—	Note 1
	JMB-t	¾-1	1-1½	5000 @ 750°	—	
Medium High	JW-a	1½-6	2-10	400 @ 150°	250 @ 450°	Note 2
	JW-b	1½-6	2-10	400 @ 150°	250 @ 450°	Note 3
	JW-25	1½-4	2-6	230 @ 100°	160 @ 450°	Note 4
	JW-35	1½-4	2-6	450 @ 100°	450 @ 450°	
	JW-26	1½-4	2-6	160 @ 450°	120 @ 650°	
	JW-36	1½-4	2-6	450 @ 450°	415 @ 650°	
High	JO-25	1-6	2-10	230 @ 100°	160 @ 450°	Note 5
	JO-35	1-6	2-8	600 @ 100°	525 @ 450°	
	JO-45	1-6	2-8	1200 @ 100°	1050 @ 450°	
	JO-55	1½-4	2-6	3000 @ 100°	2630 @ 450°	
	JO-26	1-6	2-10	160 @ 450°	92 @ 800°	Note 5
	JO-36	1-6	2-8	525 @ 450°	300 @ 800°	
	JO-46	1-6	2-8	1050 @ 450°	600 @ 800°	
	JO-56	1½-4	2-6	2630 @ 450°	1500 @ 800°	

[1]Forged stainless steel base and disc; cast steel cylinder and cap.
[2]Cast iron body; bronze semi-nozzle, disc, and trim.
[3]Cast iron body; stainless steel semi-nozzle, disc, and trim.
[4]Cast steel body; stainless steel semi-nozzle, disc, and trim.
[5]Cast steel body; stainless steel full-throat nozzle, disc, and trim.

Crosby Nozzle Relief Valves provide exact operation with uniform blowdown, full relieving capacity that assures positive protection, and continued as well as initial tightness. They are easy to install and maintain.

All valves are furnished with flat seats and top guided connections. They have a closed bonnet and a screwed cap unless otherwise specified.

***Low capacity valves* (*JR*)** are used for non-coking refinery service, preferably on liquids, and for pumps or pump lines carrying sour crude oil or oil vapors. They should not be used for steam, air, or oil vapor service where exact operation is required.

***Medium capacity valves* (*JMB*)** are recommended for steam, air or gas (up to 1000 psi), oil, and oil vapor. They are used on oil cracking equipment (non-coking), caustic pump discharge lines, ammonia lines, and for general service corrosive to bronze.

***Medium-High capacity valves* (*JW*)** are recommended for low and moderate pressures and temperatures. They are used in oil refineries, process plants, and for general service on steam, air, gas vapor, and liquids where full nozzle construction is deemed unnecessary.

***High capacity valves* (*JO*)** are recommended for steam, air, gas, oil, oil vapors and liquids. They are widely used in refinery, chemical, and industrial plants where positive, dependable action is needed.

Steam boiler service: These valves are not recommended for steam boiler service; for such service, use the Crosby Safety Valves shown on page 324.

Springs: Valves having catalog numbers ending with either "t" or "6" have an alloy steel spring; all other valves have a carbon steel spring.

***Ratings:** Since ratings vary with the valve size, those shown in the table above apply specifically to the smallest size valve.

The ratings also apply only to valves having standard facings. Full nozzle steel valves are available with a ring joint inlet, and when so furnished, are suitable for pressures higher than those listed in the table.

Other styles: The complete Crosby line includes valves having a wide variety of body, nozzle, and disc materials such as stainless steel, alloy steel, Monel, and Hastelloy; complete data on request.

Special tops and lifting gears: Style JMB, JW, and JO Valves are regularly furnished with a screwed cap and without a lifting gear.

When specified, the following special types of top construction can be furnished:

Regular lifting gear: Used for services where the valves need not be tight on the discharge side but where periodic testing is desirable.

Packed lifting gear: Used where tightness on the discharge side and periodic testing of the valves are desirable; it eliminates having a stuffing box around the main spindle.

Testing rod: A testing rod is available on valves having a packed lifting gear or cap. The rod holds the valve shut against over-pressure when the equipment on which the valve is installed is being given a hydrostatic test.

Prices and additional information furnished on application.

Pressure Regulators, Steam Traps, Separators, and Expansion Joints

Regulators and Pressure Reducing Valves
Crane Pressure Regulators.....pages 336 to 339
Klipfel Pressure Reducing Valves.....pages 340 and 341
Mueller Pressure Regulators.....page 342
Fulton Sylphon Temperature Regulators.....page 342

Air Vent or Water Drain Valves.....pages 343 and 344

Steam Traps
Crane Inverted Open Float Type.....pages 344 to 347
Hoffman Thermostatic Type.....page 343
Velan Bimetallic Type.....page 348

Separators and Strainers
Steam and Oil Separators.....pages 354 and 355
Sediment Separators.....pages 356 and 357
Dexter Automatic Separators.....page 353
Logan Aridifiers.....page 353
Swartwout Exhaust Heads.....page 349

Expansion Joints
Brass.....page 350
Iron Body.....page 350
Copper, Stainless Steel, and Rubber.....page 351
Adsco, Iron and Steel.....page 352

Drip Pockets.....page 355
Expansion in Pipe Lines.....page 349

For suggested installation of Crane Air Vent or Water Drain Valves and Inverted Open Float Steam Traps, see page 344.

To make this catalog more convenient to use, the complete Crane line of special duty valves and of specialties has been divided into several groups. Special duty valves are shown on pages 299 to 334, and specialties not referred to above are shown on pages 359 to 374.

Standard Types of Pipe Bends....pages 502 and 503

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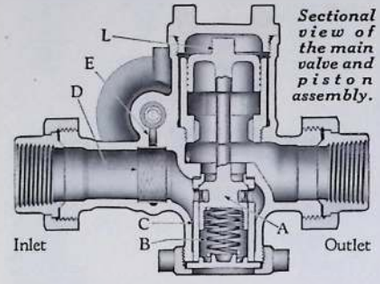
Bronze Pressure Regulators

Two essential but separate mechanisms—the main valve assembly and auxiliary valve assembly—are features of Crane Pressure Regulators. Interconnected for transmission of pressure but independent mechanically, they operate in the same body.

Except for necessary pipe connections, the regulator would function as well with the units separated.

The main valve assembly includes a disc and seat. The movement of the disc is controlled by a piston actuated by pressure from the auxiliary valve.

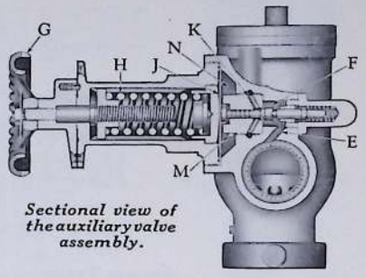
The auxiliary valve assembly includes a device to manually set the desired outlet pressure, an auxiliary valve to control the operation of the main valve, and a mechanism to operate the auxiliary valve itself.



Sectional view of the main valve and piston assembly.

Operation of Crane Pressure Regulators

With the regulator properly installed in the line and ready to go into service, the successive steps which take place in its operation are as follows:



Sectional view of the auxiliary valve assembly.

1. High pressure steam (or air) from the inlet piping flows into the inlet side of the regulator as far as the main disc A, which is held lightly to its seat by the main disc spring B.

2. This high pressure then passes into the main disc spring chamber through the ports in the liner C and acts to hold the main disc tightly to its seat.

3. A portion of the high pressure steam (or air) in the regulator inlet passes through the screen D into the high pressure port E and fills the chamber around the auxiliary valve F, which is held lightly to its seat by the auxiliary valve spring.

4. When the handwheel G is turned in a clockwise direction, the regulating spring H is compressed, deflecting the diaphragm J. This deflection of the diaphragm moves the auxiliary valve F off its seat and allows pressure to flow through the intermediate pressure port K into the chamber above the piston L.

5. The piston then moves downward, overcoming resistance of the main disc A, forcing it off its seat.

6. Steam (or air) then flows past the main disc A and fills the outlet piping system. Pressure from the outlet of the regulator is transmitted back through the low pressure port M to the diaphragm chamber N. As the pressure builds up in this chamber, it finally overcomes the tension on the diaphragm J, caused by the regulating spring H, and forces the diaphragm back toward its original position.

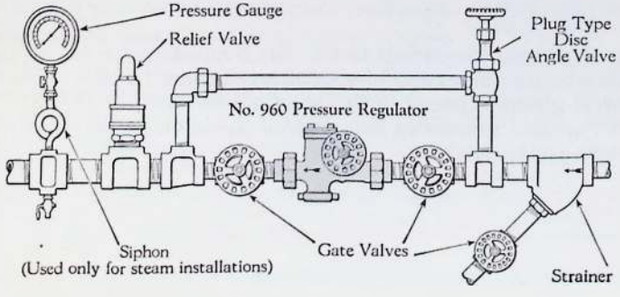
7. Just as soon as the diaphragm returns to its original position, the auxiliary valve closes, thus cutting off the pressure to the top of the piston L.

8. The high pressure in the spring chamber of the main disc A then forces the main disc back to its seat, cutting off the steam (or air) supply to the outlet side of the regulator.

9. As the outlet pressure falls, the pressure in the diaphragm chamber also falls, with the result that the regulating spring tension again deflects the diaphragm and moves the auxiliary valve off its seat.

10. The entire cycle of operations is then repeated. The cycle is automatic and practically instantaneous; there is no lag between operations.

Recommended Piping Arrangement for Pressure Regulator



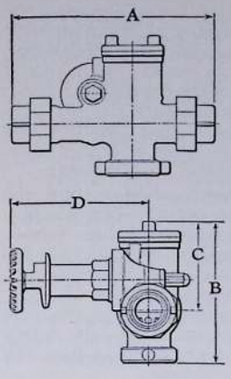
Automatically Maintained Pressure

When the handwheel is set to obtain any desired outlet pressure, this pressure is maintained within close limits if the quantity of steam or air being used remains fairly constant.

Continually Proportioned Flow

When steam or air is being used in the outlet system, the regulator actually operates in a "floating" position; that is, both the main disc and the auxiliary valve move back and forth without pausing at any one position, and thus continually proportion the flow of steam or air to satisfy the outlet requirements.

Bronze Pressure Regulators

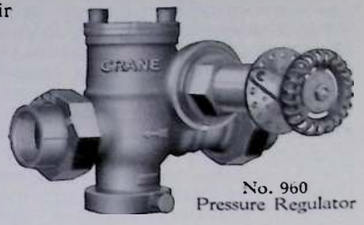


MAXIMUM INLET PRESSURES
250 pounds steam, **450°** F. **250** pounds air

For description, operation, and recommended installation, see the preceding page.

List Prices and Dimensions

Size Inches	Price Each	Dimensions, in Inches A	B	C	D
½	89.00	7	4⅝	3	6
¾	99.00	8¼	5¾	3⅝	6¼
1	111.00	9	6⅜	4	7¼
1¼	138.00	9⅝	7	4½	7½
1½	171.00	10¾	8	5	7½
2	215.00	12	9⅛	5⅝	7½



No. 960 Pressure Regulator

For steam and air capacities, see the following two pages.

Service recommendations: Crane Pressure Regulators have been specifically designed to provide accurate, automatic pressure regulation on steam and air. They are particularly suitable for use in modern process work, on vulcanizers, cookers, dryers, paper machines, heating systems, air tools, air blasts, and many other services. They may be used to reduce pressure to engines and pumps if ample receiver capacity to eliminate pulsations is provided between the engine or pump and the regulator.

Fundamental characteristics: These regulators should not be confused with ordinary reducing valves. They will not allow the outlet pressure to build up to the inlet pressure when no steam or air is being used in the outlet piping. Reasonable fluctuations of the inlet pressure do not affect the outlet pressure.

The regulators are reliable and feature a wide range of available reduced pressures, simplicity of operation, accessibility for inspection, and convenience in making repairs. They have malleable iron union rings and tail-pieces on the inlet and outlet ends.

Locking: Each regulator is equipped with a locking device to permit protection of the pressure setting against tampering. Locks are furnished only when specified and at an advance in price.

Outlet pressure ranges: Regulators are fitted with regulating springs and diaphragms to suit any one of the following ranges of outlet pressures:

1 to 10 pounds	**20 to 100 pounds**
5 to 30 pounds	**90 to 200 pounds**

How to order regulators: Orders should specify the size of the regulator (or capacity desired; see pages 338 and 339) and the outlet pressure. Unless otherwise specified, regulators suitable for steam will be furnished; if wanted for air, specify "for air".

These regulators should not be used where the outlet pressure is more than 80% of the inlet pressure.

Operating Characteristics of Crane Pressure Regulators

A Pressure Regulator should be chosen on the basis of its capacity to provide the rate of flow required in the outlet piping. The nearer correct it is to the proper size, the more trouble-free it will be and the longer it will last. A regulator that is too large is not only subject to extreme throttling and undue wear but may also supply steam or air in surges, causing pulsations. A regulator that is too small, particularly on low pressures, will dance and chatter.

Best results are obtained when the regulator is selected to supply flow rates that are approximately 50 per cent of the maximum obtainable through the regulator. This condition keeps the disc unseated—keeps it properly throttling the flow by holding the disc in a "floating" position—while at the same time permitting variations in flow demand in either direction. In addition, the damaging effects of wire-drawing and the danger of having small particles of foreign matter adhere to the seating surfaces and cause an increase in the outlet pressure, are substantially reduced.

Theoretically, if the flow demand remained fixed at all times, it would be possible to select a regulator (an orifice would give the same results) that would deliver the required amount of steam or air at exactly the desired outlet pressure. Actually, however, such ideal conditions seldom exist, because the flow demand in outlet piping varies with many factors, such as shut-off intervals, number of pieces of equipment in operation, warming-up periods, etc. Under practical operating conditions, therefore, when a regulator is set for one condition of flow demand and this condition changes, the regulator will strive automatically to compensate for the change, but in so doing will produce some variation in the outlet pressure. An increase in demand will cause a decrease in the outlet pressure, up to the point where the regulator is delivering its fullest possible capacity; in other words, is providing no regulation at all, if the demand is great enough. A decrease in demand will cause an increase in the outlet pressure, up to the point of the actual outlet or dead-end pressure setting on the regulator, if the demand ceases entirely.

Important: Select the regulator on the basis of its capacity. See pages 338 and 339 for capacity tables. Orders should always specify the desired outlet pressure. The regulator is then equipped with the proper springs and diaphragm as indicated under "outlet pressure ranges" above; the regulating wheel permits adjustment throughout the range.

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Capacities of No. 960 Pressure Regulators

Explanation of Tables

The capacity tables ("Steam" below and "Air" on the opposite page) show: (1) inlet pressures at convenient increments from 30 to 250 pounds, (2) capacities or rates of flow at various pounds change in the outlet pressure, and (3) last column in each half of table, maximum rate of flow.

The columns showing pounds change in outlet pressure to obtain rate of flow apply to ***any*** outlet pressure. For example, assume steam at 100 psi is to be reduced through a ½-inch regulator to a maximum or dead-end outlet pressure of 20 psi: at 19 psi outlet pressure (1-pound decrease), the regulator would deliver 41 pounds of steam per hour; at 18 psi outlet pressure (2-pound decrease), 70 pounds of steam per hour; at 12 psi outlet pressure (8-pound decrease), 225 pounds of steam per hour, etc. In this example, if the selected maximum or dead-end outlet pressure were 60 psi, the capacity would be the same at 59, 58, and 52 psi outlet pressure (1, 2, and 8-pound change or decrease), respectively, etc.

The heavy black line through the tables separates the rates of flow at each inlet pressure at approximately 50 per cent of the maximum capacity of the regulator. The normal flow demand of the outlet system should correspond with the capacity of the regulator as shown near this black line. This will assure the use of a regulator that operates properly, has long life, and provides practical variation in lower or higher capacity when the flow demand varies from normal.

The "maximum — no regulation" columns show the maximum rate of flow, which occurs when the flow demand is so great that the outlet pressure has dropped to the point where the regulator is delivering full capacity (no regulation). This latter figure is provided so that the safety valve which should be installed in the outlet piping can be properly sized; for proper protection and maximum safety, the safety valve should be capable of discharging at least the maximum flow through the regulator.

(Continued on the following page)

Steam Capacities

Inlet Pressure	Rate of Flow of Saturated Steam In Pounds per Hour											
	Pounds Change in Outlet Pressure to Obtain Rate of Flow											Maximum
Psi	1	2	3	4	5	8	10	12	15	20	25	No Regulation
½-inch Regulators												
30	27	50	70	90	110	150						187
40	29	55	80	100	125	175						228
50	31	58	85	110	135	200	225					270
60	33	60	88	113	138	205	230	270				311
70	35	62	91	116	141	210	240	280				353
80	37	64	94	119	144	215	250	290	320			394
90	39	68	97	122	147	220	260	300	340			436
100	41	70	100	125	150	225	270	310	360	410		478
125	43	76	108	135	165	245	295	340	390	450		580
150	45	82	117	150	185	270	325	375	425	490	520	685
175	47	88	126	160	200	295	355	405	460	535	565	790
200	49	95	135	175	215	320	385	435	495	580	610	895
250	55	110	165	215	270	410	485	540	605	685	710	1060
¾-inch Regulators												
30	48	89	124	160	195	265						330
40	51	97	142	175	220	310						405
50	55	103	150	195	240	355	400					480
60	58	106	155	200	245	365	405	480				550
70	62	110	160	205	250	370	425	495				625
80	65	113	165	210	255	380	440	515	565			695
90	69	120	170	215	260	390	460	530	600			770
100	73	124	175	220	265	400	480	550	635	725		845
125	76	135	190	240	290	435	520	600	690	795		1025
150	80	145	205	265	325	480	575	665	750	865	920	1210
175	83	155	225	285	355	520	630	715	815	945	1000	1400
200	87	170	240	310	380	565	680	770	875	1025	1080	1585
250	97	195	290	380	480	725	860	955	1070	1210	1255	1875
1-inch Regulators												
30	84	155	215	280	340	465						580
40	90	170	250	310	390	540						705
50	96	180	265	340	420	620	700					835
60	102	185	275	350	430	635	715	835				965
70	108	190	280	360	435	650	745	870				1095
80	115	200	290	370	445	665	775	900	990			1220
90	121	210	300	380	455	680	805	930	1055			1350
100	127	215	310	390	465	700	835	960	1115	1270		1480
125	133	235	335	420	510	760	915	1055	1210	1395		1800
150	140	255	365	465	575	835	1010	1165	1320	1520	1610	2125
175	146	275	390	495	620	915	1100	1255	1425	1660	1750	2450
200	152	295	420	540	665	990	1195	1350	1535	1800	1890	2775
250	170	340	510	665	835	1270	1505	1675	1875	2125	2200	3285

Inlet Pressure	Rate of Flow of Saturated Steam In Pounds per Hour											
	Pounds Change in Outlet Pressure to Obtain Rate of Flow											Maximum
Psi	1	2	3	4	5	8	10	12	15	20	25	No Regulation
1¼-inch Regulators												
30	145	270	380	490	595	815						1015
40	155	300	435	545	680	950						1240
50	170	315	460	595	735	1085	1220					1465
60	180	325	480	615	750	1115	1250	1465				1690
70	190	335	495	630	765	1140	1305	1520				1915
80	200	350	510	645	780	1165	1360	1575	1740			2140
90	210	370	525	660	800	1195	1410	1630	1845			2365
100	225	380	545	680	815	1220	1465	1685	1955	2225		2595
125	235	415	585	735	895	1330	1600	1845	2120	2445		3150
150	245	445	635	815	1005	1465	1765	2035	2310	2660	2825	3720
175	255	480	685	870	1085	1600	1930	2200	2500	2905	3070	4290
200	265	515	735	950	1165	1740	2090	2360	2690	3150	3310	4860
250	300	595	895	1165	1465	2225	2635	2930	3285	3720	3855	5755
1½-inch Regulators												
30	190	350	490	630	770	1050						1310
40	205	385	560	700	875	1225						1595
50	215	405	595	770	945	1400	1575					1890
60	230	420	615	790	965	1435	1610	1890				2175
70	245	435	635	810	985	1470	1680	1960				2470
80	260	450	660	835	1010	1505	1750	2030	2240			2760
90	275	475	680	855	1030	1540	1820	2100	2380			3050
100	285	490	700	875	1050	1575	1890	2170	2520	2870		3345
125	300	530	755	945	1155	1715	2065	2380	2730	3150		4060
150	315	575	820	1050	1295	1890	2275	2625	2975	3430	3640	4795
175	330	615	880	1120	1400	2065	2485	2835	3220	3745	3955	5530
200	345	665	945	1225	1505	2240	2695	3045	3465	4060	4270	6265
250	385	770	1155	1505	1890	2870	3395	3780	4235	4795	4970	7420
2-inch Regulators												
30	215	400	560	720	880	1200						1495
40	230	440	640	800	1000	1400						1825
50	250	465	680	880	1080	1600	1800					2160
60	265	480	705	905	1105	1640	1840	2160				2490
70	280	495	730	930	1130	1680	1920	2240				2825
80	295	510	750	950	1150	1720	2000	2320	2560			3150
90	310	545	775	975	1175	1760	2080	2400	2720			3490
100	330	560	800	1000	1200	1800	2160	2480	2880	3280		3825
125	345	610	865	1080	1320	1960	2360	2720	3120	3600		4640
150	360	655	935	1200	1480	2160	2600	3000	3400	3920	4160	5480
175	375	705	1010	1280	1600	2360	2840	3240	3680	4280	4520	6320
200	390	760	1080	1400	1720	2560	3080	3480	3960	4640	4880	7160
250	440	880	1320	1720	2160	3280	3880	4320	4840	5480	5680	8480

(Continued from the preceding page)

Example: Unlike most capacity tables, these are designed to show accurate and complete capacity ratings under any combination of varying operating conditions. For example, assume a regulator is desired that will reduce 100 psi inlet steam pressure to approximately 40 psi on the outlet and deliver steam at a normal rate of 225 pounds per hour. Adjusted for 40 psi maximum or dead-end outlet pressure, the ½-inch regulator will deliver this rate of flow when the outlet pressure has dropped 8 pounds, or is 32 psi; this regulator would have additional capacity (up to 410 pounds per hour with an outlet pressure of 20 psi) for warming up periods, and at the same time, would have an ample range of lower capacity at 35, 36, 37, 38, and 39 psi outlet pressure, when the required rate of flow was less than normal. If originally adjusted to 48 psi maximum or dead-end outlet pressure, this regulator would deliver the desired rate of flow at 40 psi, but the pressure in the outlet would build up to a maximum of 48 psi when the flow demand ceased entirely.

The ¾-inch regulator would also deliver this rate of flow, at about 36 psi if adjusted to 40 psi dead-end outlet pressure, or at about 40 psi if adjusted to 44 psi dead-end outlet pressure. The 1-inch regulator would also deliver this rate of flow with only about 2 pounds change between the dead-end and the normal-flow outlet pressures, but it would be too large for most satisfactory operation, etc.

Choose the regulator on the basis of its capacity to provide the desired rate of flow without requiring manual attention of the regulating wheel and within acceptable limits of variation between the dead-end outlet pressure and the actual outlet pressure under the desired flow conditions. Use of the regulating wheel can, of course, narrow these limits if manual adjustment is made following changes in flow demand.

These regulators are not recommended for use where the desired outlet pressure is more than 80 per cent of the inlet pressure.

See pages 336 and 337 for description of regulators and explanation of operating characteristics.

Air Capacities

Inlet Pressure	Rate of Flow of Free Air In Cubic Feet per Minute, at 70° F.											
	Pounds Change in Outlet Pressure to Obtain Rate of Flow											Maximum
Psi	1	2	3	4	5	8	10	12	15	20	25	No Regulation
½-inch Regulators												
30	10	18	25	32	39	53						66
40	10	19	28	35	44	62						81
50	11	20	30	39	48	71						96
60	12	21	31	40	49	72	81	92				110
70	12	22	32	41	50	74	85	99				125
80	13	23	33	42	51	76	89	103	114			140
90	14	24	34	43	52	78	92	107	121			155
100	15	26	35	44	53	80	96	111	128	146		170
125	16	27	38	48	58	87	105	121	138	160		206
150	16	29	41	53	65	96	115	133	151	174	184	244
175	17	34	45	57	71	105	126	144	163	190	200	280
200	18	37	48	62	76	114	137	154	176	206	216	318
250	20	39	59	76	96	146	172	192	215	243	252	376
¾-inch Regulators												
30	18	32	44	57	69	94						117
40	18	34	50	62	78	110						143
50	19	35	53	69	85	126						170
60	21	37	55	71	87	127	143	163				195
70	21	39	57	73	88	131	150	175				221
80	23	41	58	74	90	135	158	182	202			248
90	25	42	60	76	92	138	163	189	214			274
100	27	46	62	78	94	142	170	196	227	258		300
125	28	48	67	85	103	154	186	214	244	283		365
150	28	51	73	94	115	170	204	235	267	308	326	432
175	30	60	80	101	126	186	225	255	289	336	354	495
200	32	65	85	110	135	202	242	273	312	365	382	565
250	35	69	104	135	170	258	304	340	380	430	446	665
1-inch Regulators												
30	31	56	77	99	121	164						205
40	31	59	87	109	136	192						251
50	34	62	93	121	149	220						298
60	37	65	96	124	152	223	251	285				341
70	37	68	99	127	155	229	264	307				388
80	40	71	102	130	158	236	276	319	353			434
90	43	74	105	133	161	242	285	332	375			480
100	47	81	109	136	164	248	298	344	397	453		525
125	50	84	118	149	180	270	326	375	428	496		640
150	50	90	127	164	202	298	356	412	468	540	570	755
175	53	105	140	177	220	326	390	446	505	590	620	870
200	56	115	149	192	236	353	425	477	545	640	670	985
250	62	121	183	236	298	453	533	595	665	755	780	1165

Inlet Pressure	Rate of Flow of Free Air In Cubic Feet per Minute, at 70° F.											
	Pounds Change in Outlet Pressure to Obtain Rate of Flow											Maximum
Psi	1	2	3	4	5	8	10	12	15	20	25	No Regulation
1¼-inch Regulators												
30	54	98	136	174	212	288						358
40	54	103	152	190	239	337						440
50	60	109	163	212	261	386						520
60	65	114	168	217	266	391	440	500				595
70	65	119	174	223	272	402	462	540				680
80	71	125	179	228	277	413	483	560	620			760
90	76	130	185	233	282	424	500	580	655			840
100	81	141	190	239	288	434	520	605	695	795		925
125	87	147	206	261	315	472	570	655	750	870		1120
150	87	157	223	288	353	520	625	720	820	945	1000	1325
175	92	185	244	310	386	570	685	780	885	1030	1085	1520
200	98	201	261	337	413	620	745	835	955	1120	1175	1725
250	109	212	320	413	520	795	935	1045	1165	1320	1370	2040
1½-inch Regulators												
30	70	126	175	224	273	371						462
40	70	133	196	245	308	434						565
50	77	140	210	273	336	497						670
60	84	147	217	280	343	505	565	645				770
70	84	154	224	287	350	520	595	695				875
80	91	161	231	294	357	530	625	720	800			980
90	98	168	238	301	364	545	645	750	845			1085
100	105	182	245	308	373	560	670	775	895	1020		1190
125	112	189	266	336	406	610	735	845	965	1120		1440
150	112	203	287	371	455	670	805	930	1055	1220	1290	1710
175	119	238	315	399	497	735	880	1010	1140	1330	1400	1960
200	126	259	336	435	530	800	960	1080	1230	1440	1510	2225
250	140	273	413	530	670	1020	1205	1345	1505	1700	1765	2630
2-inch Regulators												
30	80	144	200	256	312	424						530
40	80	152	224	280	352	496						650
50	88	160	240	312	384	570						770
60	96	168	248	320	392	575	650	735				880
70	96	176	256	328	400	590	680	790				1000
80	104	184	264	336	408	610	710	825	910			1120
90	112	192	272	344	416	625	735	855	965			1240
100	120	208	280	352	424	640	770	890	1025	1170		1360
125	128	216	304	384	464	695	840	970	1105	1280		1650
150	128	232	328	424	520	770	920	1065	1210	1390	1470	1950
175	136	272	360	456	570	840	1010	1150	1305	1520	1600	2240
200	144	296	384	496	610	910	1095	1230	1410	1650	1730	2545
250	160	312	472	610	770	1170	1375	1535	1720	1945	2015	3010

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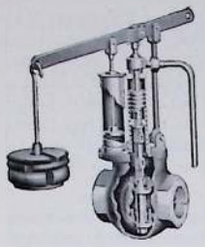
Klipfel Pressure Reducing Valves

Maximum Inlet Pressures

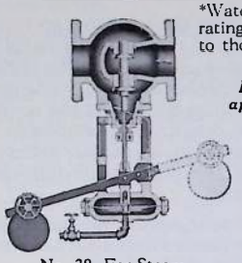
Valve Ends	Steam 475° F., Max.	*Water, Air, or Gas
Screwed	200 pounds	200 pounds
Standard Flanged	125 pounds	150 pounds
Extra Heavy Flanged	250 pounds	300 pounds

*Water, air, and gas ratings do not apply to the No. 1 Valve.

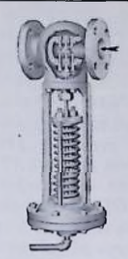
Prices on application



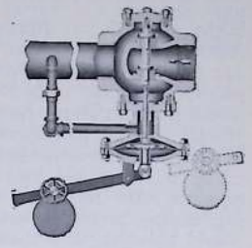
No. 1, For Steam Only (Piston Type)
10 to 150 pounds reduced pressure



No. 38, For Steam, Water, Air, or Gas
Vacuum to medium reduced pressures



No. 300, For Steam, Water, Air, or Gas
10 to 75 pounds reduced pressure



No. 310, For Steam, Water, Air, or Gas
Vacuum to 20 pounds reduced pressures

Range of sizes: All valves are furnished with screwed ends in sizes ⅜ to 3-inch and with standard or extra heavy flanged ends in sizes 2 to 6-inch. Nos. 38 and 310 are also available with standard or extra heavy flanged ends in sizes 8 to 12-inch. End flanges on flanged valves are furnished faced and drilled.

Materials: These valves have a bronze body in sizes 1½-inch and smaller and a semi-steel body in sizes 2-inch and larger. All sizes are bronze trimmed.

No. 1: No. 1, for steam only, has a long water-sealed piston which is balanced between the reduced pressure in the valve outlet and the weighted lever. The oil-filled dashpot insures steady operation. The desired reduced pressure should be specified so that the right piston size and correct number of weights can be furnished. The inner valve has a close sliding fit in the seats.

Operation: Steam enters at the right end of the body and flows through the ports of the balanced inner valve into the outlet chamber where its pressure balances the piston against the weight and lever. Any rise or fall in reduced pressure moves the piston which gradually closes or opens the valve until normal pressure is restored.

No. 38: This valve is suitable for ordinary fluids, not injurious to a rubber diaphragm, for reduced pressures ranging from vacuum up to 45 pounds, depending on the valve size. The diaphragm chamber is separated from the valve body for cooler operation of the diaphragm on steam lines. The valve may be used as a steam pump governor by connecting the feeler pipe from the pump discharge to the diaphragm chamber. The double seated inner valve is almost tight closing. This valve will also operate in the inverted position.

Operation: Used as a reducing valve, a feeler pipe with a restricting valve connects the tapped opening in the diaphragm chamber to the outlet pipe. The weight on the left end of the lever holds the valve open until the reduced pressure is sufficient to raise the diaphragm and close the valve. Regardless of changes in initial pressure, a constant reduced pressure is maintained as it must always balance the diaphragm against the constant force exerted by the weight and lever.

No. 300: This valve is well adapted for use on steam, water, or air where infrequent adjustment is required. The springs are made extra long and compressed nearly solid when installed. Much more accurate regulation at a specified pressure is obtained in this way than is possible with a short spring or one only partly compressed. Interchangeable springs of different gauge wire are available, each for the best regulation within a moderate range of adjustment. Adjustment of the reduced pressure is accomplished by turning the nuts on the side rods.

Operation: The spring holds the valve fully open until the reduced pressure transmitted from the outlet pipe through the feeler pipe is sufficient to force the diaphragm down and partially close the valve. Any change in reduced pressure moves the diaphragm and inner valve in a direction to restore the normal set pressure. The valve will operate just as well in an inverted position.

No. 310: This valve is suitable for handling any ordinary fluid, not injurious to a rubber diaphragm, for reduced pressures ranging from vacuum up to 20 pounds. It is widely used for low pressure steam or vacuum heating. The large area of the diaphragm and the absence of packing box friction promote sensitive and accurate regulation regardless of changes in inlet pressure and required capacity. When used for cold fluids, this valve may be inverted.

Operation: The reduced pressure, transmitted to the diaphragm through a feeler pipe in sizes 3-inch and larger (illustrated) or through a diagonal drilled hole in the body in smaller sizes, balances the diaphragm against the force exerted by the weight and lever. Any rise in this pressure moves the inner valve toward the closed position. A drop in outlet pressure allows the valve to open farther. The reduced pressure is raised by adding more weights on the lever.

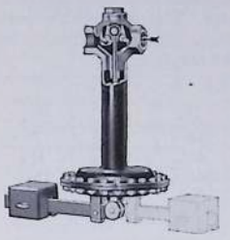
Klipfel Ball-Type Pressure Reducing Valves

Valve Ends	Steam 475° F., Max.	Water, Air, or Gas
Screwed	200 pounds	200 pounds
Standard Flanged	125 pounds	150 pounds
Extra Heavy Flanged	250 pounds	300 pounds

Prices on application



No. 400
Spring Loaded
For 10 to 75 pounds reduced pressure

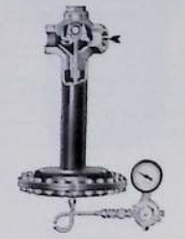


No. 410, Single Lever
For vacuum to 20 pounds reduced pressure

No. 411, Twin Levers
For 0 to 40 pounds reduced pressure



No. 431
Air Loaded—Dome Type
For 5 to 150 pounds reduced pressure



No. 432
Air Loaded—Pilot Controlled
For 0 to 150 pounds reduced pressure

These valves embody many improvements contributing to close regulation of reduced pressure, increased capacity, tight closing, and durability. Their ball is free to seat perfectly. Grinding-in is never required. The streamlined form of the opening between the ball and seat and the large body passages permit a great volume of flow. The seat is beveled at a sharp angle to fit the ball tightly along a narrow line of contact. The guides are integral with the seat.

The internal Pitot tube control in Nos. 410, 411, 431, and 432 Valves avoids the use of an external feeler pipe. The Pitot tube, rather than an external feeler pipe, is more satisfactory for most applications.

Range of sizes: The valves are available with screwed ends in sizes ⅜ to 2½-inch and with standard or extra heavy flanged ends in sizes 2 and 2½-inch. End flanges on flanged valves are faced and drilled.

Materials: The valves have a bronze body in sizes 1½-inch and smaller; larger sizes have a semi-steel body. All sizes have a stainless steel ball and a stainless steel or Monel seat. No. 400 has a semi-steel bracket and diaphragm chamber. The other valves have a wrought steel water leg, diaphragm chamber, or air dome.

No. 400: In this valve, several interchangeable springs are available, each adapted to handle a limited portion of the 10 to 75-pound reduced pressure range. The bracket is attached directly to the body in all sizes for increased strength and rigidity. The valve will operate in any position.

Operation: The spring holds the valve open until the reduced pressure, transmitted through the feeler pipe, is great enough to move the diaphragm and force the ball to the seat.

No. 410: This valve is recommended for steam heating service, process work, and other applications where reduced pressures from 0 to 20 pounds are required. When so ordered, the lever can be arranged for vacuum service. The reduced pressure is adjusted by changing the weights on the lever.

Operation: The diaphragm is balanced between the loading force exerted by the weight and the reduced pressure transmitted through the diagonal Pitot tube from the body outlet into the water leg. Any increase or decrease in the reduced pressure induces the diaphragm to close or open the valve until the normal pressure is restored and the diaphragm is once again in balance.

No. 411: This valve is the same as the No. 410 except it is equipped with two independent levers for symmetrical distribution of loading on reduced pressures up to 40 pounds.

No. 431: This improved dome type valve can accommodate reduced pressures from 5 to 150 pounds by merely changing the air pressure pumped into the dome to equal the desired reduced pressure. The accuracy and sensitivity of regulation is uniform over the entire range of adjustment.

Operation: The tank or dome is filled with air to the required pressure by an ordinary tire pump. The elastic pressure of air (or other gas) confined in the tank or dome is utilized to load the diaphragm and balance it against the reduced pressure.

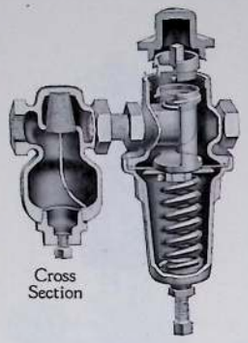
No. 432: This valve is recommended for use where the reduced pressure must be changed frequently. When connected to a source of compressed air at sufficiently high pressure, the pilot valve is adjusted to maintain a loading pressure on the diaphragm equal to the desired reduced pressure. This valve is convenient for remote control.

The complete valve includes pressure gauge, 6 feet of copper tubing, fittings, Schrader air valve, and pilot valve, where such parts are required.

Operation: A small, adjustable pilot valve maintains a constant air pressure under the diaphragm equal to the desired reduced pressure. The Pitot tube produces a sucking effect which lowers the pressure in the water leg as the flow increases, thereby causing the valve to open more and deliver a slightly rising pressure as the demand increases.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 192 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/192

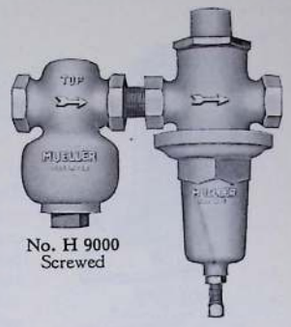
Mueller Pressure Regulators



Cross Section

Service recommendations: The No. H 9000 Regulators, suitable for use on hot and cold water, air, oil, and other fluids, are particularly adapted for industrial service.

Pressure range: The valves are regularly made for initial pressures from 40 to 250 pounds and delivery pressures from 25 to 75 pounds. They can be furnished to order for any initial pressure up to 300 pounds or for delivery pressures from 5 to 125 pounds (special springs required). The valves are set for 45 pounds delivery pressure unless otherwise ordered. Orders should specify catalog number, size, inlet and outlet pressures, and service.



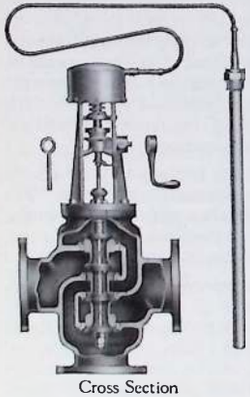
No. H 9000
Screwed

Construction: These regulators are furnished with strainers, completely assembled. The regulating valve, made entirely of bronze (2½-inch size has an iron body), features a full seat opening and can supply a full volume of water at the reduced pressure. The special composition diaphragm will withstand a pressure of 800 pounds. A special composition disc is not affected by hot water. The removable seat ring, disc, and diaphragm make repair possible without removing the valve from the line.

Dimensions, in Inches

Size	¼	⅜	½	¾	1	1¼	1½	2	2½
End to end, assembly	5 1/16	6⅜	7 7/16	8 15/16	9 13/16	12 11/16	14½	17⅜	20
Center to top	1 7/16	2¼	2¼	3½	3⅛	3½	4 1/16	4 13/16	5⅜
Center to bottom	4 15/16	5½	7 1/16	8	8 1/16	10 5/16	10 13/16	14 3/16	16¼

Fulton Sylphon Temperature Regulators



Cross Section
No. 923-3
(Shown with Type "WB" Valve)

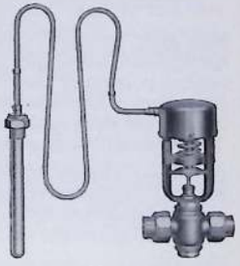
No. 923-3 have a bronze body and trim (cast iron body on 6-inch size). They can be manually operated independently of the regulator thermostat by means of a crank.

No. 923-3 Regulators are used to control the circulation of cooling water through the jacket of internal combustion engines. Sizes ½ to 1½-inch have a three-way type "WC" Valve; larger sizes have a three-way type "WB" Valve.

No. 999 Regulators are used for heating, ventilating, storage water heaters, industrial process temperature control, etc.

Both regulators are available for temperatures ranging from 40° to 420° F. and are adjustable between limits of any selected range. They are regularly equipped with a copper bulb having brass fittings and eight feet of brass armored, copper connecting tube (other lengths furnished to order).

Automatic radiator valves (not illustrated): Valves to automatically control the supply of steam to radiators include No. 885 Valves for exposed type radiators and No. 895 Valves, for concealed type radiators. Both are furnished in sizes ½ to 1½-inch for steam pressures up to 15 pounds.



No. 999

No. 999 have a stainless steel frame. They are available with bronze or stainless steel trim, direct or reverse-acting valve, and a thermometer mounted on the regulator head; specify on order.

Valve Sizes and *Maximum Pressures (Pounds)

Valve Size Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4	5	6
No. 923-3			100	60	35	25	15	35	65	85	60	50	40
No. 999	250	250	250	250	250	250	225	85	65	55	40		

*Indicates pressure drop across valve.

Prices on application

Air Vent or Water Drain Valves

Ball Float Type

(Patent Pending)

List Prices, Dimensions, and Continuous Discharge Capacities at 70° F.

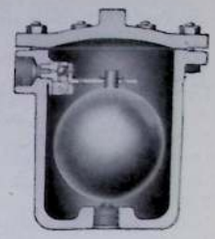
Catalog No.	No. 976		No. 977	
List Price Each	17.00		34.50	
Pipe Size In.	½		¾	
Height In.	6⅜		7⅜	
Diameter In.	5⅝		7½	
Orifice Size In.	5/32	5/64	3/16	3/32
Seat Number	11A	14A	23A	26A
*Effective Seat Pressure Pounds per Square Inch	Capacities as Air Vent Valve Cubic Feet of Free Air per Minute			
1	2.3		3.3	
2 to 4	3.2		4.6	
5 to 9	5.0		7.2	
10 to 14	7.0	1.8	10.0	2.6
15 to 19	8.7	2.2	12.3	3.1
20 to 24	10.0	2.5	14.4	3.7
25 to 29	11.6	2.9	16.5	4.2
30	13.0	3.3	18.6	4.7
31 to 39		3.3		4.7
40 to 49		4.0		5.8
50 to 74		4.7		6.8
75 to 99		6.6		9.4
100 to 124		8.4		12.0
125 to 149		10.2		14.7
150		12.0		17.3
*Effective Seat Pressure Pounds per Square Inch	Capacities as Water Drain Valve Pounds Water per Hour (Inverted Position)			
1	270		385	
2 to 4	370		535	
5 to 9	575		830	
10 to 14	785	195	1130	280
15 to 19	955	240	1380	345
20 to 24	1090	275	1575	390
25 to 29	1225	305	1765	440
30	1320	330	1905	475
31 to 39		330		475
40 to 49		380		545
50 to 74		420		605
75 to 99		510		710
100 to 124		575		825
125		650		930

*Effective seat pressure is the net difference between the valve inlet and outlet pressures.

RANGE OF WORKING PRESSURES

As Air Vent Valve
1 to **30** pounds or **10** to **150** pounds
(Maximum pressure is marked on cap)

As Water Drain Valve
1 to **30** pounds or **10** to **125** pounds



Cross Section



No. 976 or No. 977

See page 344 for installation suggestions.

These simple, efficient, and economical devices automatically remove air from water piping, oil piping, and pressure vessels, or water or oil from compressed air systems. They should not be used on steam lines.

Air vent valve: To remove air from water or oil-laden systems, the valve should be installed at the highest point in the system where air will collect. Normally the valve is filled with water or oil; as the air accumulates, it displaces the liquid in the body causing the float to drop and the valve to open. As the air is discharged and the water or oil re-enters the body, the float rises and closes the valve to prevent the escape of the liquid.

Water drain valve: To remove water or oil from air-laden systems, the valve must be installed in an inverted position (with cap down) at the lowest point in the system. The cycle of operation is the reverse of that described in the paragraph above. It is recommended that a sediment separator be installed in the line leading to the drain valve (see typical installation on page 344); for description of sediment separators, see pages 350 and 357.

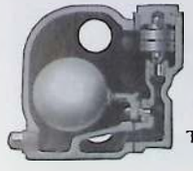
Materials: The valves are ruggedly constructed. Their body and cap are cast iron; the joint is fitted with a Cranite gasket and is bolted. The ball-type disc, made of 16 to 18 per cent chromium steel, is guided to an Exelloy seat. The ball float is copper.

Capacity and pressure range: Each valve is furnished with one of two sizes of seat orifices. The size of the orifice determines both the discharge capacity at various effective seat pressures and the pressure range of the valve, as indicated in the table at the left.

Selecting the proper valve: Select a valve on the basis of its capacity. To assure intermittent discharge, allow an ample factor of safety (at least 2 to 1) between the maximum capacity required for the system and the continuous discharge capacity of the valve.

Ordering: Orders must specify the catalog number, the maximum operating pressure, and either the orifice size or seat number.

Float and Thermostatic Traps



50 Series
Float and
Thermostatic
Trap

These Hoffman Traps find wide application in steam heating installations. The 50 Series Float Trap (not illustrated) is used for removing condensate only; the 50 Series Float and Thermostatic Trap (illustrated at the left) has both a float mechanism for removing condensate and a thermostatic element, permitting air to by-pass to the trap outlet to avoid air binding. The traps are made in sizes ¾ to 2-inch, with capacities up to 12,000 pounds of condensate per hour; prices and additional information will be furnished on request.

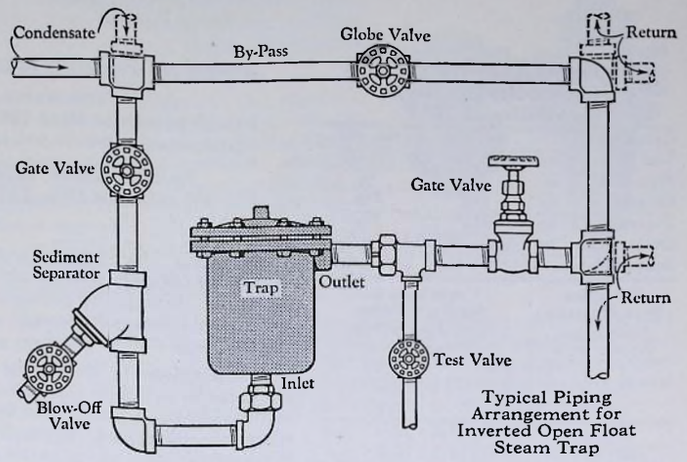
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Installation of Steam Traps and Air Vent or Water Drain Valves

Use Crane Plug Type Disc Globe or Angle Valves for all throttling service.

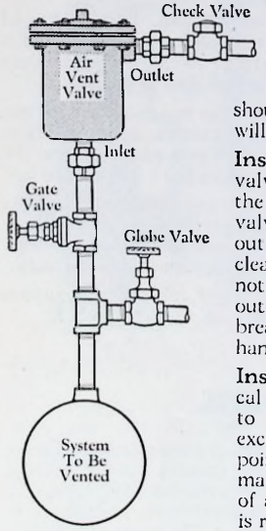
Crane Inverted Open Float Steam Traps, Air Vent Valves, and Water Drain Valves can only be used for discharging to regions where the pressure is less than that in the trap or valve. They can be used to discharge into a back pressure or vacuum, but the pressure rating of the trap or valve must be greater than, (a) the difference between the back pressure and the inlet pressure, or (b) the sum of the vacuum and the inlet pressure. For complete description, capacities, etc., see pages 343 and 345 to 347.

These products are thoroughly and carefully tested before shipment. Properly selected and installed, they will give many years of satisfactory and efficient service. The illustrations on this page show a preferred, typical piping arrangement for each of these products, so designed that the trap or valve is accessible for the periodic inspection and cleaning that usually accompanies the use of any automatic device.



Typical Piping Arrangement for Inverted Open Float Steam Trap

Blow new lines clear of all foreign matter before installing traps, air vent valves, or water drain valves.

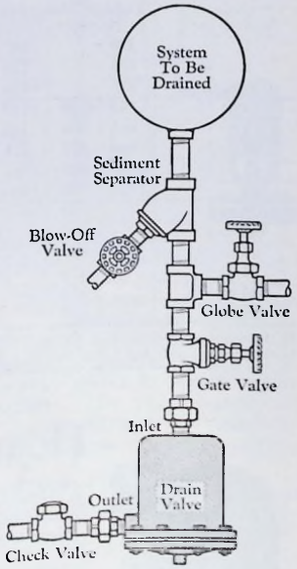


Typical Piping Arrangement for Air Vent Valve

Installation of Steam Traps: Wherever possible, install the trap below the lowest point in the system, with the line leading to the trap pitched downward to assure good drainage. Use a sediment separator just ahead of the trap to prevent scale, sediment, and other foreign matter from entering the trap and interfering with proper operation; a valve on the separator will make it possible to periodically blow-out accumulated foreign matter. The gate valves in the inlet and outlet lines, when shut, permit isolating the trap for inspection and cleaning. If only the gate valve in the outlet line is closed, the test valve can be opened to observe the operation of the trap; if the trap is functioning properly, there will be no flow of water between periods of discharge, nor any flow of steam. A by-pass line with a globe valve makes it possible to rid the system of condensate by hand throttling while the trap is out of service. A check valve (not illustrated) should be used in the outlet or return line where two or more traps are discharging into a common line; should one trap be shut down, the check valve will prevent back-flow from the remaining units.

Installation of Air Vent Valves: Install the valve at the highest point in the system, pitching the inlet line upward to the vent valve. A gate valve in the inlet line and the check valve in the outlet make it possible to isolate the valve for cleaning and inspection. The check valve will not allow air to pass back into the system; without it, the air vent valve will also act as a vacuum breaker. The globe valve permits venting by hand throttling when the gate valve is shut.

Installation of Water Drain Valves: The typical installation for the water drain valve is similar to that of the air vent valve described above except inverted, with the valve at the lowest point in the system. In addition, since foreign matter will tend to collect at low points, the use of a sediment separator with blow-off valve also is recommended.



Typical Piping Arrangement for Water Drain Valve

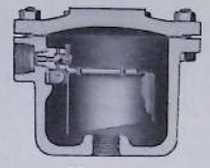
Do not install an air vent or water drain valve where it can freeze.

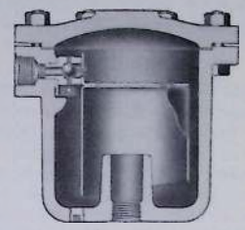
Inverted Open Float Steam Traps

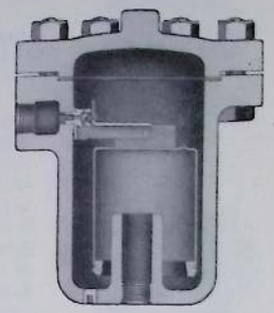
(Patented)

General Description

Fuel is wasted and efficiency greatly reduced unless condensate is drained from steam lines as rapidly as it accumulates. At the same time, the practice of recovering condensate for heating, for hot water needs, or for return to boilers saves many fuel dollars.


No. 9810


No. 9812


No. 9820

Typical cross sections of Crane Inverted Float Steam Traps

Both of these operations are performed efficiently and economically with Crane Inverted Open Float Steam Traps. They provide a simple, trouble-free method for removing condensate from steam piping, separators, and all types of steam heated equipment.

Construction: These traps are small and compact, but have high discharging capacities and are free from complex operating mechanisms. They are extremely simple, having only one major moving part, the float, which actuates the disc through a simple lever. The disc is ball-type and is guided to its seat; it holds pressure easily. The body has an internal inlet nozzle which retains the water seal and precludes the possibility of live steam passing through the trap. A small hole in the top of the float allows air and other non-condensable gases to accumulate at the top of the trap.

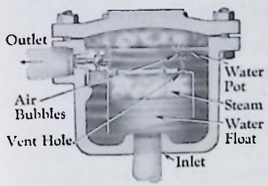
The cover or cap is bolted to the body, the joint being fitted with a Cranite gasket. ½-inch traps have a 1/16-inch raised face on the body and cap; larger sizes have a male and female joint. Bolts are arranged so that the cap can be assembled in one position only, at which the word "Outlet" on the cap is directly over that opening on the side of the body.

Materials: On the Nos. 9810, 9811, 9812, 9813, and 9814 Traps the body and cap are made of cast iron: On the Nos. 9820 and 9821, these parts are Ferrosteel. All traps have a renewable Exelloy seat bushing and fulcrum rod, and a 16 per cent to 18 per cent chromium steel ball disc; these parts have excellent resistance to wear, erosion, and corrosion. The float, lever, and lever supports are made of brass, copper, or other non-corrosive materials. The traps are unusually strong and durable.

Capacity: The capacity of any trap depends upon the effective seat pressure and the orifice size. The only force available to open the disc against the effective seat pressure in the trap is the weight of the float multiplied by the lever arm attached to the disc, and this is a fixed quantity for any one trap. As the effective seat pressure is increased, the orifice area must be decreased. If the area is too large, the trap will fail to function. If the area is too small, the trap will function properly, but its capacity will be reduced.

Each trap is furnished with one of several sizes of seat orifices. Since both the capacity of the trap and the maximum pressure at which it can be used depend upon the size of the seat orifice, care should be exercised when ordering to see that both pressure and capacity are considered. See pages 346 and 347.

Operation

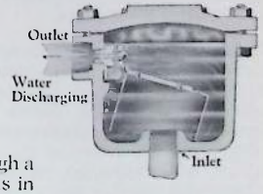


Trap Closed

Incoming steam under the float buoys the float up, keeping the outlet closed.

These traps are actuated solely by the rise and fall of the float resting on the accumulated condensate. The float is buoyant when filled with incoming steam and the discharge valve is closed. When incoming condensate floods the float, it sinks, thereby opening the valve and permitting the condensate to be discharged by the effective pressure.

Air or other non-condensable gas vents through a small hole in the top of the float and collects in the upper part of the trap. At each operation, this air or gas is discharged. The entire cycle of operation is practically instantaneous. If the condensate accumulates at a rate equal to the trap capacity, continuous discharge may occur; for these conditions a larger capacity trap should be used.



Trap Open

Incoming condensate fills the float, sinks it, and opens the outlet.

Suggestions for installing traps . . . . . page 344
List prices, pressures, and dimensions . . . . page 346
Capacities . . . . . page 347
Sediment Separators . . . . pages 356 and 357

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Inverted Open Float Steam Traps

(Patented)



No. 9810



No. 9811
No. 9812
No. 9813
No. 9814



No. 9820
No. 9821

RANGE OF WORKING PRESSURES
1 to 300 pounds saturated steam

How to order: Each trap is furnished with one of several sizes of seat orifices. Since both the capacity of the trap and the maximum pressure at which it can be used depend upon the size of the seat orifice, care must be exercised when selecting a trap to be sure that it will satisfy the needs of the installation. Capacities are shown on the opposite page; orifice sizes, maximum pressures, and seat numbers are shown in the table at the right.

When ordering, be sure to specify the catalog number and the maximum pressure. If the maximum pressure is not included, the order should state either the orifice size or the seat number.

List Prices and Dimensions

Catalog No. of Trap	List Price Each	Dimensions, in Inches		
		Pipe Size	Height	Diameter
No. 9810	13.50	1/2	4 1/2	5 3/8
No. 9811	21.00	1/2	7 3/8	7 1/2
No. 9812	21.00	3/4	7 3/8	7 1/2
No. 9813	33.50	3/4	11	8 1/2
No. 9814	50.00	1	12 3/16	8 3/4
No. 9820	37.50	3/4	9 5/8	8 3/8
No. 9821	65.00	1	11 15/16	9 7/8

Orifice Sizes, Maximum Pressures, and Seat Numbers

Catalog No. of Trap	Size of Orifice Inches	Maximum Pressure (Marked on Trap) Psi	Seat Number
No. 9810	.059	150	16A
	1/16	125	15A
	5/64	75	14A
	3/32	50	13A
	1/8	30	12A
	5/32	15	11A
	3/16	5	10A
No. 9811 and No. 9812	3/32	200	26A
	1/8	150	25A
	5/32	100	24A
	3/16	50	23A
	1/4	30	22A
	5/16	15	21A
	11/32	5	20A
No. 9813	5/32	200	38A
	3/16	150	37A
	7/32	100	36A
	5/16	50	34A
	3/8	30	33A
	1/2	15	32A
	5/8	5	31A
No. 9814	7/32	200	36A
	1/4	150	35A
	5/16	100	34A
	3/8	50	33A
	1/2	30	32A
	5/8	15	31A
	11/16	5	30A
No. 9820	3/32	300	13A
	1/8	250	12A
No. 9821	5/32	300	24A
	3/16	250	23A

Capacity: Pipe size is not a measure of the capacity of a trap to discharge condensate or water. Capacity is determined by the design and construction of the trap, the size of the orifice, and the effective seat pressure. Crane Inverted Open Float Steam Traps have large capacity, as shown on the opposite page; they should be selected on the basis of their ability to discharge the maximum rate of condensation expected in the system.

Safety factor: Since condensate loads are difficult to determine and since intermittent discharge is preferred to continuous discharge, it is necessary to select a trap which allows some factor of safety between its actual continuous discharge capacity and the condensation rate of the system. A 2 to 1 safety factor is the smallest recommended, and selecting traps with three or four times more capacity than is expected is often considered good practice. Where heavy condensate loads must be discharged in a short time, as during warming-up periods, the selection of the trap should be based on the period in minutes in which it will be necessary to evacuate the condensate.

Maximum pressure: The maximum pressure at which each orifice for each trap will operate is shown in the large table on this page and also across the top of the table on the opposite page; this pressure is stamped on the cover of the trap. The traps will operate at the lower pressures for which capacities are given, but not at pressures higher than the maximum.

Effective seat pressure: The effective seat pressure, also known as "differential pressure", is the net difference between the inlet and outlet pressures on the trap. To determine the effective seat pressure, subtract the outlet pressure from the inlet pressure; when discharging into a vacuum, the effective seat pressure is the inlet pressure plus 1 pound for each 2 inches of vacuum. Where the inlet and outlet pressures vary, use the minimum effective seat pressure to determine the size of orifice for the capacity required, and use the maximum effective seat pressure to determine the maximum pressure of the trap.

General description and operation . . . . page 345
Suggestions for installation . . . . page 344
Capacities . . . . . page 347

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Effective Seat Pressure Lbs. per Sq. in.	No. 9810 Orifice Size, Inches							No. 9811 and No. 9812 Orifice Size, Inches							No. 9813 Orifice Size, Inches							No. 9814 Orifice Size, Inches							No. 9820 Orifice Size, Inches		No. 9821 Orifice Size, Inches	
	.059	1/16	5/64	3/32	1/8	5/32	3/16	3/32	1/8	5/32	3/16	1/4	5/16	11/32	5/32	3/16	7/32	5/16	3/8	1/2	5/8	7/32	1/4	5/16	3/8	1/2	5/8	11/16	3/32	1/8	5/32	3/16
	Maximum Pressure—Pressure Marking on Trap																														
1	150	125	75	50	30	15	5	200	150	100	50	30	15	5	200	150	100	50	30	15	5	200	150	100	50	30	15	5	300	250	300	250
2							385							1300							4295							5200				
5	3 & 4					240	370	535					955	1490	1805					3815	5970	7225					3815	5970	7225				
				145	205	370	575	830			575	830	1475	2300	2785				2300	3315	5890	9205			2300	3315	5890	9205	11135				
10	6 to 9			145	205	370	575				575	830	1475	2300					2300	3315	5890				2300	3315	5890	9205					
15	11 to 14	110	125	195	280	500	785			500	785	1130	2015	3145				1540	3145	4530	8050		1540	2015	3145	4530	8050	12580					
		135	155	240	345	615	955		345	615	955	1380	2455	3835			1380	1880	3835	5520	9815		1880	2455	3835	5520	9815	15340					
	16 to 19	135	155	240	345	615			345	615	955	1380	2455				1380	1880	3835	5520			1880	2455	3835	5520	9815						
20	21 to 24	155	175	275	390	700			390	700	1090	1575	2800			1090	1575	2140	4370	6295			2140	2800	4370	6295	11190						
25	26 to 29	175	195	305	440	785			440	785	1225	1765	3140			1225	1765	2405	4895	7060			2405	3140	4895	7060	12540				785		1765
30		185	210	330	475	850			475	850	1320	1905	3385			1320	1905	2595	5290	7620			2595	3385	5290	7620	13350				850		1905
	31 to 39	185	210	330	475				475	850	1320	1905				1320	1905	2595	5290				2595	3385	5290	7620					850		1905
40	41 to 49	215	245	380	545				545	970	1550	2180				1550	2180	2970	6060				2970	3880	6060	8725				545	970	1550	2180
50		240	270	420	605				605	1075	1690	2430				1690	2430	3310	6735				3310	4320	6735	9710				605	1075	1690	2430
	51 to 59	240	270	420					605	1075	1690					1690	2430	3310					3310	4320	6735					605	1075	1690	2430
60	61 to 74	260	295	460					660	1175	1840					1840	2650	3610					3610	4715	7365					660	1175	1840	2650
75		285	325	510					710	1295	2030					2030	2915	3975					3975	5190	8095					710	1295	2030	2915
	76 to 89	285	325						710	1295	2030					2030	2915	3975					3975	5190	8095					710	1295	2030	2915
90	91 to 99	310	355						795	1410	2205					2205	3175	4320					4320	5645	8820					795	1410	2205	3175
100		325	370						825	1470	2300					2300	3305	4505					4505	5880	9170					825	1470	2300	3305
	101 to 124	325	370						825	1470						2300	3305						4505	5880						825	1470	2300	3305
125		365	415						930	1655						2590	3725						5075	6625						930	1655	2590	3725
	126 to 149	365							930	1655						2590	3725						5075	6625						930	1655	2590	3725
150		390							1000	1770						2775	3990						5435	7100						1000	1770	2775	3990
	151 to 174								1000							2775							5435							1000	1770	2775	3990
175	176 to 199								1105							3065							6005							1105	1955	3065	4405
200									1170							3250							6365							1170	2075	3250	4670
	201 to 224																													1170	2075	3250	4670
225	226 to 249																													1270	2270	3545	5000
250																														1310	2325	3640	5110
	251 to 274																													1310		3640	
275	276 to 299																													1345		3740	
300																														1375		3825	

Inverted Open Float Steam Traps
Continuous Discharge Capacities in Pounds of Water per Hour

Safety factor: The table above shows actual continuous discharge capacities. A safety factor of at least 2 to 1 should be used when selecting a trap, to assure intermittent discharge and reserve capacity in case of errors in estimating condensate loads; see explanation on opposite page.

Effective seat pressures: The increments commonly used for listing effective seat pressures are shown in bold face in the column at the left. To avoid unnecessary interpolation and the danger of overlooking the maximum pressure of the trap, intermediate pressure ranges have been added in light face. See opposite page for explanation of effective seat pressures.

Figures enclosed by heavy lines: For easy identification, the most advantageous capacities for each orifice in each trap have been enclosed by heavy black lines. For example, assume a trap is needed on a 15-pound line to discharge (including safety factor) 250 pounds of water per hour against 5 pounds outlet pressure (10 pounds effective seat pressure).

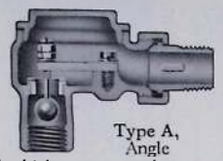
The No. 9810 Trap would fill this need, with orifices and capacities as follows: 3/32-inch, 280 lbs.; 1/8-inch, 500 lbs.; or 5/32-inch, 785 lbs. The latter (figure enclosed within heavy black lines) would be the best choice from the standpoint of intermittent discharge, liberal safety factor, etc.

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Velan Universal Steam Traps

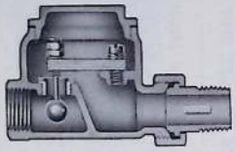
(Patent Pending)

Plain Types
With Air Vent and Check Valve



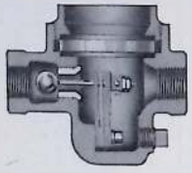
Type A, Angle

For high pressure radiators and heating units in marine and stationary service. ½ and ¾-inch screwed connections.



Type C, Convector

A light weight, economical trap. ½ and ¾-inch screwed connections.



Type P, Junior

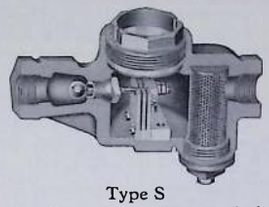
For heating, processing, and air vent service. Fits all standard installations. ½ and ¾-inch screwed connections.

High Capacity Drainage Controls

For Steam Pressures Up to 1400 Pounds

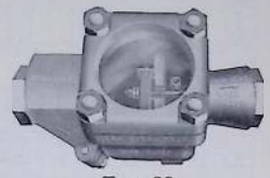
For Temperatures Up to 1000° F.

Strainer Types
With Air Vent, Check Valve, and Control Glass



Type S

An all-purpose steam trap ideal for process industries. ½, ¾, and 1-inch screwed or flanged connections.



Type SS

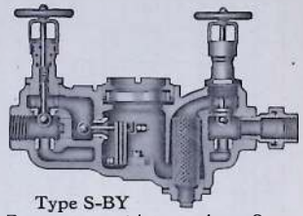
Excellent for rapid handling of large quantities of air and condensate. ¾, 1, and 1¼-inch screwed or flanged connections.

Velan Steam Traps have an extensive application in oil refinery, power, chemical, textile, rubber, printing, and other industries. The traps can be mounted at any angle and are frostproof when installed in a vertical position. A single trap can be used for a wide range of pressures and temperatures.

Simplified operations: Each Velan trap combines the functions of a steam trap, air by-pass valve, and check valve. Some also include a strainer and control glass.

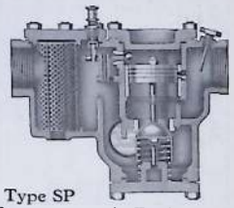
The heart of the Velan trap is a bimetallic element which controls a free floating ball valve. As the trap fills with steam, the increased temperature reacts on the element and causes it to deflect, thus closing the valve tightly against the seat.

When condensate and air collect in the trap, the temperature drops and causes the element to revert to its original position; this permits the line pressure to push the valve off its seat, instantly discharging accumulated condensate and air.



Type S-BY

By-pass type with two valves. Saves space. Eliminates many troublesome, leaky joints. Signalling feature indicates when trap and by-pass are operating. Valves can be repacked while under full pressure. Same connections as Type S.



Type SP

Piston operated. Discharges air as efficiently as water. Capacities up to 500,000 pounds per hour. 1 to 3-inch screwed or flanged connections.



Type N

Designed especially for marine service. Operates in any position. High capacity at both low and high pressures. ½, ¾, and 1-inch screwed, flanged, or socket-weld connections.

Ratings, Orifices, and Capacities

Type of Trap	Pressure Rating Psi	Orifice Size Inches	Capacity Pounds Per Hour
Type A	0-25 0-100 0-200	7/16 7/16 7/16	5,600[a]
Type C	0-25 0-100	7/16 7/16	5,600[a]
Type P	0-50 0-200	½ ½	20,500[b]
Type S	0-50 0-200 0-300	½ or 5/8 ½ or 5/8 ½ or 5/8	22,000[b]
Type SS	0-250 0-350 0-650	7/8 9/16 9/16	62,000[b]
Type S-BY	0-200 0-350 0-650	½ ½ 5/8	20,500[b]
Type SP	0-250 0-650	2 2	350,000[b]
Type N	0-150 0-300 0-650 600-1400	½ ½ 5/16 5/16	22,000[b]

[a]At 25 psi pressure. [b]At 200 psi pressure.

Materials: Plain Types A and C have a bronze body. Type P has a bronze or semi-steel body.

Strainer types have a semi-steel body for pressures below 200 pounds, a cast steel body for pressures up to 600 pounds, and a molybdenum-chrome body for higher pressures.

All of the traps have stainless steel working parts.

Temperature control: The traps can be adjusted to discharge condensate at predetermined temperatures. Where continuous operation is important, strainer type traps (except Type N) can be furnished with a thermometer and outside assembly for temperature adjustment.

Ordering: Specify the type, size and kind of connection, orifice size, and maximum pressure.

Prices on application.

Swartwout Cast Iron Exhaust Heads

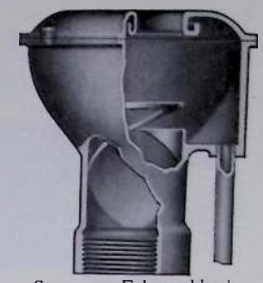
Swartwout Exhaust Heads effectively remove water and oil from exhaust steam discharging to atmosphere. If exhausted direct from the pipe, water and oil would tend to deteriorate roofs and side walls of buildings.

These exhaust heads neither interrupt nor slow down the flow of steam; nor is there any appreciable back pressure. Oil and water are removed simultaneously and only dry steam passes out into the atmosphere.

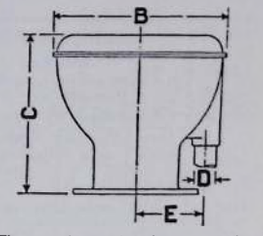
Construction: Centrifugal force, utilized in the design of the Swartwout Exhaust Head, is responsible for the removal of oil and water without any change in the direct flow of steam. Although made of cast iron, the exhaust heads are light in weight. They are exceptionally durable, ornamental, and rustproof. Once in position, there is no further expense for replacement, except where plant expansion necessitates the use of a larger head.

Flange dimensions and drilling: The end flange on flanged exhaust heads conforms to the American Cast Iron Flange Standard, Class 125 (B16.1-1948).

Prices include facing and drilling to this Standard. No reduction in price is made if Exhaust Heads are ordered faced only.



Swartwout Exhaust Head



These exhaust heads are made with a screwed connection in sizes 5-inch and smaller, and with a flanged connection in larger sizes.

Prices on application

Dimensions, in Inches

Screwed					Flanged, F. & D.				
Size Inches	B	C	D	E	Size Inches	B	C	D	E
1	7¾	8⅛	½	2⅞	6	16	14⅞	1	6⅜
1¼	7¾	8⅛	½	2⅞	8	18¾	17⅞	1¼	7½
1½	7¾	8⅛	½	2⅞	10	23	21¾	2	9⅜
2	9	10	¾	3 5/16	12	28½	25	2½	11¾
2½	9	10	¾	3 5/16	14	30½	27	2½	12⅞
3	9¾	10¾	¾	4 1/16	16	34¼	30½	3	14
3½	9¾	10¾	¾	4 1/16	18	38	33⅞	3	15 11/16
4	11½	11 11/16	1	4 15/16	20	41¼	38⅜	3½	16¾
5	13⅞	13¼	1	5½	24	56½	46	4	19½
					30	62	57	4	24½

Expansion in Pipe Lines

The expansion for any length of pipe may be found by the following method: from the table below, obtain the difference in increased length at the minimum and maximum temperatures, divide this result by 100 to obtain the increase in length per foot, and multiply by the length of the line in feet.

Linear Expansion

Temp.	Inches per 100 Feet				Temp.	Inches per 100 Feet				Temp.	Inches per 100 Feet	
Degrees F.	Steel	Wrought Iron	Brass	Copper	Degrees F.	Steel	Wrought Iron	Brass	Copper	Degrees F.	Steel	Wrought Iron
0	0	0	0	0	340	2.76	2.87	4.30	3.95	680	5.965	6.20
20	.15	.155	.25	.25	360	2.935	3.05	4.58	4.15	700	6.17	6.42
40	.30	.31	.45	.45	380	3.11	3.235	4.85	4.40	720	6.375	6.625
60	.455	.475	.67	.65	400	3.29	3.43	5.14	4.64	740	6.58	6.835
80	.61	.63	.92	.87	420	3.465	3.62	5.45	4.89	760	6.79	7.05
100	.77	.80	1.17	1.10	440	3.65	3.805	5.73	5.15	780	6.99	7.275
120	.915	.96	1.41	1.35	460	3.835	4.00	5.96	5.37	800	7.21	7.49
140	1.075	1.13	1.69	1.57	480	4.02	4.19	6.25	5.64	820	7.415	7.73
160	1.235	1.29	1.91	1.77	500	4.21	4.39	6.55	5.88	840	7.63	7.93
180	1.40	1.46	2.15	2.00	520	4.39	4.58			860	7.84	8.145
200	1.57	1.64	2.43	2.25	540	4.59	4.78			880	8.055	8.37
220	1.73	1.81	2.71	2.52	560	4.78	4.975			900	8.28	8.60
240	1.89	1.98	2.97	2.74	580	4.975	5.175			920	8.495	8.82
260	2.065	2.16	3.22	2.95	600	5.17	5.38			940	8.72	9.05
280	2.23	2.335	3.47	3.17	620	5.365	5.58			960	8.945	9.28
300	2.41	2.52	3.76	3.42	640	5.565	5.785			980	9.17	9.52
320	2.59	2.70	4.07	3.70	660	5.765	5.99			1000	9.40	9.75

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125-Pound Expansion Joints

Brass



Semi-Guided, Screwed
No. 404
Standard Traverse
No. 406
Special Traverse

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas

Iron Body



Semi-Guided, Screwed
No. 398
Standard Traverse
No. 400
Special Traverse



Semi-Guided, Flanged
No. 401
Standard Traverse
No. 403
Special Traverse

List Prices and Dimensions

Size	Brass Expansion Joints Screwed				Size	Iron Body Expansion Joints							
	No. 404 Standard Traverse			No. 406 Special 6-inch Traverse		Screwed				Flanged, F. & D.			
						No. 398 Standard Traverse			No. 400 Special 6-inch Traverse	No. 401 Standard Traverse			No. 403 Special 6-inch Traverse
	List Price	Traverse	End to end, open	List Price		List Price	Traverse	End to end, open	List Price	List Price	Traverse	Face to face, open	List Price
Inches	Each	Inches	Inches	Each	Inches	Each	Inches	Inches	Each	Each	Inches	Inches	Each
½	3.75	2	6⅜		1½	20.00	2½	13¾	26.50	27.00	2½	13⅜	33.50
¾	5.50	2¼	7¼	11.00	2	21.50	2½	13¾	29.00	29.50	2½	12⅛	37.00
1	6.50	2¼	7⅜	12.50	2½	25.00	2½	14½	34.00	35.00	2½	12¼	44.00
1¼	8.50	2¼	7⅜	15.50	3	32.50	2¾	15¼	46.50	44.50	2¾	13	58.50
1½	10.50	2¼	7⅝	18.50	3½	45.50	3	17¼		62.00	3	15	
2	18.50	2½	8⅜	28.50	4	53.00	3¼	18⅛	75.00	71.50	3¼	15¾	93.50
2½	30.00	2½	9⅛		5					93.00	4	17½	117.00
3	55.00	2¾	10⅜		6					108.00	4	19⅛	138.00
					8					135.00	4	19¾	
					10					185.00	4	21¾	
					12					270.00	4	23⅝	

Brass Expansion Joints: Crane brass semi-guided expansion joints are chiefly used in interior piping work, on steam and hot water heating lines, domestic hot water lines, and for air, oil, and gas service. The joints are sturdily constructed and well-proportioned. A large packing nut provides ample space for packing.

Iron Body Expansion Joints: The iron body semi-guided expansion joints are of good proportions throughout and are made of high quality materials. The stuffing box is of ample size; the bolted packing gland, carefully machined to guide the sleeves, assures uniform pressure on the packing.

Flanged end joints 6-inch and smaller and all screwed end joints have brass sleeves. Flanged end joints 8-inch and larger have steel sleeves, chromium-plated; brass sleeves can be furnished when desired; prices on application.

Iron joints are furnished with drain bosses. They will be tapped, when so ordered, at an extra price.

Packing: Expansion Joints are regularly furnished without packing in the stuffing box, unless specifically ordered packed, in which case an extra charge is made. Orders for packed joints must specify the kind of packing wanted, or give complete information on the fluid to be handled.

Crane Pipe Bends . . . pages 502 to 504

Installation: To obtain the maximum efficiency from expansion joints and to assure satisfactory operation, the pipe line must be properly anchored and guided to force the joints to compensate for expansion and contraction.

Over-all length of special traverse joints: To find the over-all length of special traverse joints, take the over-all length of the standard traverse joint of the same size and add twice the difference between the special traverse and the standard traverse.

End flanges: End flanges of flanged iron joints conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). List prices include facing and drilling to this Standard. When ordered faced only, they will be furnished at the same price as for faced and drilled. See page 459 for drilling templates.

Special Iron Body Joints: When required, iron body joints can be furnished with an anchor base which will be drilled with four bolt holes. A service outlet which will be screwed can also be furnished. Prices on application.

All-Iron Expansion Joints will be furnished with steel sleeves, chromium-plated, unless otherwise specified. Prices on application.

Guided Expansion Joints . . . page 352

Badger Expansion Joints

Non-Equalizing



Non-Equalizing
Flanged or Welding Ends

The Non-Equalizing "Packless" Expansion Joint is used to relieve stress and absorb vibration between connecting equipment, and to compensate for changes in lengths of pipe lines due to temperature fluctuations.

This expansion joint is formed from single pieces of tubing. Heat-treated after forming, it retains its strength and flexing qualities, assuring long life. It is made of copper for normal pressures and temperatures and of stainless steel where corrosion is a problem. Special metals furnished to order.

This joint is limited to use on pipe lines with traverses not exceeding ½-inch, and for pressures from high vacuum to 25 psi in copper and 50 psi in stainless steel. It can be furnished round (any diameter), oval, rectangular, or in any special shape required, with either flanged or welding ends, and in any required length.

Self-Equalizing

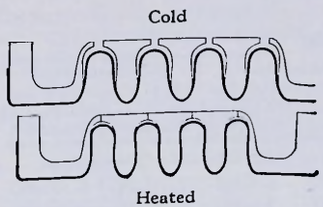
With Directed Flexing Action



Self-Equalizing
Welding Ends

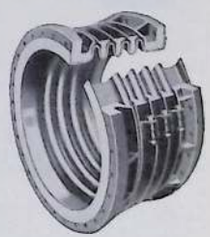
This joint features "directed flexing," which distributes the flexing stress. The corrugations, working with the Directed-Flexing Rings, avoid excessive stress. The equalizing rings progressively control and limit the flexing movement as well as support the corrugated members for high pressures.

The joints are furnished in sizes ranging from 4 to 30-inch. Single joints are available in traverses up to 6-inch; double joints, in traverses up to 12-inch.



Directed Flexing is based on the progressively-controlled movement of the all-curve corrugations by the correspondingly shaped equalizing rings.

This principle of operation is illustrated at the left. The upper portion of the illustration shows the position of the corrugations and equalizing rings while the pipe line is cold. The lower portion shows their positions after the pipe line is heated.



U. S. Rubber Spool-Type Expansion Joints

For Vacuum Service—Style 4039
For Pressure Service—Style 4140

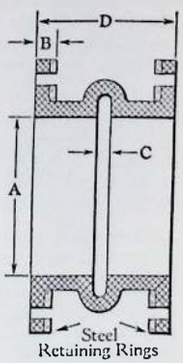
Dimensions and Ratings

Size	Dimensions in Inches				*Ratings for Style 4140	
					Compression	Working Pressure
Inches	A	B	C	D min.	Inches	180° F. Max.
6	6	1	½	6	.43	125 pounds
8	8	1⅛	¾	6	.43	115 pounds
10	10	1⅛	¾	6½	.43	115 pounds
12	12	1⅛	¾	6½	.68	115 pounds
14	14	1¼	¾	7½	.68	75 pounds
16	16	1¼	¾	7½	.68	60 pounds
18	18	1¼	¾	8	.68	60 pounds
20	20	1⅜	⅞	8	.68	60 pounds
24	24	1⅜	⅞	8¼	.81	50 pounds
30	30	1⅜	1	8¼	.93	50 pounds
36	36	1⅜	1	8½	.93	40 pounds

*Style 4039 is recommended for 30 inches of mercury.

Rubber Spool-Type Expansion Joints are used on piping installations to avoid excessive stress, absorb vibration, and to eliminate undesirable sounds. The joints are reinforced with solid metal rings embedded in the carcass and with heavy duck. They also have full faced, fabric reinforced rubber flanges.

Smaller sizes, larger sizes, and other types of Rubber Expansion Joints can be furnished when required.



Prices on application

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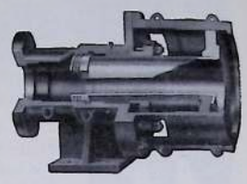
Adsco Iron and Steel Body Expansion Joints

Internally Guided Type



The small over-all diameter permits installation in limited space. The slip is guided internally and cannot pull out of the body. The polished surface of the slip is not in contact with other metal parts.

Piston Ring (Externally Guided Type)



This type is furnished complete with a two-piece removable external guide. ***It can be unpacked and completely repacked under full operating pressure.*** Piston rings hold the line pressure during the packing operation.

Internally — Externally Guided Type



The slip is fully guided at extreme ends throughout its entire length of travel. This feature is frequently called for in Army and Navy specifications. A two-piece removable external guide permits smaller manholes.

Piston Ring (Internally Guided Type)



Has no external guide, permitting installation in limited space; otherwise it is similar to the type above. ***It can be unpacked and completely repacked under full operating pressure.*** Piping should be well guided.

Catalog Numbers of Types Available

Type	Semi-Steel 1¼ to 20-inch Pipe Size		Fabricated Steel 1½ to 20-inch Pipe Size		Semi-Steel 1½ to 20-inch Pipe Size		Fabricated Steel 1½ to 20-inch Pipe Size	
	125-Pound Standard	250-Pound Standard	150-Pound Standard	300-Pound Standard	125-Pound Standard	250-Pound Standard	150-Pound Standard	300-Pound Standard
	Internally Guided Type				Piston Ring, Externally Guided Type			
Single, No Base	S-1-IS	S-5-IS	S-151-IS	S-301-IS	S-1-PG	S-5-PG	S-151-PG	S-301-PG
Single, With Base	S-2-IS	S-6-IS	S-152-IS	S-302-IS	S-2-PG	S-6-PG	S-152-PG	S-302-PG
Double, With Base	D-2-IS	D-6-IS	D-152-IS	D-302-IS	D-2-PG	D-6-PG	D-152-PG	D-302-PG
	Internally-Externally Guided Type				Piston Ring, Internally Guided Type			
Single, No Base	S-1-GIS	S-5-GIS	S-151-GIS	S-301-GIS	S-1-P	S-5-P	S-151-P	S-301-P
Single, With Base	S-2-GIS	S-6-GIS	S-152-GIS	S-302-GIS	S-2-P	S-6-P	S-152-P	S-302-P
Double, With Base	D-6-GIS	D-6-GIS	D-152-GIS	D-302-GIS	D-2-P	D-6-P	D-152-P	D-302-P

Bodies, single or double, are fabricated steel or cast semi-steel, and are provided with a drip connection when specified. The bodies of these expansion joints can also be furnished with or without a base or service outlet connection for a branch line.

Slips, in cast semi-steel joints, are bronze in sizes 3½-inch and smaller, and chromium-plated steel in sizes 4-inch and larger. Both types of slips are equipped with Van Stone flanges. In fabricated steel joints, all slips are chromium-plated steel with steel flanges welded to the slips.

Stuffing boxes hold ample packing, assuring tight joints with minimum repacking.

Packing is not regularly furnished with the expansion joints unless specified. When joints are ordered packed, the pressure, temperature, and fluid handled should be specified.

Packing glands are accurately machined. They have a long lip to permit compression of the packing to one-half the original depth.

Glands studs and nuts are of non-corrosive metal to prevent freezing. The studs are embedded in the body and furnish rigidity to the packing gland.

Service outlets for branch lines are in the form of a service fitting in the Piston-Ring Type Joint. On the other styles, the outlets are integral with the body.

Bases are integral with the body and have four bolt holes. Their heavy webs withstand severe strain.

The standard traverse is 4 inches per slip. Also furnished with 8 and 12-inch traverses per slip.

Drip connections are provided when specified.

Lubrication fittings are provided when specified. Otherwise holes are tapped and plugged.

Prices on application

Dexter Automatic Separators



Type A

Service recommendation: Dexter (Leavitt) Separators, used to remove water, oil, and dirt from compressed air lines, are recommended for pressures up to 125 pounds.

Tools and equipment operate better and last longer when protected by these separators, since the elimination of water from the compressed air permits adequate lubrication, and prevents clogging by foreign matter or subjection to the abrasive action of pipe scale particles.

Spoilage of work is eliminated. Spray painting, air-jet cleaning, blowing dust from band saws, are typical operations that require the clean, dry air furnished by the Dexter Automatic Separators.

Type A Separators are used mainly for point-of-use installations—on service outlets in factory systems, and on portable compressors. These separators should be installed as close as possible to service outlets so there can be no further condensation in the lines. A shut-off cock at the inlet is recommended, to permit removal of the screen for cleaning.

The separators can be furnished complete with pressure regulating valve and pressure gauge for paint spray applications.

Type C Separators are made in the larger sizes required for installation in main lines of distribution systems. A shut-off cock permits removal of the screen for cleaning without interrupting the operation of the pipe line.

Construction: Types A and C are basically similar. They have the same welded tubular construction that provides strength and compactness without excessive weight.

Operation: Operation is based upon the simple principle that when compressed air is allowed to expand, the water and oil vapors contained in the air are precipitated.



Type C

The practical application of this principle involves: (1) bringing about the necessary expansion without interrupting the free flow of air through the separator; (2) segregating the precipitated water and oil so that they cannot be picked up by the flowing air stream; and (3) venting the separated water and oil into the atmosphere.

Operation is entirely automatic and continuous except for the occasional cleaning of the screen to remove dirt and scum collected in the eliminator.

Dimensions, in Inches

Size		⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10
Type A	Width	1¾	2¾	2¾	2¾	5½	5½	8	8	9½								
	Height	8	15	15	15	19½	19½	25	25	25								
Type C	Width				2¾	5½	5½	8	8	9½	19½	22	23½	26½	31½	37⅜	52½	61⅛
	Height				20	30½	30½	35½	35½	36	62⅛	72	84 9/16	87¾	98 1/16	111 3/8	127 3/16	141 13/16

Logan Aridifiers

The Logan Aridifier quickly removes oil, moisture, dirt, rust, fine scale, and other impurities from compressed air and gas lines. Equipment operates better, lasts longer. Corrosion, freezing, fouling, and caking are eliminated. Rapid tool wear and clogged orifices are prevented. Air used for spraying provides a smooth finish.

Types and Data

Size No.	CFM Free Air at 100 psi	Pipe Size Inches	Width Inches	Length Inches
2T	7-33	¾	4½	5¼
3T	17-53	1	4¾	7½
4T	35-145	1½	7	9
5T	90-350	2	7¾	9¾
6T	175-575	2	8⅞	10⅛
7T	400-1200	3	12¾	9
9F	700-2200	4	14½	10 3/16
10F	1500-5000	6	18⅝	12

The aridifier is recommended for pressures up to 150 pounds. Its cast iron housing encloses four multi-bladed rotors which are mounted on a vertical spindle and rotate on oil-sealed stainless steel bearings.

Install the unit in an upright position. Air passes upward through the aridifier forcing the rotors to rotate at high speed in opposite directions. Moisture and impurities in the air stream impinge upon the rotor blades, from where they are hurled certrifugally to the outer wall of the housing into a trap, and finally down through the drain. The clean, dried air passes to the outlet at the top of the housing. Self-cleaning, the aridifier requires minimum attention.

Order by size number. The line pressure and estimated cfm of free air at the installation point should be considered.

Prices on application



Aridifier with a section of the casing cut out to show top spider, rotors, and drainage well. Note opposite rotation of four multi-bladed rotors.

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Steam and Oil Separators



Horizontal
No. 07, 125-Pound
No. 011, 250-Pound

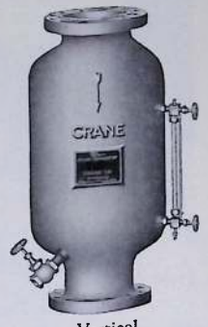
WORKING PRESSURES
125-Pound — **125** pounds saturated steam
250-Pound — **250** pounds saturated steam

Service Recommendations: Horizontal Separators are recommended for use in live steam lines to remove condensation from the steam before it is used in steam-heated apparatus, such as cooking kettles, evaporators, heating systems, etc. They can also be used as oil separators.

Vertical Separators are used to remove condensation from vertical lines with downward flow, such as steam lines to turbines, pumps, etc.

List prices of 125-Pound Horizontal Separators include a nipple, a No. 438 Brass Gate Valve for drain, and a No. 610 Water Gauge.

List prices of 250-Pound Horizontal and Vertical Separators include a nipple, a No. 362 E Bronze Globe Valve for drain, and a No. 616 Water Gauge.



Vertical
With Top Inlet
No. 013, 250-Pound

List Prices, Each (Flanged, Faced, and Drilled)

Size		Inches	1½	2	2½	3	3½	4	5	6	8	10	12
Horizontal	No. 07, 125-Pound		85.00	99.50	121.00	149.00	178.00	206.00	270.00	348.00	476.00	603.00	710.00
	No. 011, 250-Pound		94.00	110.00	133.00	163.00	195.00	227.00	298.00	383.00	522.00		
Vertical	No. 013, 250-Pound		94.00	110.00	133.00	163.00	195.00	227.00	298.00	383.00	522.00		

Construction and materials: These separators afford an efficient, economical means of removing free oil and condensate. Their large areas, the ample size and proper shape of their baffle surfaces, and the location of their openings, assure the highest degree of efficiency with the lowest possible pressure drop.

The 125-Pound Separators are made of cast iron. The 250-Pound Separators are made of Ferrosteel, the No. 011 having a cast iron drip pocket.

Flange dimensions: End flanges of 125-Pound and 250-Pound Separators conform to the American Cast Iron Flange Standards, Class 125 (B16.1-1948) and Class 250 (B16b-1944), respectively.

Drilling: List prices of all separators include facing and drilling to the particular standard applying, as listed above. No deduction is made for separators ordered faced only.

Importance of proper size: To secure maximum efficiency, separators should be selected on the basis of the amount of steam to be handled, not on existing pipe sizes. Too small a separator means too high a velocity, resulting in poor separation. To obtain a proper size separator, use the following formula:

$$C = \frac{A \times B \times 2.4}{V}$$

in which C = Area of inlet in square inches
A = Pounds of steam per hour
B = Volume in cubic feet per pound of steam at given pressure
V = Velocity in feet per minute (7000 max.)

Welded Steel Steam Receiver Separators

Crane can supply Steel Steam Receiver Separators of the welded type. Of high quality, and carefully and accurately fabricated, they conform to the A.S.M.E. Boiler Construction Code for Unfired Pressure Vessels.

Inquiries and orders for receiver separators must be accompanied by complete specifications, including drawings showing the size and location of all openings. Prices on application.

Dimensions, in Inches

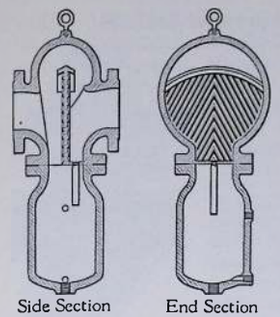
Size of Separator		1½	2	2½	3	3½	4	5	6	8	10	12
Horizontal	Face to face	10	10	11	12	14	14	16	17	20	23	26
	Center to top	4	4¾	5½	9½	11	11¼	12¾	15	18	22	26½
	Center to bottom	17	17	18½	20⅛	22½	23¼	26⅛	28¾	34½	40⅜	45
	Greatest width	6⅝	7¾	8¾	9½	11⅛	12	14¼	16½	21	25	29
Vertical	Face to face	27	27	27	29	31	31	33	38	41		
	Greatest diameter	11	10¾	10⅞	12⅜	14	14	15⅞	17⅜	20		
Size of drain		½	½	¾	1	1	1	1¼	1¼	1¼	1½	1½
Size of valve for drain		½	½	½	½	½	½	½	½	1	1	1½
Center to center of water gauge		6	6	6	6	6	10	10	10	*14	14	14

General description . . . page 355

*10" on the No. 013

Templates for drilling . . . pages 459 and 460

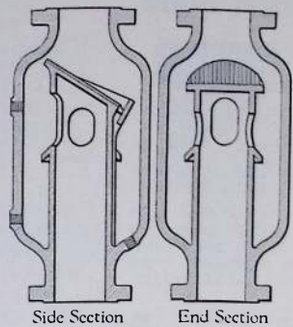
Steam and Oil Separators (Cont.)



Side Section End Section
Horizontal Separators

PRINCIPLE OF DESIGN

The design of Crane Steam and Oil Separators is based upon a scientific principle involving the tendency of a non-elastic body to move in a straight line. Water and oil entrained in flowing steam are non-elastic; therefore, if the direction of the steam flow is abruptly changed, these fluids will tend to be precipitated out of the current. If the velocity of the flowing steam is greatly decreased at the same time, the precipitation of the fluids will be increased, and there will be no tendency to pick them up again as the dry steam passes the baffle plates.



Side Section End Section
Vertical Separators

A necessity in steam-consuming plants: In handling steam, it is essential the steam be delivered at its point of usage as moisture-free as possible.

In live steam lines, condensation is always a source of loss, whether the steam is to be used to drive an engine, turbine, or pump, or whether the steam is to be used as a heating medium.

In exhaust steam lines, oil from the engines or pumps renders the steam unfit for further use as a heating medium or for direct return to the boilers. Oil in pipes, radiators, etc., checks free radiation of heat. Oil in boilers combines with water impurities, and if present in any appreciable quantity, forms a thick insulating coating over the heating surface.

Crane Steam and Oil Separators remove such condensation and oil efficiently and economically.

Horizontal separators: The bodies of horizontal separators provide a greatly enlarged cross section resulting in a lower velocity of the entering steam. Midway of this enlarged section, a corrugated baffle plate, interposed in the flow, frees the steam of most of its entrained moisture. The steam rises over the top of the baffle, and deflected by the curved walls of the head, strikes the corrugations of the reverse side of the baffle before passing on.

The corrugations of the baffle plate run at an angle to the current of steam, affording ready drainage as well as effectively preventing the steam from picking up and carrying globules of water or oil over the top of the baffle. The normal flow of steam is away from the accumulation of condensate in the separator, which also aids in separation.

Vertical separators: Vertical separators employ the same principles of design as the horizontal type, but due to the change in form, there are certain necessary changes in structural details which do not alter their effectiveness.

Automatic drainage: To secure maximum efficiency, all separators must be properly drained. This drainage should be automatic and only the best of steam traps should be used; see pages 345 to 348.

Cast Iron Drip Pockets



No. 420, 125-Pound
No. 422 E, 250-Pound

WORKING PRESSURES
125-Pound—**125** pounds steam
250-Pound—**250** pounds steam

Drip Pockets are tapped for water gauge. Drip Pockets for 250 pounds steam, 450° F., are made to order of Ferrosteel at a 25 per cent advance in price.

Service recommendations: Drip pockets are used primarily as condensation collectors, but also aid in keeping the pipe line clean by receiving foreign matter. They should be located where condensation is most likely to collect.

Size: Full size drip pockets, corresponding to the size of the line on which they are applied, should always be used except on lines larger than 12-inch. The 12-inch size, used with a reducing fitting, is large enough for steam lines from 12 to 24-inch.

Flange dimensions: Flanges on 125-Pound and 250-Pound Drip Pockets conform to the American Cast Iron Flange Standards, Class 125 (B16.1-1948) and Class 250 (B16b-1944), respectively. Prices include facing and drilling (F. & D.) to the Standard applying; no deduction is made for drip pockets ordered faced only.

List Prices, Each, and Dimensions, in Inches

Size		Inches	2½	3	3½	4	5	6	8	10	12
Flanged, F. & D.	No. 420, 125-Pound		33.00	36.50	40.00	43.00	50.00	61.50	91.50	133.00	200.00
	No. 422 E, 250-Pound		40.50	44.50	48.50	52.70	60.70	75.00	111.00		
Over-all height			13⅛	14⅛	16	16¼	18⅛	20¼	24½	28½	32
Size of drain			¾	1	1	1	1¼	1¼	1¼	1½	1½
Size of tapping for water gauge			½	½	½	½	½	½	½	½	½
Center to center of tappings			6	6	6	10	10	10	14	14	14

Templates for drilling, pages 459 and 460.

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Y-Pattern Sediment Separators

Iron Body



Screwed
No. 988½, 125-Pound
No. 990½, 250-Pound

Separators above have a screwed cap on sizes 1½-inch and smaller, as illustrated; larger sizes have a bolted cap.



Flanged
No. 989½, 125-Pound
No. 991½, 250-Pound

Cast Steel



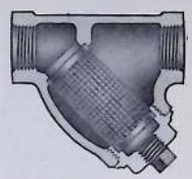
Screwed
No. 994 D, 600-Pound

WORKING PRESSURES

Sediment Separator		Saturated Steam	Cold water, oil, or gas
Iron Body	125-Pound	125 pounds	200 pounds
	250-Pound	250 pounds	500 pounds
Cast Steel	Rated for 600 pounds steam, 900° F. Other ratings same as 600-Pound Screwed Gate Valves, page 224.		

Service recommendations: Crane Y-Pattern Sediment Separators protect equipment against damage from dirt, grit, scale, and all foreign matter in steam, water, air, oil, and gas lines. The No. 994 D Separators are used where severe services require the strength and durability of steel.

Features: The separators are simple in design and rugged in construction. Their large screening area makes them exceptionally efficient. Their internal parts are readily accessible. The separators not only prevent passage of foreign matter, but also furnish a pocket for its accumulation, from which the matter can be easily removed through the blow-off connection. The connection is fitted with a plug.



Typical Cross Section (Iron Body, Screwed)

Materials: Iron body separators have a screwed brass cap on sizes 1½-inch and smaller and a bolted iron cap on larger sizes. Cast steel separators have a body and bolted cap made of carbon steel. The joint between the body and cap, of the male and female type, is equipped with a metallic gasket; Triplex Steel studs are used.

Screens: The strainer element is a Monel mesh screen rolled into the shape of a cylinder. The ends are reinforced. One end fits into a recess in the diagonal wall of the body and the other is retained by the cap. The screen is secure; it will not loosen in service.

The mesh type of screen is furnished for greater efficiency and increased screening area. The screening area in Crane Separators, much greater than the area of the pipe (more than 500 per cent on the 20 mesh screen), assures free fluid flow with minimum pressure loss.

If not otherwise specified, separators are furnished with a 20 mesh Monel screen (400 holes per square inch) suitable for steam, water, and medium or heavy oils.

When specified, separators will be furnished at no extra charge with a 40 mesh Monel screen (1600 holes per square inch) suitable for steam, air, gas, gasoline, light oils, and Grades 1, 2, and 3 fuel oils. To strain dirt from air or gases, a 40 mesh Monel screen packed with Everdur wool is recommended.

Finer mesh screens, perforated screens, or screens made of steel or 18-8 Chrome-Nickel Alloy can be furnished when so ordered; prices on application.

Flange dimensions and drilling: Inlet and outlet flanges on No. 989½ Separators conform to American Cast Iron Flange Standard, Class 125 (B16.1-1948); on the No. 991½, the flanges conform to American Cast Iron Flange Standard, Class 250 (B16b-1944).

Prices of flanged sediment separators include facing and drilling (F.&D.) to the Standard applying. No deduction is made if they are ordered faced only.

List Prices and Dimensions

Catalog Number and Type	Size (Inches)	List Prices (Each)	Dimensions, in Inches: End to end or face to face	Center to extreme bottom	Size of blow-off
No. 988½ 125-Pound Screwed	¼	4.00	3¼	2¼	⅜
	⅜	4.00	3¼	2¼	⅜
	½	4.60	3¾	2¾	⅜
	¾	5.30	4¼	3	½
	1	6.40	5	3¾	¾
	1¼	8.00	6	4½	¾
	1½	10.20	7	5¼	1
	2	19.50	8½	8	1
	2½	24.00	10	9¼	1¼
	3	31.50	11½	10½	1¼
No. 990½ 250-Pound Screwed	½	5.20	3¾	2¾	⅜
	¾	6.00	4¼	3	½
	1	7.20	5	3¾	¾
	1¼	9.00	6	4½	¾
	1½	11.30	7	5¼	1
	2	21.50	8½	8	1
No. 989½ 125-Pound Flanged F. & D.	2	28.00	10¾	8	1
	2½	34.00	11⅞	9¼	1¼
	3	44.00	13¼	10½	1¼
	4	88.50	16¾	13	1¼
	5	122.00	18	15	1½
	6	178.00	20½	16½	1½
	8	243.00	25	20	2
	10	455.00	31	24½	2
	12	On request	34½	28	2
No. 991½ 250-Pound Flanged F. & D.	2	32.50	11¼	8	1
	2½	39.00	12½	9¼	1¼
	3	51.00	14	10½	1¼
	4	102.00	17	13	1¼
	5	153.00	19	15½	1½
	6	223.00	21½	17	1½
	8	On request	26	20½	2
	10		33	25	2
	12		36	28	2
No. 994 D 600-Pound Screwed	½	18.00	3¾	3⅝	½
	¾	26.00	4¼	4	½
	1	33.00	5	4½	¾
	1¼	44.00	6	5½	¾

Templates for drilling . . . . pages 459 and 460

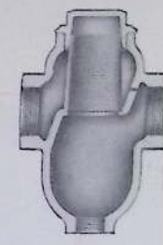
Iron Body Sediment Separators

125-Pound



No. 986
Screwed

WORKING PRESSURES
125 pounds saturated steam
200 pounds cold water, oil, or gas



Cross Section

List Prices and Dimensions

Size	Inches	½	¾	1	1¼	1½	2	2½	3
No. 986	Each	3.20	4.00	5.20	6.40	8.80	13.60	19.00	25.00
End to end	Inches	3⅛	3¾	4¼	5	5½	6¾	8	9½
Center to top	Inches	1¾	2¼	2⅞	3 5/16	3 13/16	5	7	8
Center to bottom	Inches	2⅜	2¾	3⅜	4	4 9/16	5½	7	8½
Size of drain	Inches	½	½	¾	¾	1	1	1¼	1¼

Service recommendation: Dirt and pipe scale in piping conveying steam, water, air, oil, and other fluids are serious trouble makers, frequently cutting the seats and discs of valves and interfering with the operation of automatic devices and machines.

Crane Sediment Separators will effectively remove all foreign matter passing through the lines in which they are installed. They not only prevent the passage of such matter but furnish a pocket for its accumulation, from which the matter can be easily blown.

Construction: No. 986 Separators have a cast iron body and a brass screwed cap in sizes 1½-inch and smaller; 2-inch and larger have a bolted iron cap.

The strainer element is a brass screen rolled into the form of a frustrum of a cone, one end of which seats in the cap and the other on a machined surface in the bridge wall of the body. The area through the screen is much greater than the area of the pipe size. Unrestricted flow of the line fluid is assured even when some of the holes are clogged with foreign matter.

Screens: Unless otherwise ordered, these separators are furnished with screens having perforations .057-inch in diameter (135 holes per square inch) and are then suitable for steam, water, and medium or heavy oils. For air, gas, gasoline, volatile oils, and fuel oils, screens having perforations .033-inch in diameter (331 holes per square inch) will be furnished.

When finer perforations are desired, .02-inch diameter perforated screens (952 holes per square inch) can be furnished from stock. Screens having any other diameter perforations can be furnished on special order.

250-Pound



No. 988
Screwed

WORKING PRESSURES
250 pounds saturated steam
400 pounds cold water, oil, or gas



Cross Section

List Prices and Dimensions

Size	Inches	½	¾	1	1¼	1½	2	2½	3
No. 988	Each	5.00	6.20	8.00	10.00	13.50	21.00	26.00	34.50
End to end	Inches	3	3½	3½	3¾	4	4½	5⅜	6
Center to top	Inches	2⅛	2⅝	3	3½	3⅞	4¾	5¾	6½
Center to bottom	Inches	3⅛	4	4	4⅝	5¼	6½	8	9¼
Size of drain	Inches	½	¾	¾	1	1	1	1¼	1¼

Features: Crane 250-Pound Sediment Separators, like the 125-Pound described above, embody the four essential principles of a good separator: arrestment of foreign matter, a pocket for its accumulation, large screen area, and a vertical screen, allowing a large percentage of the heavy particles to drop naturally to the pocket.

Materials: The strainer element is a flat brass screen supported between the body and cap by a malleable iron grate.

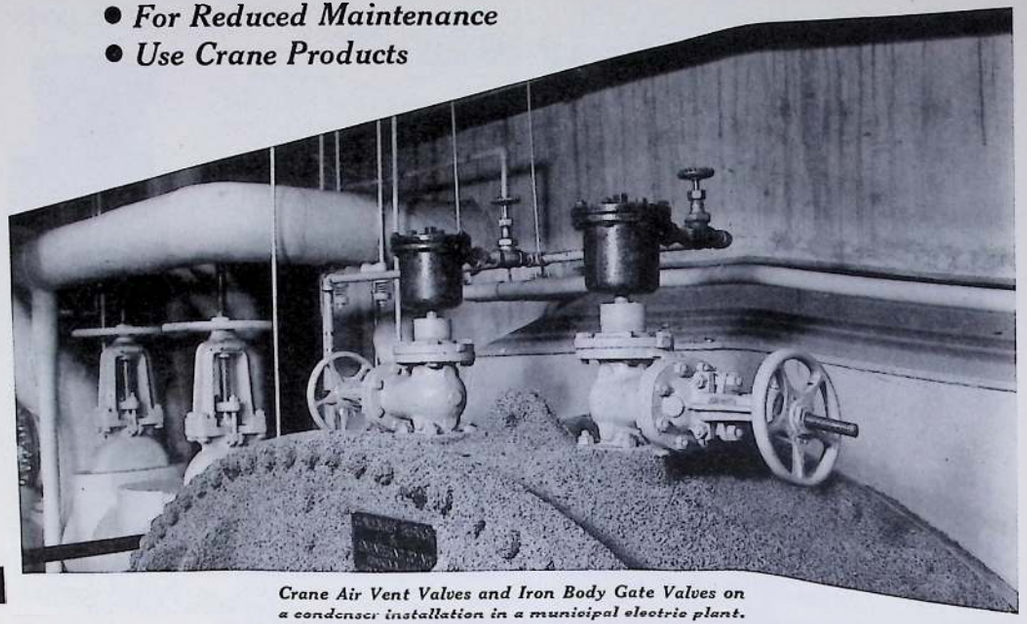
The body and bolted cap are made of cast iron.

Screens: Unless otherwise ordered, these separators are furnished with screens having perforations .057-inch in diameter (135 holes per square inch) and are then suitable for steam, water, and medium or heavy oils. For air, gas, gasoline, volatile oils, and fuel oils, screens having perforations .033-inch in diameter (331 holes per square inch) will be furnished.

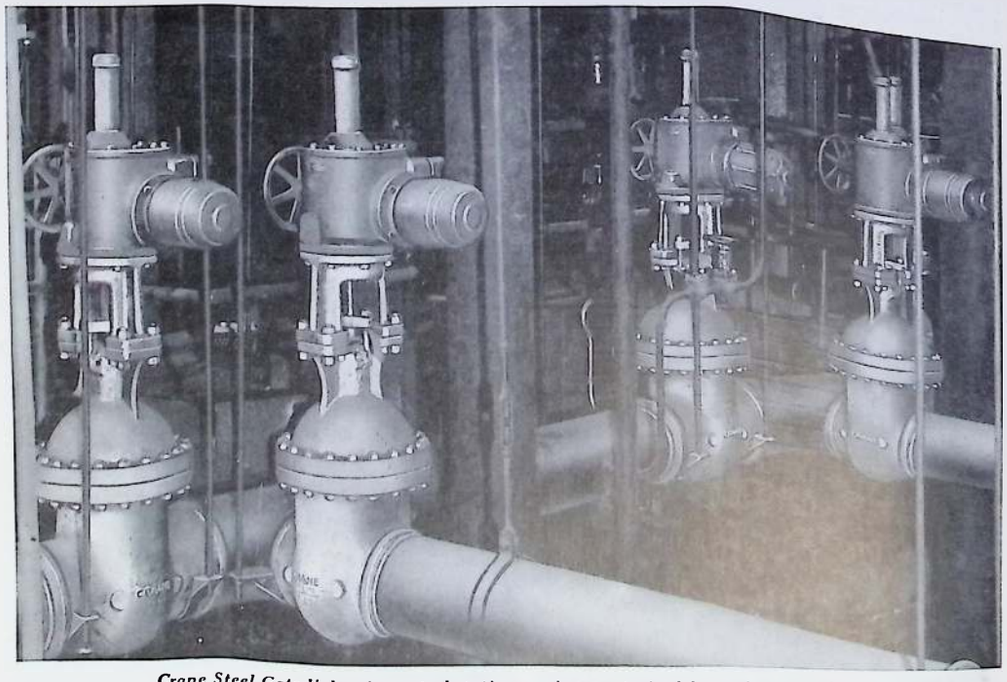
When finer perforations are desired, .02-inch diameter perforated screens (952 holes per square inch) can be furnished from stock. Screens having any other diameter perforations can be furnished on special order.

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- *For Dependable Plant Operation*
- *For Reduced Maintenance*
- *Use Crane Products*



Crane Air Vent Valves and Iron Body Gate Valves on a condenser installation in a municipal electric plant.



Crane Steel Gate Valves in central station service—motorized for easier operation. For a description of Crane cylinder and motor operated valves, see pages 124 to 129.

Gauges, Joints, Unit Heaters, and Miscellaneous Specialties

Water Gauges and Accessories
Brass Water Gauges....page 360
Gauge Glasses....page 361
Gauge Glass Cutters....page 361
Extra Guards for Water Gauges....page 361

Brass Try Cocks....page 361

Joints
Brass Swing Joints....page 361
Chiksan Swivel Joints....page 363
Perfecting Service Rotary Unions....page 363
Barco Flexible Joints....pages 364 and 365

Buckeye Brass Whistles....page 362
Sherman Fusible Plugs....page 362

Gauges and Thermometers
Crosby Gauges....page 366
Marshalltown Gauges and Thermometers....page 367

Siphons for Steam Gauges....page 361

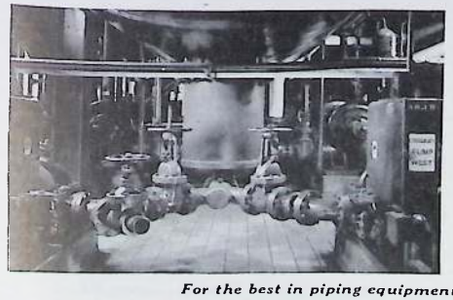
Heating and Ventilating Equipment
Sturtevant Unit Heaters....page 368
Trane Unit Heaters....page 369
Reznor Gas-Fired Unit Heaters....page 371
Ilg Fans and Ventilators....page 370

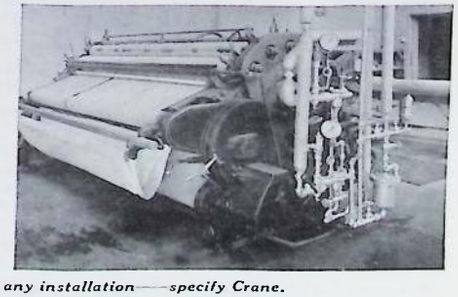
Pumps and Boiler Controls
Hoffman Condensation Pumps....page 371
McDonnell Boiler Controls....page 372
Blakeslee Steam Jet Pumps or Ejectors....page 372
Penberthy Injectors and Ejectors....page 373

Lubricators, Oil and Grease Cups....page 374

The items referred to above are only a portion of the complete Crane line of specialties and of special duty valves. For other products of this nature, see pages 299 to 357.

Brass Whistle Valves....*page 54*
Corrosion-Resistant Alloy Liquid Level Gauges....*page 382*
All-Iron Liquid Level Gauges....*page 413*



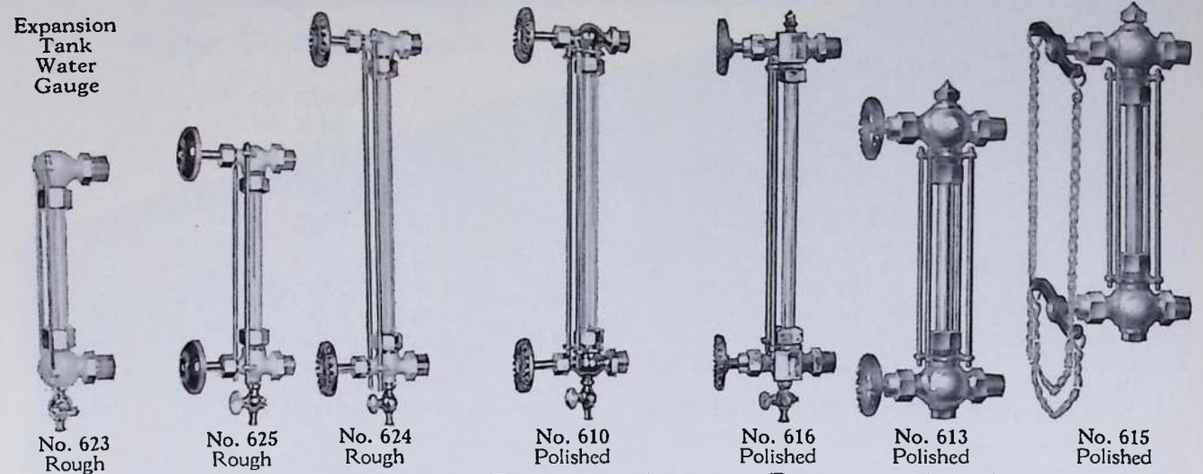


For the best in piping equipment—for any installation—specify Crane.

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Brass Water Gauges

100-Pound 175-Pound 250-Pound



Expansion Tank Water Gauge

No. 623 Rough

No. 625 Rough

No. 624 Rough

For 100 pounds working pressure

No. 610 Polished

For 175 pounds working pressure

No. 616 Polished

No. 613 Polished

No. 615 Polished

For 250 pounds working pressure

Made with Crane Special Bronze Bodies.

Center to Center of Valves

Unless otherwise ordered, the No. 610, No. 613, No. 615, No. 616, No. 624, and No. 625 Gauges are furnished with the centers shown below:

½-inch No. 610 . . . with 14-inch centers
¾-inch No. 610 . . . with 18-inch centers
¾-inch No. 613 . . . with 18-inch centers
¾-inch No. 615 . . . with 18-inch centers
½-inch No. 616 . . . with 14-inch centers
½-inch No. 624 . . . with 14-inch centers
½-inch No. 625 . . . with 8-inch centers

When other centers are required, orders must so specify.

The No. 623 Gauge regularly is furnished with 13½-inch centers, as listed in the table at the right; any other center is considered special.

Centers over 36 inches: When Water Gauges with centers greater than 36 inches are required, two Gauges of shorter lengths, staggered on the boiler, are recommended.

No. 613 Gauge: The lower valve of the No. 613 Water Gauge is drilled and tapped for a ⅜-inch drain.

By closing both valves and removing the cap at the top of the upper valve, the glass in this Gauge can be renewed while the boiler is under pressure.

List Prices and Dimensions

½-inch No. 610	Price, with 14″ or shorter centers	Each	13.50
	Extra for each inch over 14″, up to 36″		.08
	Size of glass for 14″ centers	Inches	⅝×12¾
	Length of guard rod for 14″ centers	Inches	14
¾-inch No. 610	Price, with 18″ or shorter centers	Each	20.00
	Extra for each inch over 18″, up to 36″		.08
	Size of glass for 18″ centers	Inches	¾×16
	Length of guard rods for 18″ centers	Inches	17
¾-inch No. 613	Price, with 18″ or shorter centers	Each	27.00
	Extra for each inch over 18″, up to 36″		.11
	Size of glass for 18″ centers	Inches	⅝×16
	Length of guard rods for 18″ centers	Inches	17
¾-inch No. 615	Price, with 18″ or shorter centers	Each	45.00
	Extra for each inch over 18″, up to 36″		.11
	Size of glass for 18″ centers	Inches	⅝×16
	Length of guard rods for 18″ centers	Inches	17
½-inch No. 616	Price, with 14″ or shorter centers	Each	16.00
	Extra for each inch over 14″, up to 36″		.08
	Size of glass for 14″ centers	Inches	½×12½
	Length of guard rods for 14″ centers	Inches	14
½-inch No. 623	Price, with 13½″ centers	Each	*
	Size of glass	Inches	⅝×12
½-inch No. 624	Price, with 14″ or shorter centers	Each	7.40
	Extra for each inch over 14″, up to 36″		.08
	Size of glass for 14″ centers	Inches	⅝×12¾
	Length of guard rods for 14″ centers	Inches	15
½-inch No. 625	Price, with 8″ or shorter centers	Each	7.40
	Extra for each inch over 8″, up to 36″		.08
	Size of glass for 8″ centers	Inches	⅝×6¾
	Length of guard rods for 8″ centers	Inches	9

*Price on application.

No. 615 Gauge: The No. 615 Gauge is especially suited for service on boilers having the Water Gauge above the reach of the operator. It is chain operated and regularly is furnished with chains that drop 12½ feet below the lower valve.

When the valves are open, the levers stand in a horizontal position. When the valves are closed, the levers stand at an angle of 45 degrees, with the right hand side down.

The lower valve of the No. 615 Water Gauge is drilled and tapped for a ⅜-inch drain.

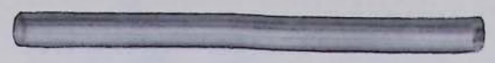
By closing both valves and removing the cap at the top of the upper valve, the glass in this Gauge can be renewed while the boiler is under pressure.

Corrosion-Resistant Liquid Level Gauges . . . . page 382

Ammonia Liquid Gauges . . . . page 413

Water Gauge Accessories

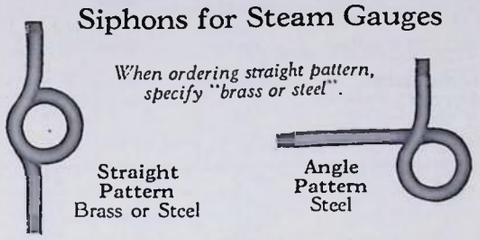
PYREX High Pressure Gauge Glasses



Dimensions, in Inches

Length	Outside Dia. ½	⅝	¾	1	Length	Outside Dia. ½	⅝	¾	1
8					18				
9					19				
10					20				
11					21				
12	*Prices on Application*				22	*Prices on Application*			
13					23				
14					24				
15					30				
16					36				
17									

Siphons for Steam Gauges



When ordering straight pattern, specify "brass or steel".

Straight Pattern Brass or Steel

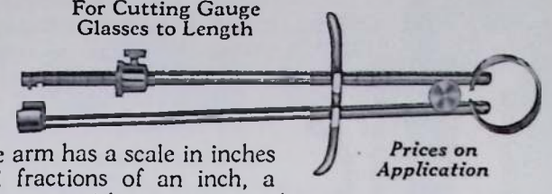
Angle Pattern Steel

List Each	Straight Pattern		Angle Pattern		
	Brass	1.80	Steel	.80	Steel only .80

Made from ¼″ Standard weight pipe: Wrought Steel for 475 lbs., 750° F. and Red Brass for 250 lbs. saturated steam. Straight pattern is 8″ long. Center of loop to long end of angle type is 6″; to short end, 4″.

Chesterton Gauge Glass Cutters

For Cutting Gauge Glasses to Length



Prices on Application

One arm has a scale in inches and fractions of an inch, a slide stop with set screw, and a rotary cutter at the end. This arm is inserted in the end of the glass tube to the required distance, against the slide stop or gauge, the outside of the glass tube resting in the circled end of the other arm. With a slight pressure of thumb and finger on the lever, and a rotation of the glass with the other hand, the rotary cutter makes an even cut around the inside of the tube and a very little pressure breaks it off. Extra cutter wheels are available.

Extra Brass Guards for Water Gauges

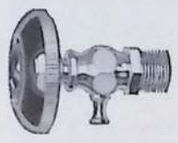
List Prices

*Overall Length In Inches	Price Each	*Overall Length In Inches	Price Each
9	.30	23	.54
11	.30	25	.60
13	.30	27	.66
14	.32	29	.72
15	.36	31	.80
17	.40	33	.88
19	.44	35	1.06
21	.48		

*Length includes acorn.



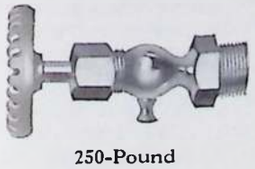
Brass Try Cocks



Low Pressure
No. 731, with Moulded Composition Wheel
15 pounds steam working pressure



125-Pound
No. 730
(Short Pattern)
125 pounds steam working pressure



250-Pound
No. 734
With Stuffing Box
250 pounds steam working pressure

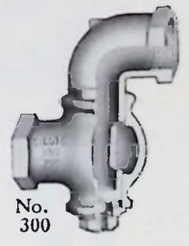
For list prices and description of Brass Cylinder Cocks, Gauge Cocks, and Pet Cocks, see page 67.

List Prices, Each

Size	In.	⅜	½	¾
No. 730		3.10	3.20	
No. 731		2.60		
No. 734		3.50	3.80	4.20

Brass Swing Joints

WORKING PRESSURE
150 pounds
water, oil, or gas, 200° F.



No. 300

These swing joints are designed for use in making up adjustable connections in piping to tanks and other apparatus where permanently fixed connections cannot be made.

Basically, the joints consist of an ell-shaped plug held into the body with a nut and washer. All parts are brass to eliminate binding of the plug by corrosion. Operation is similar to that of an ordinary plug cock. The design of port and body assures free fluid flow; there is no restriction of port area regardless of the angle at which the plug is turned. No packing is used.

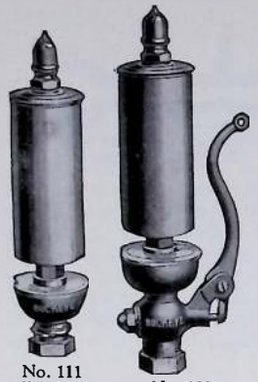
List Prices, and Dimensions, in Inches

Size	Inches	¼	⅜	½	¾	1
No. 300	Each	4.40	4.60	5.40	8.20	12.00
Center to end		13/16	⅞	1 1/16	1¼	1½
Center to center of pipe		1 5/32	1 5/16	1 9/16	1⅞	2¼

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Buckeye Brass Whistles

Plain



No. 111 Without Valve

No. 109 With Valve

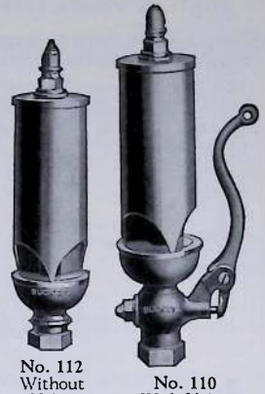
These all-brass whistles produce clear, emphatic signals. They are accurately designed and constructed to produce distinct, even tones with a minimum amount of compressed air or steam pressure. Ideal for use on factories and public buildings, they will work satisfactorily on steam or air pressures of 80 to 150 pounds.

The chime whistle is furnished with or without a valve in the base. The bell is cast in one piece and the chime construction gives a pleasing, composite tone.

The plain whistle is constructed with extra quality brass tubing in the bell which gives a clear, resonant sound and which can be adjusted by screwing the bell up or down.

The size of the whistle is determined by the diameter of the bell and not by the pipe connection. Orders should specify both the bell diameter and the size of the pipe connection wanted.

Chime



No. 112 Without Valve

No. 110 With Valve

Sizes and Dimensions, in Inches

Sizes to Specify		Diameter of bell	1	1½	2	2½	3	4
		Size of pipe connection	⅜	⅜ or ½	½ or ¾	¾ or 1	¾ or 1	1 or 1¼
Length of Bell	Plain Whistles	No. 109, with Valve		3⅛	4¾	5½	6¼	8¼
		No. 111, without Valve	2	3⅛	4¾	5½	6¼	8¼
	Chime Whistles	No. 110, with Valve		4	5	6⅛	7¾	10¼
		No. 112, without Valve		4	5	6⅛	7¾	10¼

Sherman Fusible Plugs

Short Pattern



No. 99 Fire Side Type (Outside)

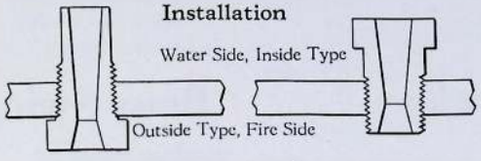
No. 99 A Water Side Type (Inside)

Tube Plug



No. 99 F Tube Plug

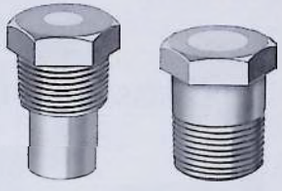
Installation



Minimum Diameter Core Size, in Inches

Plug Size	Inches	⅜	½	¾	1
Short Pattern	No. 99	⅜	½	½	½
	No. 99 A	⅜	½	½	½
Long Pattern	No. 99 B or 99 C	¼	½	½	½
	No. 99 D or 99 E		⅜	⅜	⅜
Tube	No. 99 F	⅜	⅜		
A.S.M.E. and API	No. 991		⅜	⅜	⅜
	No. 992	⅜	⅜	⅜	⅜

Long Pattern



Fire Side Type (Outside) No. 99 B Standard No. 99 D High Pressure

Water Side Type (Inside) No. 99 C Standard No. 99 E High Pressure

Short Pattern, Long Pattern, and Tube Plugs are made from standard high grade brass and filled with pure tin.

The Short Pattern are suitable for low pressures only and do not conform to code. Standard Long Pattern are suitable for pressures up to 175 pounds, High Pressure Long Pattern for pressures over 175 pounds up to 225 pounds, and Tube Plugs for pressures not exceeding 225 pounds.

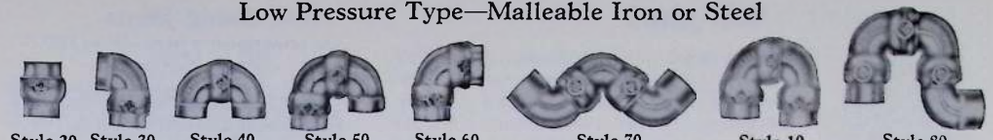
Massachusetts Standard: Tube plugs and long pattern plugs ½-inch and larger comply with Massachusetts Steam Boiler Rules when marked "Mass. Std."; when specified they will be so marked.

A.S.M.E. and API Plugs: No. 991 Fire Side Plugs and No. 992 Water Side Plugs (not illustrated) are made of bronze, filled with pure tin, and conform with A.S.M.E. and API Codes. They are stamped "A.S.M.E. STD.". The A.S.M.E. Code does not recommend the use of fusible plugs when boilers are operated at working pressures in excess of 250 pounds.

Prices on application

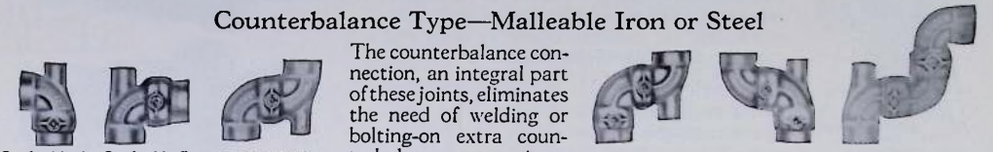
Chiksan Ball-Bearing Swivel Joints

Low Pressure Type—Malleable Iron or Steel



Style 20 Style 30 Style 40 Style 50 Style 60 Style 70 Style 10 Style 80

Counterbalance Type—Malleable Iron or Steel



Style 30×4 Style 30×5 Style 40×5

The counterbalance connection, an integral part of these joints, eliminates the need of welding or bolting-on extra counterbalance connections.

Style 50×5 Style 50×1 Style 70×5

High Pressure and High Temperature Type Joints (not illustrated) are also available; see the table below for ratings and sizes.

Types, Ratings, and Sizes

Type of Swing Joint	Material	Maximum Rating, Pounds 225° F.	Maximum Rating, Pounds 500° F.	Sizes Available, in Inches Threaded	Flanged	Welding
*Low Pressure	Mall. Iron	300	—	⅜ to 4	3 & 4	—
	Steel	1000	—	⅜ to 4	2 to 12†	6 to 12†
Counterbalance	Mall. Iron	300	—	2 to 4	2½ to 4	—
	Steel	1000	—	2 to 4	2 to 4	—
High Pressure	Steel	3000	—	⅜ to 5	—	2 to 5
High Temperature	Steel	—	700	⅜ to 4	2 to 4	—

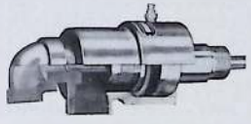
*Low Pressure Joints are also available in bronze or aluminum.

†Welding joints (ends bored for welding) and 6 to 12-inch flanged joints are made by welding swivel units to standard weld elbows. Flanged joints are not furnished in the 5-inch size.

Chiksan Joints have rotating members locked together by double rows of ball bearings. This maintains a pre-regulated load upon the packing element, assuring a pressure-tight, perfectly aligned joint at all times. Specially designed packing units are properly compounded for various services handling liquids, vapors, or gas. The joints are easily dismantled and serviced.

Steel joints are forged in the smaller sizes and cast in larger sizes. Joints with one end threaded and one end flanged are also available.

Perfecting Service Rotary Unions



Heavy Monel bellows, tough pressure-tight graphite seal ring, ball bearing radial thrust, and special steel shaft assure long use.

These ball bearing rotary unions are designed to convey fluids or gases from a stationary pipe line to a revolving shaft or drum. They are widely used on dryer rolls, cooling rolls, ball mills, rubber mills, calenders, air clutches, etc.



Type S—Siphon Type

For use where entrance and exit of liquids or gas are desired in the same unit, or for siphon drainage of condensate from roll or drum. Sizes ½ to 3-inch.



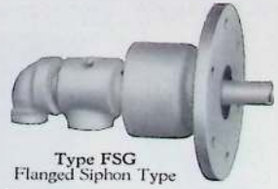
Type P—Single Inlet Type

Used to introduce or extract liquids or gas from either end of a roll or other revolving equipment. Sizes ¾ to 3-inch.

The unions feature a low friction, drop-tight mechanical seal. No packing is used. No adjustments are needed.

Types S and P are all-purpose unions furnished with a rubber hose for coolant service and an all-bronze metal hose for steam and soluble fluid service. The units are suitable for steam pressures up to 150 pounds, hot oil up to 550° F., coolants, air, gases, water, brine, vacuum, alternate fluids, etc. They can be used for speeds up to 1000 rpm.

Type FSG is designed for continuous heavy duty service at steam pressures up to 200 pounds. The unit, bolted directly to the revolving equipment becomes a part of the equipment eliminating any over-hang. The low friction, metal-backed graphite bearings require no lubrication.



Type FSG
Flanged Siphon Type

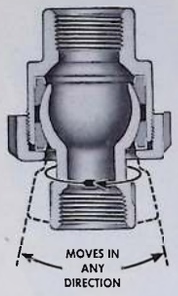
Heavy duty. Sizes 1¼ to 5-inch N.P.T. Plain type also available.

Prices on application

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Barco Flexible Joints

Ball Joints



Cross Section of Style 7-8

Flexible Ball Joints provide movement in all planes in a single joint. They provide a 360° swivel or rotating movement plus a 30° to 40° flexing or angular movement. The use of the proper gasket assures a tight seal and maximum safety. A choice of materials renders the joints suitable for use on steam, water, oil, air, gasoline, corrosive acids and caustics, tar, and similar fluids.

Each style is available in the Standard or Series 600 pressure class. The Style 7-8C is also available in the Series 2500 class.

Standard Ball Joints are available in sizes ¼ to 6-inch in bronze, and in sizes ½ to 6-inch in malleable iron, steel, and aluminum, (or as specials, in stainless steel and other alloys). A choice of gaskets, identified by service numbers, makes the joints suitable for the following services:


Style 7-8

Service No. 11: For 300 pounds steam and, except in the larger sizes, for 1500 pounds hydraulic. Temperature range from −50° to 425° F.

Service No. 11LA: For water, oil, air, gas, and gasoline at pressures up to 150 pounds. Temperature range from −20° to 220° F.

Service No. 11L: For water, oil, air, gas, and gasoline at pressures up to 300 pounds. Temperature range from −20° to 220° F.


Style 7-8B

Service No. 11CT: Has minimum torque. Suitable for corrosive chemical and caustics or for severe steam service. Recommended for 300 pounds steam and, except in the larger sizes, for 1500 pounds hydraulic. Temperature range from −50° to 500° F.

Series 600 Ball Joints are made in sizes ½ to 6-inch in malleable iron and steel or, as specials, in stainless steel. A choice of gaskets (identified by service numbers) makes the joints suitable for the following services:


Style 7A-8

Service No. 11: For 300 pounds steam and, except in the larger sizes, for 2000 pounds hydraulic. Temperature range from −50° to 425° F.

Service No. 11M: For 600 pounds steam and, except in the larger sizes, for 4000 pounds hydraulic. Temperature range up to 750° F. for steel, and up to 500° F. for malleable iron.


Style 7A-8B

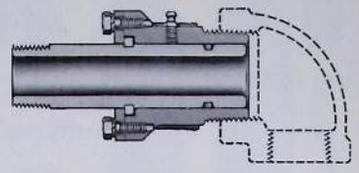

Style 7F-8F
Flanged connections. Sizes 4 and 6" only.

Series 2500 Ball Joints are available only in Style 7-8C, sizes 1 to 4-inch. Suitable for 750 pounds steam, 7500 pounds hydraulic, and for temperatures up to 1000° F.

Ordering: Specify series, size, style number, material, and service number.

Swing Joints

For temperatures from -40° to 225° F.


Cross section of a Style 5011 Swing Joint. Other styles, described below, are available. All are the straight type.

Barco Swing Joints are designed to handle air, gas, water, gasoline, oil, and chemicals. Their simple "O" ring construction assures quick, inexpensive maintenance and provides a seal equally effective for vacuum or pressure service. The long bearing surface assures adequate piping support.

The joints rotate a full 360° in one plane. They provide a swivel or slow and steady rotating movement without any side flexibility. They are ideal for use on overhead loading lines, hose reels, and swing lines where joints moving in one plane only are required to support the piping.

Several swing joints can be connected together with elbows to provide rotation in more than one plane.

Style 5001, available in sizes ⅜, ½, and ¾-inch, has a steel casing and a steel sleeve. The thrust is absorbed by metal washers at each end of the casing. Recommended for hydraulic service up to 500 pounds and for air or gas service up to 250 pounds.

Style 5011 has a steel sleeve and a malleable iron casing. The thrust ring carries the load in either direction. The ring is held by a flange which is easily removed for servicing without disturbing the piping. Recommended for hydraulic, air, or gas service. Sizes 1, 1¼, and 1½-inch are suitable for pressures up to 250 pounds; sizes 2, 2½, and 3-inch, for pressures up to 200 pounds.

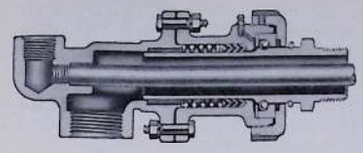
Style 5021 is available in sizes 4, 6, 8, 10, and 12-inch with flanged connections. The sleeve is steel; casing and flanges are semi-steel. Recommended for hydraulic, air, or gas service up to 150 pounds.

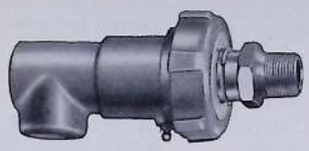
Dimensions, data, and installation combinations furnished on request.

Prices on application

Barco Flexible Joints

Revolving Joints


Siphon Design
Type IBRA Angle
Type IBR Straight Way


Single Flow Design
Type IBRSA Angle
Type IBRS Straight Way

Straight Way Joints are not illustrated.

The revolving joints shown above are designed for steam, air, gas, and hydraulic service at temperatures up to 450° F. Light in weight, compact, and easily installed, they are recommended for the continuous rotation necessary to the heating or cooling of all types of rolls, drums, and dryers.

Types IBR and IBRA are designed for use where liquids, gas, or steam must both enter and leave through a single joint. The siphon serves as a return line for steam condensate but may also be used as the inlet pipe.

Types IBRS and IBRSA convey liquids, gas, or steam into, or out of, revolving drums.

All types except IBRA are furnished in sizes ½, ¾, 1, 1¼, 1½, and 2-inch, and in a 1-inch 14 NF straight thread size. Type IBRA is furnished in sizes 1 to 2-inch. Each type is available with right or left hand threads on the rotating shaft.

Sizes ½ and ¾-inch are suitable for 250 pounds steam and 1000 pounds hydraulic pressures; larger sizes are suitable for 150 pounds steam and 200 pounds hydraulic. Speeds up to 500 rpm on steam, and 750 rpm on hydraulic service at temperatures under 100° F., are possible.

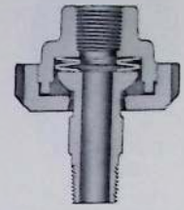
Other revolving joints: Other revolving joints suitable for steam pressures up to 250 pounds and temperatures up to 450° F. are available. They are:

Type R (siphon) and Type RS (single flow), made in sizes 2½ and 3-inch; also suitable for hydraulic pressures up to 500 pounds. When ordering specify whether for steam or hydraulic service.

Type V, ideal for machine tool, air, and hydraulic clutch applications, as well as for general steam use, is suitable for hydraulic pressures up to 1000 pounds. Speeds up to 2500 rpm on cold liquids can be obtained. Available with either a right or left hand ¼-inch pipe thread or ⅝-inch, 18NF straight thread.

Ordering: When ordering, specify the type designation, size, fluid handled, temperature, pressure, and any special operating condition.

Rotary Swivel Joints


Cross Section
Style SA-7S-8CS
Straight Swivel


Style SA-7AS-8CS
90° Swivel

Swivel Joints are available in the Standard and the Series 600 Class.

Rotary Swivel Joints feature easy movement, low torque, and a tight seal. They will not leak under rapid temperature changes, as from steam to cold water. The rotary swivel provides a 360° swivel movement, plus a 10° angular movement which relieves piping strains or misalignment.

Except for their spring-seated, single gasket design, swivel joints are similar to the ball joints shown on page 364. They are widely used to convey steam to movable platens and molds in rubber, plastic, and tire presses, or to convey oil to moving parts on hydraulic die casting machines or presses.

Standard Swivel Joints have a steel ball. The casing is bronze on sizes ⅜, ½, ¾, and 1-inch and malleable iron on sizes 1¼, 1½, and 2-inch. A choice of gaskets (identified by service numbers) makes the joints suitable for the following services:

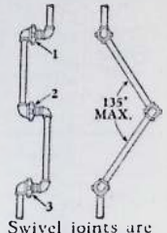
Service No. 11: For general use at 300 pounds steam and up to 1000 pounds hydraulic. Temperature range, −50° to 425° F.

Service No. 11CT: For severe conditions, as where there is frequent or rapid movement, or where low torque is needed. Suitable for 300 pounds steam pressure and up to 1000 pounds hydraulic. Temperature range from −50° to 500° F.

Series 600 Swivel Joints, made in sizes ⅜ to 2-inch, have a steel ball and a malleable iron casing. A choice of gaskets (identified by service numbers) makes the joints suitable for the following services:

Service No. 11: For 300 pounds steam pressure and up to 2000 pounds hydraulic. Temperature range from −50° to 425° F.

Service No. 11M: For 600 pounds steam pressure and up to 2500 pounds hydraulic. Temperature range from −50° to 600° F.



Swivel joints are most commonly used to provide movement in one plane; this requires three swivel joints installed in dog-leg fashion, as shown.

Hydraulic ratings: Hydraulic ratings vary according to size; complete data on request.

Ordering: When ordering, specify series, pipe size, style number, and service number.

Prices on application

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Crosby Gauges

Pressure, Vacuum, Compound, or Altitude



Bellows Gauge
Style AZ



Standard
Single Tube Gauge
Style AA



Heavy Duty
Single Tube Gauges
Styles
AAO, AIO, ASO,
AIH, and ASH

Crosby Gauges are high quality instruments designed for accuracy and durability. Illustrations show, in part, the extent of the Crosby line. The table below lists some of the various types available, materials, dial ranges, etc.

Movements: Movements on Crosby Gauges are mounted on a socket extension and are entirely independent of the case. Bronze movements have a hard phosphor bronze sector and pinion with milled teeth and lapped bushings. Steel movements have a hard Monel sector, hardened stainless steel pinion with milled teeth and stainless steel bushings, line reamed and lapped.

Tubes: All tubes are heat treated. Drawn bronze tubes have soldered connections. Drawn alloy steel tubes have welded connections. Bored steel tubes, bored and turned from forged alloy steel billets, have threaded connections.

Test gauges: Test gauges are made in a variety of sizes and pressure classes for use in various services. Style **ACV**, for testing gasoline and related fluids by the Reid Vapor Test Method, conforms to A.S.T.M. Specifications.

Illuminated dials: When orders so specify, Style **AAO** and Style **AIH** Gauges in sizes 10 and 12-inch will be furnished with an illuminated dial; an extra charge applies. The metal dial is illuminated without shadows or glare by a circular, neon-type tube attached to a reflector ring.

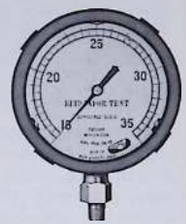
Protectors and diaphragms: Protectors and diaphragms are available for all gauges used in corrosive services. A special cleanout-type protector can be furnished where viscous matter such as paper pulp or soap accumulates and must be removed.

Gauge testers: Gauge testers, in dead weight or fluid pressure scale types, are available for pressures up to 25,000 pounds; information furnished on request.

Ordering: When ordering, specify the style number, the dial size and range, and the size of the connection.



Standard Test Gauge
Style AC



Reid Test Gauge
Style ACV



Style AAO or AIH can be furnished with an illuminated dial on sizes 10 and 12-inch.

Styles, Sizes, Materials, Services, and Dial Ranges

Type	Style No. and Description	[1]Cases, and Dial Sizes in Inches		Materials		Services and Standard Dial Ranges (Min-Max. Ranges From Zero)				
		Brass Case	[2]Iron Case	Tube and Socket	Movement	Pressure Psi	Vacuum Hg.	Compound Hg.	Compound Pressure Psi	Altitude Feet
Bellows	AZ.....Low Pressure	—	4½-8½	Brass	Same as AC	½-15	30″	On request		1¼-35
Single Tube	AA.....Standard	3½-12	3½-12	Brass	Same as AC	15-1000	30″	30″	15-300	40-500
	AAO....Heavy Duty	4½-12	4½-12	Brass	Stainless steel; hard Monel sector	15-1000	30″	30″	15-300	—
	AIO.....Heavy Duty			Steel[3]						
	ASO.....Heavy Duty			Steel[3]						
	AIH.....Heavy Duty	4½-12	4½-12	Steel[3]		100-10000	—	30″	100-300	—
	ASH....Heavy Duty									
	AH.....Hydrostatic	4½-12	4½-12	Steel[3]	Same as AC	100-10000	—	—	—	—
Test	AC.....Standard	3½-12	—	Brass	Phosphor Bronze	15-1000	30″	30″	15-300	—
	ACI.....Inspectors	3								
	ACV.....Reid Vapor	4½	—	Brass		15-250[4]	—	—	—	—
	ACU....Underwriters	3½				200 or 400				
	ACIH....Bored Tube	4½-12	4½-12	Steel[3]	Same as AAO	100-10000	—	—	—	—
	ACSH....Bored Tube	6-12	6-12							

[1]Phenol cases are available for 4, 6, and 8½-inch Single Tube Gauges and for 4½-inch Style AZ and ACV Gauges.
[2]In sizes 10 and 12-inch, cases are made of aluminum instead of cast iron.
[3]The tube is drawn steel on Style AIO; bored steel on Styles AIH, AH, and ACIH; drawn stainless steel on Style ASO; and bored stainless steel on Styles ASH and ACSH.
[4]Style ACV is also available with dial graduating from 5-25, 15-35, 25-45, 30-60, or 50-100 psi.

Prices and additional information furnished on application.

Marshalltown Gauges and Thermometers

Marshalltown Gauges and Thermometers are precision instruments. They are available with drawn steel, flanged iron, or flanged brass cases. Steel and iron cases have a steel ring, the assembly being finished in black enamel. Brass cases are polished and include a brass ring (threaded); the assembly will be nickel or chrome-plated, if specified.

Gauges: Vacuum, Pressure, and Compound Gauges are suitable for air, gas, oil, water, and other fluids non-corrosive to bronze; when used on steam, a siphon should be used. Do not use a vacuum gauge on pressures above atmosphere or subject a Pressure Gauge to a partial vacuum; for such conditions, use a Compound Gauge.

No. 83 and No. 86 Gauges have a phosphor bronze diaphragm. Other gauges have a bourdon tube. The movements, mounted independently of the case, operate smoothly. White enameled dials are easy to read.

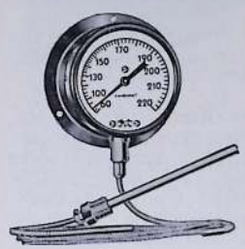
Gauges have a ¼-inch male bottom connection (½-inch on No. 51), unless otherwise specified.

Thermometers: No. 90 Thermometers have a back or bottom outlet, six feet of double braided tubing, and a ½-inch union connection.

Nos. 99 and 100 Thermometers are bi-metallic helix actuated; they have neither gears nor pinions. The center back connection is ¼-inch on 2 and 2½-inch sizes, and ½-inch on 3½ and 4½-inch sizes.

Ordering: Specify catalog number, dial size and range, style of mounting, and the size and position of the connection.

Thermometers



No. 90
Vapor Tension Type
For Distant Reading



Standard Bi-Metal Type
With Drawn Steel Case
No. 99
Brass Bulb and Stem
No. 100
Stainless Steel Bulb and Stem

Standard Pressure

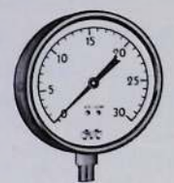


Low Pressure Diaphragm

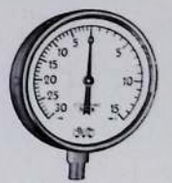


No. 23———Drawn Steel Case———No. 83
No. 24—Flanged Iron or Brass Case—No. 86

Vacuum



Compound



No. 22———Drawn Steel Case———No. 45
No. 25—Flanged Iron or Brass Case—No. 42

Hydraulic



Ammonia



No. 50———Drawn Steel Case———No. 52
No. 51—Flanged Iron or Brass Case—No. 54

For freon service, use No. 56 or 57 Gauge listed in table below; they are similar in design and construction to the Ammonia Gauge shown above.

Styles, Sizes, Material, Services, and Dial Ranges

Type		Catalog Nos. and Dial Sizes				Materials		Standard Dial Ranges Minimum—Maximum Ranges from Zero	
		Drawn Steel Case (No Back Flange)		Flanged Iron or Brass Case		Bourdon Tube	Movement		
		Cat. No.	Dial Sizes Inches	Cat. No.	Dial Sizes Inches			Vacuum Hg.	Pressure Psi.
Gauges	Pressure	No. 23	2 to 4½	No. 24	3½ to 12	Brass	Brass	—	15-1000
		No. 83	2½ to 4½	No. 86	4½ to 12	Bronze	Brass	—	15 or 10
	Vacuum	No. 22	2 to 4½	No. 25	3½ to 12	Brass	Brass	30″	—
	Compound	No. 45	2 to 4½	No. 42	3½ to 12	Brass	Brass	30″	15-300
	Hydraulic	No. 50	3½	No. 51	3½ to 12	Steel	Monel	—	1000-30000
	Ammonia	[2]No. 52	2½ & 3½	[2]No. 54	4½ to 12	Chr-Moly.	Monel	30″	150 or 300
	Freon	No. 56	2½ & 3½	No. 57	4½ to 12	Brass	Bronze	30″	150 or 300
Thermometers		—	—	No. 90	4½ to 12	Brass	Brass	See Note 3	
		No. 99	2 to 4½	—	—	Bi-metallic helix actuation			
		No. 100	2 to 4½	—	—				

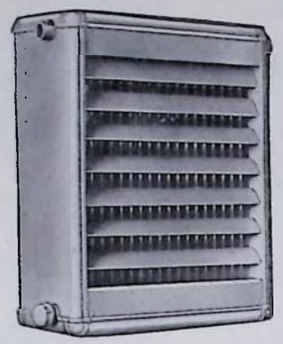
[1]Graduations also available from zero to 15-200 ounces (or inches of water).
[2]No. 52 has a black enameled, stainless steel case and ring; No. 54 is made with a flanged iron case only. Either is available with straight pressure readings (no vacuum or pressure scale) from zero to ranges of 30 up to 400 pounds.
[3]Thermometers are furnished with the following Fahrenheit temperature readings:
No. 90.....–40 to 120, 0 to 100, 40 to 150, 40 to 220, 50 to 300, 60 to 220, or 80 to 270 degrees.
No. 99 or 100.....20 to 140, 50 to 300, 50 to 400, 50 to 500, 60 to 220, or 80 to 270 degrees.

Prices and additional information on application. ***Siphons for steam gauges....page 361***

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Sturtevant Unit Heaters

Horizontal Type



Design 14
Standard Steam Type—Single Speed

Horizontal Heaters are designed to deflect the heat downward to cold areas by means of individual adjustable louvers. Inlet and outlet connections on both sides permit direct piping runs. Soft steel hangers supplied with the unit can be bent to fit all mounting requirements. Steel casing has a rust-resisting coating and a green baked enamel finish.

These heaters are available with single, double, or multi-speed motor controls.

Sturtevant Unit Heaters for steam and hot water are adaptable to any industrial or commercial application where an even flow of heat over a large area is desired. The units, easily installed, combine high efficiency with attractive, aerodynamic design.

Other units, similar to the Standard Steam Type illustrated, but with specially designed radiators, are:

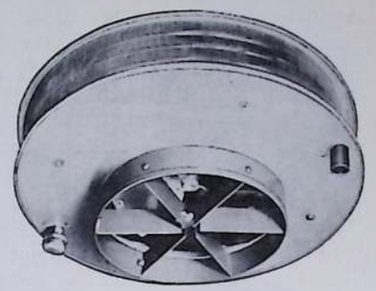
Low Temperature Steam Type—for use where lower "leaving air temperatures" than those offered by the Standard Steam Type are required.

Hot Water Type—for use with forced circulation hot water.

Textile Mill Type—for use in textile mills. Non-clogging and easy to clean.

Diffusers for Vertical Heaters: Optional equipment for vertical units include directional vanes (illustrated) and single cone or double cone diffusers. All provide a more desirable spread of the air stream.

Vertical Type



Design 12
Standard Steam Type—Single Speed
With Directional Vanes

Vertical Heaters are of the downblast type. They project the heated air downward to the working level—and recirculate the heated air ordinarily pocketed at the ceiling. They are widely used where large roof areas, obstructions, or location problems require a vertical heat source. Steam supply and return headers on both sides of the unit simplify installation and reduce piping costs.

Motor Ratings, Steam Capacities, and Dimensions

Type	Size Number	Motor H.P.	Motor Single High Speed R.P.M.	Capacities at 2 Pounds Steam 60° Entering Air: Btu per hour	EDR in sq. ft.	Condensate in lbs. per hour	Final Temp.	C.F.M. 70° Air Basis	Outlet Velocity	Dimensions, in Inches: Height	Width or Diam.	Max. Depth
Design 14 Horizontal Heaters — Standard Steam Type	25	1/100	1080	25,800	107	26.7	119.7°	398	431	20	15¾	16½
	40	1/50	1080	41,500	173	43.0	114.5°	700	526	22½	18⅛	17⅜
	55	1/20	1080	57,000	238	59.0	113.5°	978	590	24¾	19½	21
	75	1/20	1080	76,000	317	78.6	112.3°	1336	638	26¼	22	23½
	85	1/20	1080	85,600	357	88.6	124.5°	1220	538	26¾	24½	24¼
	100	1/12	1080	100,500	419	104.0	118.5°	1580	690	26¾	24½	24¼
	115	1/12	1080	114,500	478	118.5	120.5°	1740	596	30⅝	25¾	25
	125	1/6	1080	125,500	523	129.8	116.3°	2050	696	30⅝	25¾	25½
	135	1/6	1080	134,500	561	139.2	120.0°	2060	632	32½	27	26⅛
	150	1/6	1080	150,700	628	156.0	114.4°	2550	772	32½	27	26⅛
	175	¼	1080	176,600	736	182.5	113.0°	3060	836	33¾	28¼	27⅜
	200	¼	1080	200,700	837	207.5	111.0°	3620	894	35⅞	29½	28
	250	¼	820	251,000	1045	259.5	115.2°	4180	781	38⅞	34½	32¼
	300	⅓	820	300,500	1253	311.0	113.2°	5200	838	40⅞	37	34⅜
Design 12 Vertical Heaters — Standard Steam Type	D 40	1/6	1725	40,000	167	41.5	113°	695	1230		21	19
	D 55	1/6	1725	55,000	229	57.0	110°	1010	1380		26½	19
	D 75	1/6	1725	75,000	312	77.5	113°	1300	1650		29¼	18 7/16
	D100	1/6	1725	100,000	417	104.0	113°	1735	1900		32¼	19½
	D125	1/6	1725	125,000	520	130.0	126°	1740	1240		32¼	18¼
	D150	¼	1140	150,000	625	155.0	126°	2090	1340		32¼	21 1/16
	D175	¼	1140	175,000	730	181.0	126°	2440	1440		37¼	21 1/16
	D200	⅓	1140	200,000	833	207.0	125°	2830	1545		37¼	23⅛
	D250	½	1140	250,000	1040	259.0	125°	3540	1605		42½	23 3/16
	D300	½	1140	300,000	1250	310.0	125°	4250	1750		44½	24 7/16
	D350	¾	1140	350,000	1460	362.0	125°	4980	1885		52½	21 7/16
	D400	¾	1140	400,000	1665	414.0	123°	5800	2040		52½	22 11/16

Prices on application

Trane Unit Heaters

Horizontal Type



Model H
With Louver Fin Diffuser

These heaters are available with constant-speed, two-speed, or three-speed motors in both the Standard and High CFM Models.

Model H Horizontal Heaters feature the sturdiness necessary for severe industrial applications with the quiet efficiency and attractive appearance desired for use in modern shops and similar installations.

The sides, top, and bottom of the casing are of one-piece construction. The bonderized casing is finished in brown enamel. The heaters are equipped with a quiet, four-blade fan.

A louver fin diffuser (shown in the illustration above) permits easy control over the spread of the heated air and the distance of the throw and provides a great number of diffusion patterns as well; it is available at extra charge. Units regularly include louvers only.

Vertical Type



Model P
With Louver Cone Diffuser

Model P Vertical Heaters, efficient and streamlined throughout, blend well with a wide range of building types. They have an extensive industrial application wherever vertical heaters are desired.

The Model P is a draw-through, vertical discharge propeller unit heater. It can be suspended at heights from ten to sixty feet. The heater consists of an extended surface circular coil sandwiched between two circular plates, a four-blade propeller fan, and a standard motor mounted out of the air stream. Standard Models have a two-row coil; High CFM Models, a one-row coil.

Cone attachments, louvers, Free-Flo grilles, anemostats, and the louver cone diffuser (illustrated) are optional. The latter provides many diffusion patterns and permits focusing the air stream for up to 60% greater throw.

Motor Ratings, Steam Capacities, and Dimensions

Model and Number		Motor H.P.	Motor Constant High Speed R.P.M.	Capacities at 2 Pounds Steam 60° Entering Air: Btu per hour	EDR in sq. ft.	Condensate in lbs. per hour	Final Temp.	C.F.M. 70° Air Basis	Outlet Velocity	Dimensions, in Inches: Height	Width or Diam.	Depth
Model H Standard Horizontal Heaters	71H	1/30	1500	22,000	92	23	106°	438	577	19	16	15⅝
	72H	1/30	1500	36,000	150	37	125°	511	702	19	16	15⅝
	74H	1/30	1500	44,000	183	46	129°	587	811	19	16	15⅝
	76H	1/30	1500	53,000	220	55	135°	648	702	20½	17½	15⅞
	78H	1/30	1500	63,000	262	65	139°	736	506	23½	20½	20⅜
	80H	1/20	1500	78,000	325	82	135°	955	678	23½	20½	20⅜
	82H	⅛	1140	86,000	358	88	126°	1205	842	23½	20½	20⅜
	84H	⅛	1140	125,000	521	130	130°	1648	818	26½	23½	20⅜
	86H	1/6	1140	144,000	600	150	122°	2150	1050	26½	23½	21⅜
	88H	1/6	1140	180,000	750	188	130°	2370	843	29½	26½	22½
	90H	1/6	1140	200,000	833	207	131°	2600	758	32	29½	26¼
	92H	¼	1140	240,000	1000	250	127°	3310	952	32	29½	26¼
	94H	¼	1140	297,000	1235	310	136°	3590	637	40	35½	26¼
	96H	½	1140	352,000	1465	367	129°	4700	826	40	35½	26¼
Model P Standard Vertical Heaters	100 P	1/30	1500	55,300	230	57	132°	710	1390		24¾	10 3/8
	120 P	⅛	1725	97,000	405	101	123°	1420	1730		24¾	15 11/16
		1/20	1140	76,000	317	79	135°	940	1165			
	150 P	⅓	1725	141,500	590	147	118°	2250	1790		33¼	17½
		⅛	1140	120,000	500	125	132°	1535	1245			
	180 P	½	1725	194,000	807	201	111°	3500	2040		33¼	19 9/16
		1/6	1140	158,500	660	164	123°	2320	1395			
	200 P	⅓	1140	233,000	970	241	126°	3250	1545		33¼	20 1/16
	220 P	½	1140	327,000	1365	341	120°	5010	1900		38½	23 13/16
	250 P	1	1140	435,000	1815	454	123°	6360	1985		46¼	22¾
	275 P	1	1140	451,000	1880	466	122°	6700	1460		46¼	23¼
	300 P	1	1140	560,000	2330	580	128°	7580	1660		46¼	24⅛

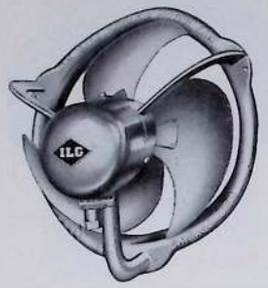
The heaters listed above are available also in High CFM Models.

Prices on application

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Ilg Heating and Ventilating Equipment

Self-Cooled Motor Propeller Fans



Type Q: The Type "Q" Propeller Fan, illustrated at the left, is used to exhaust stale air, fumes, odor, dust, etc. The patented, self-cooled motor is designed specifically for use in polluted air systems. The fan wheel, dynamically balanced, is connected directly to the motor. The fans are available in sizes ranging from 6 to 48 inches.

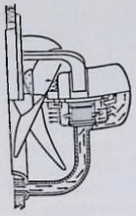
Other types: For moving greater air capacities with maximum physical dimension, the Type "P" Fan is recommended. Type "P" is a high speed, self-cooled motor propeller fan. It combines the Type "Q" wheel with a Type "P" motor.

Also available is a Type "X" Explosion-Proof Propeller Fan. This type embodies all the fine performance features of the Type "Q" Propeller Fan with the use of a ball-bearing, explosion-proof motor. The motor has been approved by the Underwriters' Laboratories, Inc., as suitable for all Class I, Group D hazardous applications.

Type "Q" Specifications*
60 Cycle Alternating Current
Constant Speed, Single-Phase

Size No. 115 Volts	Size No. 230 Volts	Rpm	Cfm	Decibel Rating
48078	48079	2750	250	50
48080	48081	1550	350	47
48090	48091	1550	500	46
48095	48096	1550	1000	54
48106	48107	1140	1700	53
48108	48109	1140	2600	56
48110	48111	1140	3600	58
48112	48113	855	4700	54
48114	48115	685	7800	61
48116	48117	570	10750	62
.....	48119	490	15500	61
.....	48121	490	23300	65

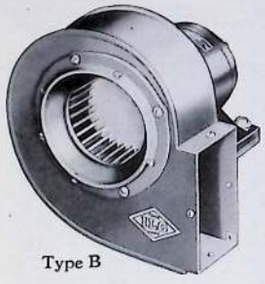
*Type "Q" is also available with 60 cycle motors of the two speed, single-phase or the constant speed, three-phase type.



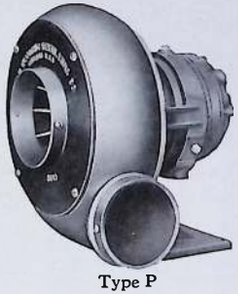
Type Q
Self-Cooled Fan

Clean, cool, fresh air, drawn from the outside, is circulated through the vent pipe and motor, and then exhausted through the front of the motor. The motor remains clean and is self cooling.

Volume Centrifugal Fans



Type B



Type P

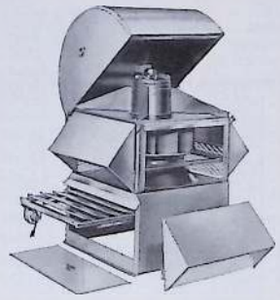
Type B: Type "B" Centrifugal Fans are used for all types of blow-in or exhaust duty requiring low pressure, small volume, and quiet operation. Rotation is clock-wise or counter clock-wise. The discharge is easily changed by rotating the housing. Units are available with free air deliveries ranging up to 2640 cubic feet per minute.

Motor ratings: 60 cycle A.C., either single-phase, 110-220 volts or three-phase, 220-440 volts. Also 115-230 volts, direct current.

Type P: Type "P" Centrifugal Fans handle small quantities of air over a pressure range of ¼ to 6½ inches. They are excellently used to exhaust steam, vapors, and chemical fumes, to handle dust from polishing wheels and grinders, and for many other exhaust purposes.

Motor ratings: 60 cycle A.C., either single-phase (constant speed), 110-220 volts, two or three-phase, 220-440 volts. Also, 25 cycle A.C., single-phase, 110-220 volts or direct current 115-230 volts.

Power Roof Ventilators



Type PRV—Open View

Type PRV: Type "PRV" Roof Ventilators, consisting of a housed, direct-connected, centrifugal fan and motor, offer accurately controlled ventilation regardless of weather conditions. Sizes are available to provide air deliveries over an extensive range of pressures, from free air to 1½-inch static.

The self-cooled motor, mounted in a separate compartment, is protected from exhaust fumes, heat, dust, and excessive moisture. The weather-tight housing contains the complete fan unit and all air control accessories; there is no need for an expensive high profile curbing, with air control accessories fitted into the roof or curbing section. The unit is easy to install, wire, and service.

Prices on application

Reznor Gas-Fired Unit Heaters

Recommendations: Reznor Gas-Fired Unit Heaters, designed for commercial and industrial application, are A.G.A. and Underwriters' approved for use with natural, manufactured, mixed, and liquefied petroleum (LP) gases.

Safety features: The heaters have a limit control which automatically shuts off the gas supply in case of excessive temperature and a fan control which responds to the temperature of the heater, and not the room thermostat. The fan control delays operation of the fan until the air is warm enough for forced circulation; the fan runs as long as the unit is warm.

Construction: The heaters have a cold rolled steel cabinet with a gray-green, baked-on enamel finish. Heat exchanger tubes are corrosion-resistant aluminized steel; the combustion chamber is welded steel. Adjustable horizontal shutters provide proper air distribution.

Other models: Blower Heaters, similar to the Suspended Fan Model and available in the same sizes and capacities, have a centrifugal type or multi-blade blower instead of a propeller fan. Duct Heaters, with input capacities of 100,000, 150,000, or 200,000 btu, are also available.



Suspended Fan Model

Ratings and Dimensions

Model No.	Motor H. P.	Input Btu per hour	Output Btu per hour	Output EDR Sq. Ft.	Air delivery Max. C.F.M.	Gas connection Inches	Over-all Dimensions, in Inches Height	Width	Depth
US 25F	1/125	25,000	20,750	87	410	½	22¼	18¾	19⅝
US 50F	1/80	50,000	41,500	173	800	½	22¼	18¾	23¼
US 75F	1/40	75,000	62,250	260	1200	¾	29½	24	24⅜
US 100F	1/20	100,000	83,000	346	1500	¾	31½	24	26⅞
US 125F	1/8	125,000	103,750	432	1500	¾	31½	24	33½
US 150F	1/8	150,000	124,500	519	1800	¾	31½	24	36⅛
US 175F	1/6	175,000	145,250	605	2100	1	33½	24	38½
US 200F	1/6	200,000	166,000	692	2400	1	33½	24	42⅛

Standard equipment includes an electric gas valve, automatic safety pilot valve, manual pilot valve, manual shut-off, fan control, limit control, summer-winter switch, and gas pressure regulator (the latter is not supplied with heaters for LP gas).

Models US 25F through US 100F are furnished with a two-speed motor; other models are furnished with a one-speed motor.

Optional equipment at extra cost includes vertical louvers, hanger boards, lift assemblies, room thermostats, etc.

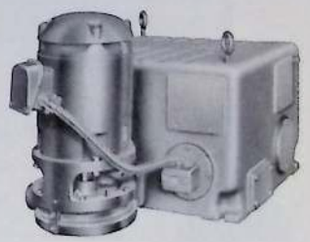
Hoffman Condensation Pumps

Recommendations: Hoffman Condensation Pumps are the vertical close-coupled centrifugal type. Compact, efficient, and ruggedly constructed, they are built for long trouble-free service. The pumps, which include a motor and receiver, are designed to operate at a wide range of pressures without danger of overloading the motor. They are especially adaptable to the high temperatures encountered in condensation pump service.

Capacities and Connections

	Capacities EDR Sq. Ft.	Capacities Pump Gpm	Receiver Gal.	Size of inlet and discharge Inches
Type CS Single Units or Type CD Double Units When ordering, specify EDR capacity	1,000	2	12 on Single	2 and ¾
	2,000	3		2 and ¾
	4,000	6	20 on Double	2 and ¾
	6,000	9		2 and ¾
	8,000	12		2 and ¾
	10,000	15	20	2 and ¾
	15,000	22½	36	2 and 1¼
	20,000	30	36	2 and 1¼
	25,000	37½	52	3 and 1½
	30,000	45	52	3 and 1½
	40,000	60	52	3 and 1½
	65,000	97½	75	4 and 2
	75,000	112½	75	4 and 2
	100,000	150	150	4 and 2½
	150,000	225	150	4 and 2½

Note: Each type is available with an outlet discharge pressure of 10, 15, 20, 30, 40, 50, or 60 psi, as specified; complete data on request.



Type CS—Single Unit (Illustrated)
Type CD—Double Unit (Not Ill.)

Function: In Hoffman pumps, the water flows directly from the tank to the centrifugal pump without passing through any intermediate piping. Single Units provide the complete equipment necessary for receiving condensate from the system and discharging it to the boiler. Duplex Units provide a stand-by pump and motor for insurance against shut-down, as well as double capacity when both pumps are operating simultaneously.

Features: All submerged parts are bonze or of non-corrosive material. Motors are the 40° C., continuous rating, heavy duty, vertical, ball bearing type. A float switch mechanism, easily adjusted, automatically controls the operation of the centrifugal pump according to the water level in the cast iron receiver. A split-type packing gland is standard on all models.

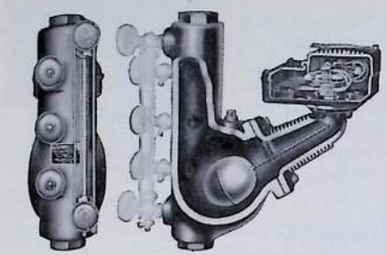
Prices on application

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McDonnell Boiler Controls

Low Water Column Type

The No. 157 McDonnell Pump Control, Low Water Cut-Off, and Alarm is used to control boiler water level, increase boiler efficiency, and promote safety in boilers of any size operating at pressures up to 150 pounds.



No. 157
Pump Control and Low Water Cut-off.
(Try-cocks and water glass are not furnished.)

Dimensions, in Inches

No.	Equalizing Pipe Tap	Try-Cock Tap	Water Glass Tap	Overall Height	Overall Width
157	1	½	½	16	13⅝
157A	1¼	¾	¾	16	13⅝
157B	1	½	½	18 1/16	13⅝
157C	1¼	½	½	18 1/16	13⅝
157D	1¼	¾	¾	18 1/16	13⅝

All have automatic reset. If manual reset is required, order No. 157M, 157AM, 157BM, 157CM, 157DM.

Construction: The No. 157 is built to withstand the arduous conditions imposed by high temperature and pressure. All operating parts are away from heat and are sealed from the float chamber by an extra heavy bellows which totally eliminates packing. Switch leads have porcelain bead insulation. The junction box cover is in two parts; the main section is factory sealed to protect switches against tampering or accidental damage.

Installation: To simplify installation, this control is made an integral part of the water column, using the water glass and try cocks removed from the old column. By making the No. 157 integral with the water column, practically all equalizing pipe and fittings are eliminated.

This control also eliminates the need for a separate blow-off valve. Since the float chamber actually is the water column, the No. 157 is directly and effectively blown down by the blow-off valve below it.

Switches: The two switches used have five terminals which may be wired to provide a pump control circuit, a low water cutoff circuit, a low water alarm circuit, or any combination of these functions. Both switches are the dependable mercury type especially designed for high temperature service. "Cut-off" and "cut-in" points of both switches can be adjusted within the range of practical requirements to meet individual needs.

Electrical ratings: Electrical ratings, approved by the Underwriters' Laboratories, are as follows:

Cut-off and pump control: A.C. ½ h.p., 115-230 volts.
D.C. ¼ h.p., 115-230 volts.
Pilot duty service: 125 volt amps., 115-230 volts.
Alarm circuit: A.C. 1 amp. or D.C. ½ amp., 115 volts.
A.C. ½ amp. or D.C. ¼ amp., 230 volts.

Blakeslee Steam Jet Pumps or Ejectors



Dimensions and Capacities

Size of Pump Inches	Capacity Gallons per Minute	Suction Pipe Inches	Discharge Pipe Inches	Steam Pipe Inches	Steam Opening Inches	H.P. Required to operate
¾	8	¾	½	⅜	3/16	2
1	15	1	¾	½	¼	3
1¼	20	1¼	1	½	5/16	4
1½	30	1¼	1¼	¾	⅜	6
2	40	2	1½	¾	7/16	8
2½	50	2½	2	1	½	10
3	60	3	2½	1	9/16	15
4	250	4	3	2		

Note: The above capacities are based on 50-pound steam pressures.

These Jet Pumps or Ejectors are used for filling tanks, transferring liquids from one part of a building to another, substituting for water tank on railroads, and unwatering shallow mines, pits, cellars, coffer-dams, quarries, wells, etc.

Liquids may be forced to an elevation equal to about one foot to each pound of steam pressure; however, it is recommend that two pumps be used, one placed above the other, for elevations above 50 feet.

The limit of perpendicular suction is 14 feet and will require a steam pressure of at least 25 pounds; special pumps are furnished for higher suction power.

These pumps will work in any position.

Prices on application

Penberthy Automatic Injectors

Sizes and Capacities

Size No.	Horsepower: Based on Ordinary Tubular Boiler	Horsepower: Based on 30 lbs. Water per H.P. per Hour	Pipe Connection Inches	Capacity per Hour 1 to 3 feet lift 60 to 110 pounds steam pressure: Maximum Gallons	Capacity per Hour 1 to 3 feet lift 60 to 110 pounds steam pressure: Minimum Gallons
OO-21	4 to 8	6 to 12	⅜	80	45
AA-21	12 to 22	15 to 30	½	180	100
BB-21	20 to 45	25 to 60	¾	360	180
CC-21	45 to 80	50 to 100	1	600	325
DD-21	75 to 135	85 to 165	1¼	1000	525
EE-23	115 to 255	150 to 320	1½	1900	850
FF-23	200 to 400	250 to 500	2	3000	1600
GG-21	375 to 600	400 to 750	2½	4200	2150

Stock Model Injectors are the "suction left overflow front, delivery back" design. Injectors with special connections or for other pressures can be furnished.



Stock Model Injector

Penberthy Injectors are efficient, re-starting, automatic boiler feeding pumps designed for use on steam lines having pressures from 25 to 160 pounds. Compact, with no moving parts, the unit is low in initial cost and requires minimum attention.

The injectors are designed for suction lift but will also work well with water under pressure. At the lower steam services, however, more efficiency will be gained if a special steam jet is substituted when the unit is connected directly to a city pressure line.

They have many industrial uses and are well adapted to steam processing boilers, vulcanizing shops, boats, laundries, portable boilers, sawmills, etc.

In installations where cold water is handled, the injectors provide quick delivery of hot water and the return of operating steam to the boiler.

Where mechanical pumps are used in hot water installations, the injectors often serve as dependable reserve units for use with cold water.

Penberthy "XL-96" Ejectors

Penberthy XL-96, Series 1 are forcing ejectors designed to operate efficiently against heads equal to one foot for each 1½ pounds of operating steam pressure. They have both lifting and elevating power but on deep suction lifts with slight elevation, the water can be delivered cooler with Penberthy Series 20 or 40 Ejectors; data furnished on request.

In size numbers 1 to 4, the ejectors are furnished all-bronze. In size numbers 5 to 10, they are furnished either all-bronze or with iron body and brass jet; orders must specify the type desired.



Series 1, Stock Model
Siphon or Steam Jet Pump

Sizes and Capacities

Size No.	Pipe Connection, in Inches: Steam	Pipe Connection, in Inches: Suction and Delivery	Capacity, Gallons per Hour: 40 to 65 pounds Steam 3 Feet Lift	Capacity, Gallons per Hour: 20 to 40 pounds 65 to 100 pounds	Capacity, Gallons per Hour: 40 to 65 pounds 50 Feet Elevation	Capacity, Gallons per Hour: 40 to 65 pounds 25 Feet Elevation	Vertical Lift: 40 to 75 pounds Steam Feet	Vertical Lift: 25 to 40 or 75 to 100 pounds Feet
1	⅜	½	240	235	120	180	23	20
2	½	¾	500	450	250	375	25	22
3	¾	1	840	700	420	625	25	22
4	1	1¼	1,350	1,300	650	950	25	22
5	1	1½	1,950	1,850	975	1,450	25	22
6	1¼	2	3,500	3,000	1,750	2,600	25	22
7	1½	2½	5,700	4,350	2,500	3,750	25	22
8	2	3	9,500	8,160	4,750	7,200	25	22
9	2	3½	13,600	12,400	6,800	10,200	25	22
10	2½	4	18,400	17,100	9,200	13,800	25	22

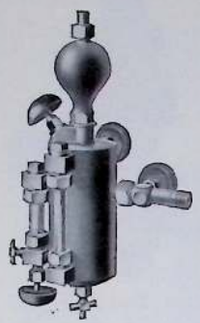
When Ejector is lifting 10 feet or over, suction pipe should be one size large than suction connection of Ejector, enlarging close to Ejector. A foot valve should be used on deep lifts.

When Ejector is elevating more than 20 feet, the discharge pipe should be one size larger than coupling on Ejector, enlarging close to Ejector.

Prices on application

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Lubricators, Oil Cups, and Grease Cups



Double Connection
Double Connection Lubricators should be installed with both connections between the boiler and the throttle.

"Detroit" Standard Lubricators

Detroit Lubricators are made in a variety of styles designed to properly lubricate the valves and cylinders of all types of steam engines, steam pumps, gas engines, air compressors, and similar operating units. Standard Lubricators are not to be used for pressures in excess of 150 pounds.

All metal parts are made of brass. Handles are made of a durable, non-heating composition. The support arm is threaded for ½-inch pipe.

Both double and single connection lubricators are available with the following capacities:

½ pint, 1 pint, or 1 quart

When ordering lubricators, specify whether the double or single connection type is wanted and, in addition, state the capacity desired.



Single Connection
Single Connection Lubricators can be connected either above or below the throttle or into the steam chest direct.

Glass Body Oil Cups



No. 600 Oil Cup

When ordering glass body oil cups, specify the catalog size numbers shown in the table below.

No. 600 Series Oil Cups (illustrated) are for use on machinery and bearings. They have set feed, sight feed, and stop feed features. The stop feed consists of a lever at the top of the cup, which permits the oil to be shut off, fed at a regular rate or in a stream, without disturbing the set feed adjustment.

The cap and base are pressed brass and the sight feed post is made of rod brass.

No. 500 Series Oil Cups are for use on machinery and all types of bearings. They have set feed and sight feed features.

The cap and base are pressed brass and the sight feed post is made of rod brass.

No. 200 Series Oil Cups are used on gas, gasoline, or oil engines. They are furnished with a screw filler cap. An equalizing tube, to overcome back pressure from engine and a ball check in base are provided to meet all requirements where back pressure is apt to occur.

Dimensions and Capacities

Catalog Size Numbers		Nos. 600 500	Nos. 601 501	Nos. 601½ 501½ 201½	Nos. 602 502 202	Nos. 604 504 204	Nos. 605 505 205	Nos. 606 506 206
Outside diameter of glass	Inches	1¼	1½	1¾	2	2½	3	3½
Height of glass	Inches	1⅛	1⅜	1⅝	1⅞	2⅜	3	4
Pipe thread on shank	Inches	⅛	¼	¼	⅜	⅜	½	½
Oil capacity	Ounces	⅝	1⅛	1½	2½	5	10	18

Plain Compression Grease Cups



No. 75 Grease Cup

A plain brass compression grease cup is a very satisfactory lubricating device in many applications, and is particularly suited for rough work.

The No. 75 Grease Cup is available in seven sizes with grease capacities ranging from ¼ up to 5 ounces and inside cup diameters from ¾ up to 3 inches.

Dimensions and Capacities

Size Number		000	00	0	1	2	3	4
Inside diameter	Inches	¾	1	1¼	1½	2	2½	3
Pipe thread on shank	Inches	⅛	⅛	⅛ or ¼	¼	⅜	½	½
Grease capacity	Ounces	¼	½	⅔	1	2	3½	5

Prices on application

Corrosion-Resistant Alloy Valves and Fittings

(Including Diaphragm Valves)

Service Recommendations.....pages 375 and 376

18-8 Mo and Monel Gate Valves
Plug Type, Outside Screw and Yoke.....page 377
Wedge, Outside Screw and Yoke.....page 378
Wedge, Non-Rising Stem.....page 380

18-8 Mo and Monel Globe Valves
Outside Screw and Yoke, Bolted Bonnet.....page 379
Union Bonnet.....page 380

18-8 Mo and Monel Swing Check Valves.....page 381
18-8 Mo Relief Valves and Liquid Level Gauge.....page 382

Ni-Resist Cast Iron Gate Valves.....page 384
Alloy Cast Iron Gate Valves.....page 385
Chlorine Globe and Angle Valves.....page 386
Monel Trimmed Gate and Globe Valves.....page 387
All-Iron Valves.....page 394

Diaphragm Valves.....pages 388 to 391
Crane-Paul Venturi Ball Valves.....pages 302 and 303

18-8 Mo Fittings, Flanges, and Unions.....page 383
Other Corrosion-Resisting Products.....page 395
Corrosion Questionnaire.....page 396

Metals and materials....pages 1 to 9

Service Recommendations

Crane Corrosion-Resistant Alloy Valves are regularly made of 18-8 Mo Alloy Steel and Monel. The fittings are regularly made of 18-8 Mo.

All castings made of corrosion-resistant metals and alloys are produced in Crane foundries under the constant supervision of expert metallurgists. Bar stock used in valves and fittings is purchased under rigid specifications which assure the use of material adequate in both physical and chemical properties. This page and the following page are devoted to service recommendations for 18-8 Mo and Monel.

It should be remembered that service recommendations are tentative in nature, and obscure factors often greatly alter circumstances and thus alter recommendations. These recommendations can be followed in most instances, however, and Crane engineers are always available to make specific recommendations based on a detailed study of the individual corrosion problem.

Marking: Crane 18-8 Mo Valves and Fittings are marked "18-10 M" to indicate the chromium and nickel content; Monel material is marked "MONEL".

Crane 18-8 Mo Alloy Steel
(Casting Equivalent of A.I.S.I. Type 316)

Crane 18-8 Mo Alloy Steel is an exceptionally high grade stainless steel that is highly resistant to many forms of corrosive action.

Crane 18-8 Mo Alloy Steel contains 18 to 22% chromium, 10 to 12% nickel, and 2.5 to 3% molybdenum, and conforms to but exceeds the minimum requirements of A.S.T.M. Specification A-296, Grade CF-8M, and A.I.S.I. (American Iron and Steel Institute) Type 316 wrought stainless steel.

Crane 18-8 Mo Alloy Steel Valves and Fittings have a wide range of application in the food, pulp, paper, textile, dye, chemical, and related industries. They are recommended for service in handling acetic acid, nitric acid, alkalies (such as caustic soda, soda ash, etc.), bleaching solutions, corrosive mine waters, fatty acids, food products, fruit juices, sulfate and sulfite liquors and vapors in paper mills, sulfurous acid, tanning liquors, and a large number of other industrial chemicals.

(Continued on the following page)

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Crane 18-8 Mo Alloy Steel

(*Continued from the preceding page*)

18-8 Mo Alloy Steel is satisfactorily resistant under most conditions to all fatty acids both pure and in the presence of customary organic impurities; but it may not be completely resistant when salt and/or other inorganic impurities are present. It can be used with these acids at temperatures up to 500° F., but processing at such temperatures introduces special problems other than corrosion. Valves and fittings for this high temperature service should receive special consideration.

For services with chromic acid, 18-8 Mo alloy is often recommended when contamination with iron must be avoided, also in many services with nitric acid it is recommended, although there are some cases where it gives inferior corrosion resistance to that of the straight chromium alloy steels. It is apparently satisfactory for handling pure phosphoric up to 85 per cent acid at ordinary temperatures, but should not be offered for use with crude acid under any circumstances. Again it shows excellent resistance to hot 98 per cent sulfuric acid and to dilute solutions (less than 10%) under oxidizing conditions at ordinary temperatures. When used with cold full strength acid and with the intermediate concentrations, the results are not so good.

18-8 Mo is practically immune to corrosion by many food products and should be acceptable, although not necessarily required, in most cases. It can also be used in service with carbonated beverages. It resists well all organic acids in the concentrations which are apt to be present; is not attacked by carbonic and sulfurous acid under similar circumstances; and in addition, is capable of resisting corrosion by the small amounts of phosphoric acid which are occasionally encountered.

18-8 Mo is also resistant to alkaline cleaning solutions and to some of the chemical sterilizers.

Thread lubricants: Crane 18-8 Mo Alloy has such excellent resistance to corrosion that it will be used in contact with a wider variety of fluids than are the more common piping materials. Some of these fluids either dissolve or react chemically with the lubricating and sealing compounds that are normally used in making up screwed joints. It is essential, therefore, that suitably compounded thread lubricants be used when assembling 18-8 Mo Alloy screwed pipe, valves, and fittings. Crane Thread Lubricant has given excellent results in many applications. Specific recommendations will be furnished upon request.

Monel

Monel is a nickel-copper alloy containing approximately two-thirds nickel and one-third copper. It has high tensile strength, ductility, and offers excellent resistance to corrosion. This alloy finds many applications in the bottling, brewing, canning, ceramic, chemical, dyestuffs, food, paint, refining, rubber, soap, sugar, tanning, textile, and related industries.

Monel may be used in handling hydrochloric acid in low concentrations when air is absent; higher concentrations are strongly corrosive. Caution should be exercised in using it in contact with hot or highly aerated solutions of this acid. Monel resists phosphoric acid over a wide range of concentrations; however, it is corroded appreciably by oxidizing impurities present in the crude acid when made by the treatment of phosphate rock with sulfuric acid. Its resistance to this crude concentrated acid is probably not quite as good as that of the copper-base alloys. It has good corrosion resistance to organic acids such as acetic, formic, and butyric, and is apparently less affected by the presence of oxidizing agents than the copper-base alloys. In all of the foregoing cases, the corrosion rate of Monel is apt to be affected adversely by the presence of air and/or other oxidizing acids. Best results are obtained from this metal when oxygen is absent or present in very small concentrations. Monel is not recommended for use with chromic acid, nitric acid, or other oxidizing acids.

Monel has excellent resistance to corrosion by solutions of fixed alkalis, such as sodium hydroxide and potassium hydroxide, but should not be used with ammonium hydroxide. Caution should be used when the service involves the handling of the fixed alkalis in high concentrations and at high temperatures; as contamination with copper may be an important consideration in some cases, Nickel may be required in preference to Monel in some cases. Monel is widely used for handling a variety of neutral, alkaline, and acid salts.

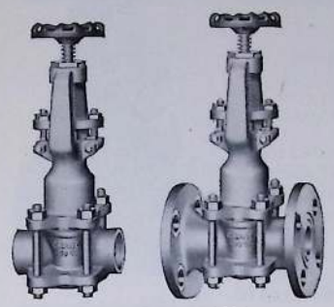
This alloy is very useful in the handling of food products due to the fact that it shows good resistance to the acids, cleaning solutions, organic acid salt mixtures, and brines encountered in the food industry. However, before any material is specified in the handling of food products, the stage of the process at which the equipment is to be used should be known.

Alloy Trimmed Valves

There are many services in which the corrosion rate of common metals, i.e. iron, steel, and brass is not objectionable from the standpoint of the fluid being handled, but is sufficient to cause the seats to leak and the rubbing surfaces to wear rapidly. For these services Crane offers various regular products in which these critical parts are made of corrosion-resistant materials. In most cases these valves are offered for specific service conditions, e.g., the No. 1644 Valve for chlorine service, the No. 14477 Valve for use with kraft liquors in paper mills, and the No. 3642 A for handling hydrofluoric acid.

It should be borne in mind, however, that all of these types of valves have application in other services as well. Further, other commercial valves frequently can be trimmed with these same corrosion-resistant alloys. Recommendations will be supplied on request.

18-8 Mo and Monel Plug Gate Valves



Outside Screw and Yoke

Screwed	Flanged
No. 18850 18-8 Mo Alloy	No. 18851 18-8 Mo Alloy
No. 17750 Monel	No. 17751 Monel

Non-Shock Working Pressures

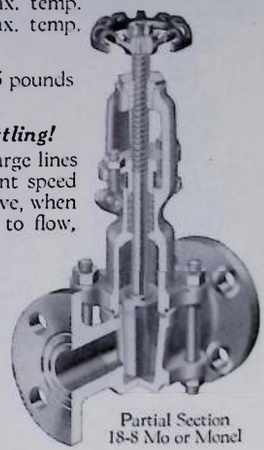
150 pounds liquid or gas; 500° F. max. temp.
230 pounds liquid or gas; 100° F. max. temp.

Hydrostatic Test Pressures

Shell—300 pounds Seat—275 pounds

For Unrestricted Flow! For Throttling!

In some services, particularly on discharge lines in the handling of fluids where constant speed pumps are used, a conventional gate valve, when wide open, offers minimum resistance to flow, but when used for throttling is subjected to rapid wear. A globe valve in the same service, while suited for throttling, introduces high resistance to flow even when wide open, consequently reducing the maximum capacity of pumps. Crane Plug Gate Valves perform perfectly for unrestricted flow or throttling. They are excellent for two-way flow; either end serves as the inlet.



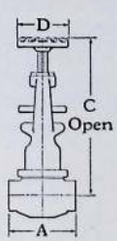
Partial Section 18-8 Mo or Monel

List Prices, Each

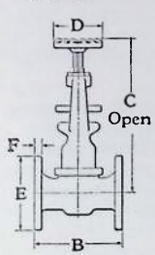
Size	Inches	½	¾	1	1¼	1½	2
18-8 Mo	No. 18850, Screwed	64.00	71.00	83.00	103.00	130.00	160.00
	No. 18851, Flanged, F.D. & S.F.	77.00	85.00	100.00	124.00	156.00	192.00
Monel	No. 17750, Screwed	67.00	75.00	87.00	108.00	137.00	168.00
	No. 17751, Flanged, F.D. & S.F.	80.00	90.00	104.00	130.00	164.00	202.00

Materials: In 18-8 Mo Valves, the body, bonnet, disc, stem, disc-stem plug, and gland are made of Crane 18-8 Mo Alloy Steel, a material equivalent to A.I.S.I. Type 316 wrought stainless steel. In Monel Valves, these parts are made of Monel. In all valves the yoke bushing is made of Cast Manganese Bronze, and the bonnet gasket is Cranite.

Body: These are outside screw and yoke valves. The stem threads, being on the outside of the valve, can be lubricated easily and are not exposed to corrosion or sediment in the line. The body features straight-through ports, circular in shape and full in area. When the valves are wide open, the disc is entirely clear of the seat opening, providing a clear, unobstructed passageway through the valve. Curved seat-faces, cast as part of the body, are accurately machined to match the curved surface of the disc.



Screwed



Flanged

Bolted bonnet: The yoke and bonnet are cast in one piece to assure strength and stiffness. The bonnet is bolted to a flange at the bottom of the valve body by four bolt-studs spaced close to each other to provide compactness and a uniform pressure on the gasket.

Dimensions, in Inches

Size	½	¾	1	1¼	1½	2
A	3	3¼	3¾	4¼	4¾	5½
B	4¼	4⅝	5	5½	6½	7
C	7⅛	8	9⅝	10¾	12¾	15
D	2 9/16	2 9/16	2¾	3 1/16	3⅝	4 1/16
E	3½	3⅞	4¼	4⅝	5	6
F	5/16	11/32	⅜	13/32	7/16	½

Templates for drilling . . page 458

Tapered plug disc: The disc, a tapered plug riding loosely on the end of the stem, is held in place by a collar on the stem and by a threaded plug screwed into the bottom of the disc. The connection is strong, serviceable, and provides accurate seating. The disc will not fall off the stem in service, even though the disc-stem plug should accidentally loosen.

The curved surface of the disc seats against two curved faces in the body when the valve is closed. Two sides of the disc are flat, permitting the disc to fit between similarly shaped faces on the inside of the bonnet. The disc rises into the bonnet but the flat faces keep it from turning. Even wear on the seating surfaces during operation, and freedom from foreign matter when the valve is closed, assure long-time seat tightness.

Stuffing box; repacking: The large, deep stuffing box has a one-piece bolted gland and is filled with high grade packing. The gland is pulled up by means of two eye-bolts hinged to the bonnet.

Although sometimes considered inadvisable on chemical services, these valves when wide open can be repacked while under pressure. The yoke is designed with liberal space above and around the gland.

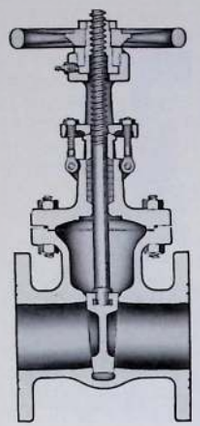
Flanged valves: Face to face and end flange dimensions conform to the MSS 150-Pound Corrosion Resistant Standard, No. SP-42-1951, for Gate Valves. Flanges are plain faced with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to this Standard, and spot facing; no deduction is made for valves ordered faced only. Full face gaskets should be used; see page 472.

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18-8 Mo and Monel Wedge Gate Valves

Working Pressures
150 pounds liquid or gas, non-shock; 500° F. max. temp.
230 pounds liquid or gas, non-shock; 100° F. max. temp.

Hydrostatic Test Pressures
Shell—300 pounds Seat—275 pounds



Cross Section
18-8 Mo or Monel

Large Size Wedge Gates
In 18-8 Mo Alloy Steel or Monel

To provide chemical and process industries with a more complete selection of efficient, trouble-free valves for corrosive fluids, Crane offers this line of specially designed Wedge Gate Valves in either 18-8 Mo Alloy Steel or Monel.

Except for the materials, the valves are alike. They are of the outside screw and yoke type construction and have a bolted bonnet and a wedge disc.

For screwed or flanged gate valves in sizes smaller than 2½-inch, use the Crane 18-8 Mo and Monel Plug Gate Valves shown on page 377.



Outside Screw and Yoke, Flanged
No. 18843
18-8 Mo Alloy Steel
No. 17743
Monel

List Prices

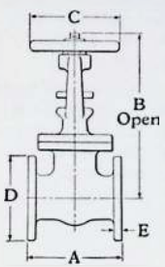
Size		Inches	2½	3	4	6
Flanged, F.D. & S.F.	No. 18843, Gate, 18-8 Mo	Each	210.00	250.00	338.00	537.00
	No. 17743, Gate, Monel	Each	263.00	311.00	424.00	671.00

Materials: All parts of the valves coming into contact with the fluid in the line, including the body, one-piece bonnet and yoke, disc, stem, and gland are made of Crane 18-8 Mo Alloy Steel in the No. 18843 Valves, and of Monel in the No. 17743 Valves. Crane 18-8 Mo Alloy Steel is a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

The yoke sleeve is made of Crane Cast Manganese Bronze, a material having superior strength and wear resistance. The wheel is malleable iron.

Construction: The valves are the outside screw and yoke type. This construction is often preferred in chemical and process industries. The stem threads are on the outside of the valve, eliminating the danger of damage to the threads by corrosion and sediment from the fluid in the line; stem thread lubrication is simplified, and the rising stem effectively indicates the position of the disc. A lubricating fitting is provided for easy lubrication of the yoke sleeve.

The body seats are cast as part of the body and are carefully and accurately machined to match the seating surfaces of the disc.



Bolted bonnet: The yoke and bonnet are cast in one piece to assure maximum strength and rigidity. The bonnet features a male and female joint for added tightness. The bonnet joint is strong and secure, yet it can be easily dismantled and reassembled without danger of injury to the valve.

Dimensions, in Inches

Size	2½	3	4	6
A	7½	8	9	10½
B	15⅜	17⅞	22⅜	31⅜
C	7	8	9	10
D	7	7½	9	11
E	9/16	⅝	11/16	13/16

Templates for drilling . . . . page 458

Disc: The valves have a solid wedge disc. The disc is carefully directed throughout its travel by long, accurately fitted guides; this minimizes "drag" and wear on the seating faces and reduces the possibility of damage to the seats.

The disc-stem connection is in the form of a T-head on the end of the stem which fits loosely into a matched slot in the disc, permitting the disc to be raised and lowered easily and safely.

Stuffing box and gland: The stuffing box is filled with high grade packing and is unusually large and deep to assure pressure-tightness.

The stuffing box is equipped with a two-piece bolted gland consisting of a steel gland flange and a ball-type gland follower. The gland flange is held securely by two eye-bolts hinged to the bonnet. The ball-type gland follower prevents binding the stem if the eye-bolts are drawn up unevenly.

Repacking: The valves, when wide open, can be repacked while under pressure.

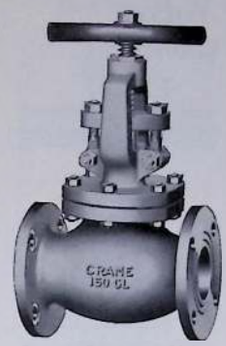
Dimensions: Face to face and end flange dimensions conform to the MSS 150-Pound Corrosion Resistant Standard, No. SP-42-1951. Flanges are plain faced with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to this Standard, and spot facing; no deduction is made for valves ordered faced only.

Full face gaskets should be used; see page 472.

18-8 Mo and Monel Globe Valves

Working Pressures
150 pounds liquid or gas, non-shock; 500° F. max. temp.
230 pounds liquid or gas, non-shock; 100° F. max. temp.

Hydrostatic Test Pressures
Shell—300 pounds Seat—275 pounds

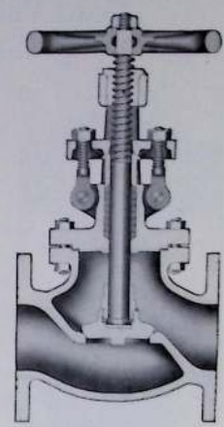


Outside Screw and Yoke Flanged
No. 18807
18-8 Mo Alloy Steel
No. 17707
Monel

Large Size Globe Valves
In 18-8 Mo Alloy Steel or Monel

These valves, specially designed for corrosive fluids, are available in either 18-8 Mo Alloy Steel or Monel. Except for materials, the valves are alike. They embody the same fine features such as outside screw and yoke construction—a bolted bonnet for maximum rigidity—smooth flowing contours within the body, with full port area to reduce pressure drop and to minimize flow resistance—and a ball-shaped seating surface for seat tightness.

For screwed or flanged globe valves in sizes smaller than 2½-inch, use the Crane 18-8 Mo and Monel Plug Gate Valves shown on page 377.



Cross Section
18-8 Mo or Monel

List Prices

Size		Inches	2½	3	4	6
Flanged, F.D. & S.F.	No. 18807, Globe, 18-8 Mo	Each	237.00	303.00	422.00	657.00
	No. 17707, Globe, Monel	Each	247.00	309.00	482.00	741.00

Materials: All parts in contact with the fluid in the line, including the body, one-piece bonnet and yoke, disc, stem, disc stem ring, and gland are made of Crane 18-8 Mo Alloy Steel in the No. 18807 Valve, and of Monel in the No. 17707 Valve. Crane 18-8 Mo Alloy Steel is a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

The yoke bushing is made of Crane Cast Manganese Bronze, a material having superior strength and high resistance to wear. The wheel is malleable iron.

Construction: The valves are the outside screw and yoke type. This construction is often preferred in chemical and process industries. The stem threads are on the outside of the valve, eliminating the danger of damage to the threads by corrosion and sediment from the fluid in the line; stem thread lubrication is simplified and the rising stem effectively indicates the position of the disc.

Bolted bonnet: The yoke and bonnet are cast in one piece to assure maximum strength and rigidity. The bonnet features a male and female joint for added tightness. The bonnet joint is strong and secure, yet it can be easily dismantled and reassembled without danger of injury to the valve.

Ball-to-35° seat: The disc in these valves has an accurately machined, ball-shaped seating surface. The seating surface in the body (seat cast integral with body) is finished at a 35 degree taper. The contact between the two surfaces results in a narrow line bearing. When the valves are used to handle fluids that leave a deposit of heavy or crusty substance, the narrow line bearing breaks through such deposits and helps to maintain seat tightness.

Disc-stem connection: The disc swivels on the stem. The disc and stem are attached by means of a disc stem ring screwed tightly into the disc. The ring will not loosen in service. The disc is amply guided. Seating is quick and accurate.

Stuffing box and gland: The stuffing box is filled with high grade packing and is unusually large and deep to assure pressure-tightness. It is equipped with a two-piece bolted gland consisting of a steel gland flange and a ball-type gland follower. The gland flange is held securely by two eye-bolts hinged to the bonnet. The ball-type gland follower prevents binding the stem if eye-bolts are drawn up unevenly.

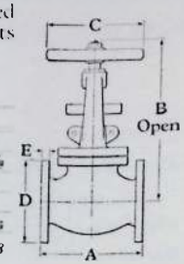
Repacking: The valves, when wide open, can be repacked while under pressure.

Dimensions: Face to face and end flange dimensions conform to the MSS 150-Pound Corrosion Resistant Standard, No. SP-42-1951. Flanges are plain faced with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to this Standard, and spot facing; no deduction is made for valves ordered faced only. Full face gaskets should be used; see page 472.

Dimensions, in Inches

Size	2½	3	4	6
A	8½	9½	11½	16
B	13⅞	15⅞	18½	21⅜
C	8	9	10	12
D	7	7½	9	11
E	9/16	⅝	11/16	13/16

Templates for drilling . . . . page 458



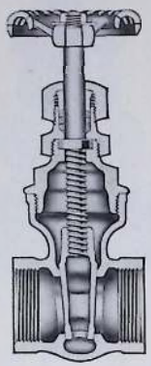
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18-8 Mo Gate and Globe Valves

Gate Valves
Wedge Disc—Non-Rising Stem

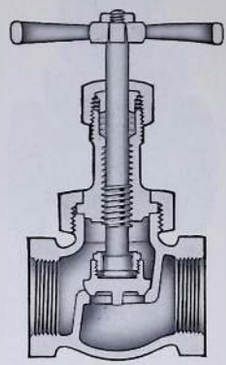
Globe Valves
Union Bonnet

WORKING PRESSURES
Gate — **150** pounds liquid or gas, non-shock
Globe — **200** pounds liquid or gas, non-shock
350° F. maximum temperature


Cross Section Gate


No. 18840
Gate, Screwed
18-8 Mo Alloy Steel


No. 18801
Globe, Screwed
18-8 Mo Alloy Steel


Cross Section Globe

List Prices

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2
Screwed	No. 18840, Gate	Each	33.00	34.00	36.50	40.00	49.00	60.50	75.50	100.00
	No. 18801, Globe	Each	24.50	28.00	34.00	41.00	50.00	62.50	78.00	106.00

3

These valves are carefully designed and assembled to assure efficient operation and long life. Metal sections are more than ample.

Materials: In these gate and globe valves, all parts which come in contact with the fluid in the line are made entirely from Crane 18-8 Mo Alloy Steel, a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

In the ¼ and ⅜-inch sizes, globe valves are made of bar stock.

Gate valve: Crane No. 18840 Gate Valves are the non-rising stem, wedge disc type. They have a screwed bonnet and are similar in design to the Crane No. 437 Brass Gate Valve. The seats are cast integral with the body. All sizes are equipped with a Style F Wheel.

Globe valve: Crane No. 18801 Globe Valves on sizes ½-inch and larger have a union bonnet and are equipped with a cross handle (illustrated). The union bonnet type construction utilizes a union ring which reinforces the bonnet joint and facilitates dismantling and reassembling without danger of injuring the valve. Valves smaller than ½-inch have a screwed bonnet and are equipped with a tee handle.

On ¼ to ½-inch globe valves, the disc is integral with the stem; in larger sizes, the disc swivels on the stem as illustrated in the cross section.

Stuffing box: Both the gate and globe valves have a stuffing box equipped with a gland. The stuffing box is of ample depth and is filled with high grade packing.

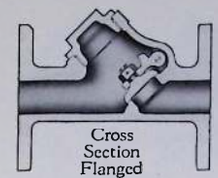
Repacking: These valves, when wide open, can be repacked while under pressure.

Dimensions, in Inches

Size		¼	⅜	½	¾	1	1¼	1½	2
Gate Valve	End to end	1⅞	1 15/16	2⅛	2⅜	2 13/16	3 3/16	3 7/16	3⅞
	Center to top	3¾	3¾	4⅛	4¾	5⅝	6½	7¼	8¾
	Diameter of wheel	1¾	1¾	2 1/16	2 9/16	2¾	3 1/16	3⅝	4 1/16
Globe Valve	End to end	1⅞	2 7/16	2¼	2¾	3 5/16	3⅞	4½	5¼
	Center to top of stem, open	3⅛	3½	4¼	5	5⅝	6½	7½	8¼
	Distance across handle	2 9/16	2 9/16	3¾	3¾	4¾	4¾	6	7

18-8 Mo and Monel Swing Check Valves

Y-Pattern
Sizes ½ to 2-inch


Cross Section Flanged


Screwed
No. 18826
18-8 Mo
Alloy Steel
No. 17726
Monel


Flanged
No. 18827
18-8 Mo
Alloy Steel
No. 17727
Monel

Working Pressures
150 pounds liquid or gas, non-shock; **500°** F. max. temp.
230 pounds liquid or gas, non-shock; **100°** F. max. temp.

Hydrostatic Test Pressures
Shell—**300** pounds Seat—**275** pounds

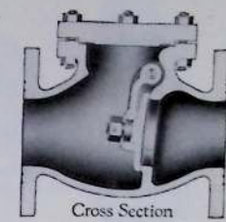
A Choice of 18-8 Mo Alloy Steel or Monel

These valves, available in 18-8 Mo Alloy Steel or Monel, are specially designed for corrosive service.

In sizes ½ to 2-inch, the valves are the regrinding type. They feature an improved Y-pattern body design. Because of the wide usage of small flanged valves in chemical and process industries, this line includes flanged as well as screwed valves.

In sizes 2½ to 6-inch, the valves are the straightway design, permitting straightway flow with a minimum of flow-resistance and pressure drop.

Straightway
Sizes 2½ to 6-inch


Cross Section


Flanged
No. 18829
18-8 Mo
Alloy Steel
No. 17729
Monel

Materials: In 18-8 Mo Valves, the body, cap, disc, hinge, and disc nut are made of Crane 18-8 Mo Alloy Steel, a material equivalent to A.I.S.I. Type 316 wrought stainless steel. In Monel valves, these parts are made of Monel.

List Prices, Each

Size		Inches	½	¾	1	1¼	1½	2	2½	3	4	6
18-8 Mo	No. 18826, Screwed		25.00	29.50	37.00	49.00	68.00	89.00				
	No. 18827, Flanged, F.D. & S.F.		37.50	44.50	55.50	73.50	102.00	133.00				
	No. 18829, Flanged, F.D. & S.F.								222.00	281.00	369.00	591.00
Monel	No. 17726, Screwed		27.50	32.50	41.00	54.00	75.00	97.50				
	No. 17727, Flanged, F.D. & S.F.		41.50	49.00	61.00	81.00	112.00	146.00				
	No. 17729, Flanged, F.D. & S.F.								281.00	354.00	517.00	857.00

3

Y-Pattern valves: These are regrinding type valves. The body, Y-pattern in shape, has a smooth contour at all points to allow swift, easy flow. The cap, screwed into the body with long, accurately machined threads, is on the same center line as the seat opening. The cap is large and permits ready access to the internal parts when it is removed.

Seating surfaces, integral with the body, can be reground without removing the body from the line; a slot in the end of the disc-spud enables rotating the disc with a screwdriver.

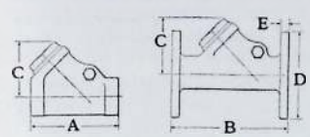
Straightway valves: These valves feature a straightway type body with a seat-face at only a slight angle from vertical so as to permit full flow. The bolted cap construction provides a very strong, tight joint, yet it can be easily dismantled for cleaning and repairing. The seat is integral with the body.

Disc and hinge: On all valves, the disc and hinge, suspended from the body by means of a hinge pin, swing freely. The disc is designed to close of its own weight and to rest on the seat when there is no flow. This prevents back-flow from gaining sufficient velocity to cause slamming or "water hammer".

Outside lever and weight: Valves 2½-inch and larger can be furnished with an outside lever and adjustable weight when orders so specify; prices on application. The lever and weight can be applied to assist the disc in closing, or to balance the disc so that the valve will open under minimum pressure.

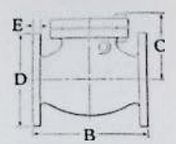
Flanged valves: End flanges conform to the MSS 150-Pound Corrosion Resistant Standard, No. SP-42-1951. Flanges are plain faced with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to the MSS 150-Pound Standard, and spot facing; no deduction is made for flanged valves ordered faced only. Full face gaskets should be used; see page 472.

Dimensions, in Inches



Size	½	¾	1	1¼	1½	2	2½	3	4	6
A	3	3½	4¼	5	5½	6½				
B	4½	5	5¾	6½	7¼	8½	8½	9½	11½	14
C	1⅞	2⅛	2¾	3⅛	3½	4¼	5⅛	5½	6½	8½
D	3½	3⅞	4¼	4⅝	5	6	7	7½	9	11
E	5/16	11/32	⅜	13/32	7/16	½	9/16	⅝	11/16	13/16

Templates for drilling . . . page 458



Straightway, Flanged

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18-8 Mo Relief Valves



No. 18859
Relief Valve
Female Inlet
Side Outlet
18-8 Mo Alloy Steel

Maximum Set Pressure
250 pounds
600° F. maximum temperature

When ordering, be sure to specify set pressure.

Materials: All parts of these relief valves coming in contact with the fluid in the line, including the body, bonnet, stem, disc, disc nut, regulating ring, gland, bonnet bushing, seat ring, and locking plug are made of Crane 18-8 Mo Alloy Steel, a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

The ⅜-inch size valves do not have a regulating ring and locking plug.

Gas service: When specifically ordered for manufactured gases, the valve seat is ground special.

Construction: The valves are ruggedly constructed. They are the outside spring type and have a screwed bonnet and a lifting lever.

A stuffing box around the stem prevents the escape of the fluid while the valve is discharging.

A blow-back regulating ring is provided for adjusting the blow-down of pressure when changing or regulating the set pressure. The adjustment of this ring may be made from the outside, without interfering with the setting of the valve.

List Prices and Dimensions

Size		Inches	⅜	½	¾	1	1¼	1½	2
No. 18859, Relief Valve		Each	70.00	76.00	84.00	100.00	122.00	150.00	185.00
Dimensions, in Inches	Size of inlet		⅜	½	¾	1	1¼	1½	2
	Size of outlet		½	½	¾	1	1¼	1½	2
	Center to top of cap		5⅝	5⅝	5⅞	7	8¼	9¼	11½
	Center to end of female inlet		1 11/16	1 11/16	2	2 3/16	2⅝	2⅞	3 7/16
	Center to end of side outlet		1 1/16	1 1/16	1 5/16	1⅝	2 1/16	2⅜	2¾

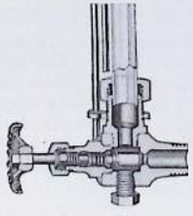
18-8 Mo Liquid Level Gauge



No. 18898
Liquid Level Gauge
(With Guard and
Glass Tube)
18-8 Mo Alloy Steel

For 150 pounds liquid
350° F. maximum temperature

Materials: These Crane No. 18898 Liquid Level Gauges are sturdy and well-constructed.



Sectional View

All parts which come in contact with the fluid in the line including the bodies, bonnets, stems, packing nuts, glands, glass retainers, and drain plug are made of Crane 18-8 Mo Alloy Steel, a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

Construction: The gauges are regularly made in the ½-inch size and with 14-inch centers.

Gauges with other centers can be furnished when ordered.

The valve bodies are square type and have an integral seat. The disc and stem also are integral. The Gauges have ⅝-inch O.D. glass and are equipped with two guard rods.

Special gauges: When ordered with a drain, the bottom valve will be fitted with a ¼-inch short nipple and a ¼-inch No. 18840 (see page 380) Gate Valve. An extra charge is made for the drain.

Gauges with an automatic check can be furnished when ordered, at a special price. The bottom valve is made with a special adapter, a special stem, and a 9/16-inch diameter ball.

List Price

Size	Inches	½
No. 18898, Liquid Level Gauge with 14" centers	Each	148.00

18-8 Mo Fittings

Screwed Fittings



No. 18860
90° Elbow



No. 18862
45° Elbow



No. 18868
Tee



No. 18878
Cap



No. 18882
Coupling



No. 18884
Plug

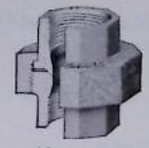


No. 18886
Bushing

Prices of bushings (larger opening determines the price) apply only to the following stock sizes:

¼×⅛	1	×¾	1½×1¼
⅜×¼		×½	×1
½×⅜			
×¼	1¼×1	2	×1½
¾×½		×¾	×1¼

Unions



No. 18890

Flanged Fittings



No. 18861
90° Flanged Elbow



No. 18863
45° Flanged Elbow

Non-Shock Working Pressures
150 pounds liquid or gas; 500° F. max. temp.
230 pounds liquid or gas; 100° F. max. temp.

18-8 Mo Alloy Steel

Except for the plugs, bushings, ¼ and ⅜-inch caps and couplings, and the ¼ and ⅜-inch union tail-piece and thread-piece which are A.I.S.I. Type 316 bar stock, the fittings, flanges, and union shown on this page are made of Crane 18-8 Mo Alloy Steel, a casting material equivalent to A.I.S.I. Type 316 wrought stainless steel.

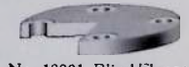
Unions: 18-8 Mo Alloy Steel Unions are regularly made with a galvanized malleable iron union ring unless specifically ordered with an 18-8 Mo ring, for which an extra charge will be made.



No. 18869, Flanged Tee



No. 18889, Screwed
Companion Flange



No. 18891, Blind Flange

List Prices, and Dimensions, in Inches

Size		Inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4	6
Screwed Fittings and Unions	Prices Each	No. 18860, 90° Elbow	2.60	2.90	3.30	3.90	5.00	6.40	8.40	12.30				
		No. 18862, 45° Elbow	2.60	2.90	3.30	3.90	5.00	6.40	8.40	12.30				
		No. 18868, Tee	3.00	3.60	4.50	5.50	7.00	9.30	12.00	17.50				
		No. 18878, Cap	1.60	2.00	2.40	3.00	3.90	5.30	7.20	10.00				
		No. 18882, Coupling	2.00	2.30	2.70	3.40	4.40	6.00	8.20	11.30				
		No. 18884, Plug	1.30	1.60	2.10	3.30	5.30	9.00	12.50	20.00				
		No. 18886, Bushing	1.80	2.10	2.60	3.40	5.00	7.50	12.00	18.50				
		No. 18890, Union	7.00	7.50	8.00	9.00	12.00	16.50	22.00	29.50				
	Center to end	90° Elbow or Tee	1 3/16	1 5/16	1⅛	1 5/16	1½	1¾	1 15/16	2¼				
		45° Elbow	¾	13/16	⅞	1	1⅛	1 5/16	1 7/16	1 11/16				
	End to end	Coupling	1	1⅛	1 5/16	1½	1 11/16	1 15/16	2⅛	2½				
		Union	1⅝	1 13/16	1 15/16	2¼	2 7/16	2 13/16	3	3⅜				
	Over-all height, Cap		1 1/16	¾	⅞	1 1/16	1 3/16	1¼	1 5/16	1 7/16				
	*Thread engagement		⅜	⅜	½	9/16	11/16	11/16	11/16	¾				
Flanged Fittings and Flanges	Prices Each	No. 18861, 90° Elbow					34.50	39.00	45.00	57.00	72.00	90.00	124.00	215.00
		No. 18863, 45° Elbow					34.50	39.00	45.00	57.00	72.00	90.00	124.00	215.00
		No. 18869, Tee					48.00	60.00	73.50	88.50	105.00	135.00	180.00	318.00
		No. 18889, Scrd. Flange					12.50	14.00	17.00	21.00	26.50	34.00	45.00	90.00
		No. 18891, Blind Flange					13.50	16.00	19.50	24.00	30.00	39.00	52.50	98.00
	Center to face	90° Elbow or Tee					3½	3¾	4	4½	5	5½	6½	8
		45° Elbow					1¾	2	2¼	2½	3	3	4	5
	Diameter of flanges						4¼	4⅝	5	6	7	7½	9	11
	Thickness of flanges						3/8	13/32	7/16	½	9/16	⅝	11/16	13/16

Flanged fittings and flanges: The dimensions of flanged fittings and flanges conform to the MSS 150-Pound Corrosion Resistant Standard, No. SP-42-1951. Flanges are plain faced with two V-shaped concentric grooves between the port and bolt holes. Prices include drilling to this Standard, and spot facing; no deduction is made for fittings or flanges ordered faced only. Use full face gaskets; see page 472.

*Explanation of thread engagement . . . . page 494

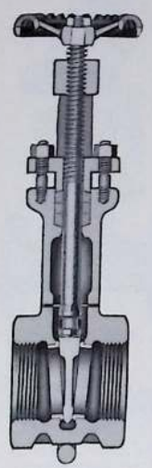
Templates for drilling . . page 458

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Ni-Resist Cast Iron Gate Valves

Wedge Disc—Outside Screw and Yoke

Sizes 3-inch and smaller



Cross Section



No. 1670
Screwed



No. 1671
Flanged

Templates for drilling, page 459.

Working Pressures
Screwed valves—**225** pounds cold water, oil, or gas, non-shock
Flanged valves—**200** pounds cold water, oil, or gas, non-shock
Air tested

Service recommendations: Crane Ni-Resist Valves are safely used where the strength of ordinary cast iron is adequate. They are especially suitable for soda and sulfate pulp mill service, for creosote used in wood preserving, for handling sour distillates and crudes in petroleum refineries, and for kindred services.

Materials: In valves 3-inch and smaller, the body and bonnet are made of Ni-Resist Cast Iron. The disc, stem, and body seat rings are Crane 18-8 Mo Alloy Steel.

In 4-inch valves and larger, the body, bonnet, and disc are made of Ni-Resist Cast Iron. The seating faces and the stem are Crane 18-8 Mo Alloy Steel.

Ni-Resist is an alloy cast iron containing approximately 14% nickel, 2% chromium, and 6% copper. Its strength and physical characteristics are similar to ordinary cast iron, but its resistance to erosion and wear is definitely superior to ordinary cast iron; its corrosion resistance is substantially greater. Ni-Resist parts are stamped "NR". Copper-free Ni-Resist is available on special order; prices on application.

Crane 18-8 Mo Alloy Steel is a material equivalent to A.I.S.I. Type 316 wrought stainless steel.

Construction: The valves are of the outside screw and yoke type. Stem threads, on the outside of the valve, are readily lubricated and are not exposed to the corrosive action of the fluid in the line. On valves ½ to 4-inch, the yoke is integral with the bonnet; on 6 and 8-inch valves, the yoke is bolted to the bonnet.

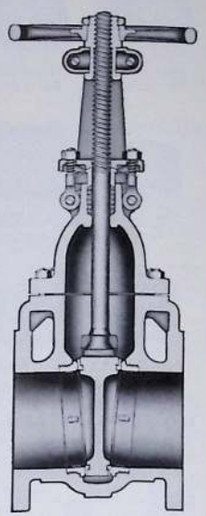
Valves 3-inch and smaller have a clamp type bolted bonnet and a one-piece bolted gland. Larger sizes have the conventional bolted bonnet and a two-piece bolted gland, consisting of a malleable iron gland flange and a ball-type gland follower. Both types of bolted bonnets are easily disassembled for cleaning or repairs.

The valves have a solid wedge disc. The seating faces are integral with the disc in sizes 3-inch and smaller and rolled into the disc in sizes 4-inch and larger. The disc-stem connection is in the form of a T-head on the end of the stem which fits loosely into a matching slot in the disc, permitting the disc to be operated easily and safely.

Stuffing box: The deep stuffing box is filled with high grade packing. The valves when wide open can be repacked while under pressure.

End flanges: End flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Prices of flanged valves include facing and drilling to this Standard; no deduction is made for valves ordered faced only. Flanges are plain faced with a smooth finish.

Sizes 4-inch and larger



Cross Section



No. 1671
Flanged

List Prices, Each, and Dimensions

Size	Inches	½	¾	1	1¼	1½	2	2½	3	4	6	8
No. 1670, Screwed		27.00	30.00	33.00	38.00	42.00	55.00					
No. 1671, Flanged, F. & D.				39.00	48.00	54.00	70.00	90.00	110.00	170.00	310.00	500.00
Dimensions, in Inches	End to end	2 1/16	2 5/16	2 9/16	2 7/8	3 1/8	3 5/8					
	Face to face			3 3/16	3 1/2	3 3/4	4 1/4	4 15/16	5 1/16	9	10 1/2	11 1/2
	Center to top, open	6 5/8	7 5/8	9 1/8	10	12 1/8	14 1/8	16 1/4	19	23 3/4	32 3/4	42 1/8
	Diameter of wheel	2 9/16	2 9/16	2 3/4	3 1/16	3 5/8	4 1/16	4 3/4	5 3/8	10	12	16
	Diameter of flanges			4 1/4	4 5/8	5	6	7	7 1/2	9	11	13 1/2
	Thickness of flanges			7/16	1/2	9/16	5/8	11/16	3/4	15/16	1	1 1/8

Alloy Cast Iron Wedge Gate Valves

For Process Industries



Outside Screw & Yoke
18-8 Mo Trimmed

No. 14477
Flanged

Working Pressure
200 pounds cold water, oil, or gas, non-shock

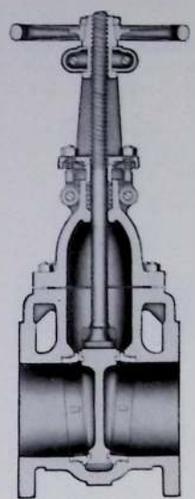
Hydrostatic Test Pressures
Shell—**350** pounds Seat—**225** pounds

18-8 Mo Alloy Trimmed
18-8 Mo Body Seat Rings 18-8 Mo Stem
18-8 Mo Faced Alloy Cast Iron Disc
Alloy Cast Iron Body Nickel-Plated Steel Gland

Service Recommendations
Crane No. 14477 Wedge Gate Valves are offered for use in services where the conventional "all-iron" and "brass trimmed" valves fail because of corrosion of seating surfaces.

The valves are used in the petroleum industry handling oils which contain traces of mineral acids. They are also used in the wood treating industry handling creosote vapors and oils, and in the pulp and paper industry handling alkaline liquors of various kinds.

No. 14477 Valves are similar in design to the Crane 125-Pound Iron Body Wedge Gate Valves shown on page 79.



Cross Section
No. 14477

List Prices

Size	Inches	2	2½	3	4	6	8	10	12
No. 14477, Flanged, F. & D.	Each	95.00	105.00	125.00	168.00	260.00	400.00	650.00	975.00

Alloy cast iron: The valve body and disc are made of a nickel low alloy cast iron, developed to meet the need for an iron having better physical properties and resistance to corrosion when subjected to services where ordinary gray iron is not adequate.

Body and bonnet: The body and bonnet are made with liberal metal sections to assure maximum strength. Tie ribs between the bonnet flange and the end flanges provide exceptional resistance to line strains. The body has straight-through ports to minimize turbulence and thereby obtain a more uniform flow through the valve.

Disc: The valves have a solid web disc, with extra long disc guides in order to minimize drag on the seating surfaces.

Stem: Stem threads have long engagement in the yoke sleeve; the valves have a tee-head disc-stem connection.

Gland and stuffing box: A two-piece ball-type gland maintains an even load on the packing and prevents binding on the stem even when the gland bolts are not pulled up evenly.

The valves have swinging gland eye bolts which move out of the way when the stuffing box is being repacked; they will not loosen in service.

Standards: These valves conform to the American Petroleum Institute (API) Standard No. 6-D, Sixth Edition, May, 1949, for 175-Pound Iron Pipe Line Gate Valves.

The valves also conform to the American Standard for Face to Face Dimensions (B16.10-1939), for 125-Pound Iron Wedge Gate Valves.

Flange dimensions and facing: The dimensions and drilling of end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced with smooth finish.

Dimensions, in Inches

Size	2	2½	3	4	6	8	10	12
Face to face	7	7½	8	9	10½	11½	13	14
Center to top, open	14 7/8	17	19½	23 5/8	32 5/8	41 7/8	50 1/8	58
Diameter of wheel	8	8	9	10	12	16	20	20
Diameter of flanges	6	7	7½	9	11	13½	16	19
Thickness of flanges	5/8	11/16	3/4	15/16	1	1 1/8	13/16	1 1/4
No. of turns to open	7	8½	10½	9	13	17	21	25½

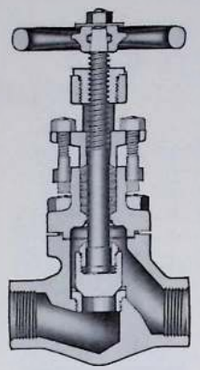
Drilling: Flanges are furnished faced and drilled unless ordered faced only. No deduction is made when valves are ordered faced only.

Templates for drilling, page 459.

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Forged Steel Globe and Angle Valves

For Chlorine Service



Cross Section Globe

Tested 300 pounds air-under-water

Service Recommendations

These valves are recommended for chlorine gas and liquid service, free from water, at temperatures not to exceed 300° F. They are strong, durable, compact valves—suitable for severe service conditions.

The valves have proven unusually satisfactory for chlorine work. They are fully dependable, providing maximum safety, long packing life, easy servicing, high corrosion resistance, and tight seating.



No. 1644, Globe Screwed



No. 1645, Angle Screwed

List Prices and Dimensions

Size			Inches	½	¾	1	1¼	1½	2
No. 1644, Globe			Each	51.00	57.50	65.50	89.00	115.00	148.00
No. 1645, Angle			Each	51.00	57.50	65.50	89.00	115.00	148.00
Dimensions, in Inches	End to end, Globe			3⅝	4⅜	5⅛	6¼	7	8⅜
	Center to end, Angle			1 13/16	2 3/16	2 9/16	3⅛	3½	4 3/16
	Center to top, open	Globe		7 5/16	8⅞	9 7/16	11 1/16	12	14⅛
		Angle		6¾	8	8 5/16	9⅝	10 3/16	12 1/16
	Diameter of wheel			3½	4	5	6	7	9

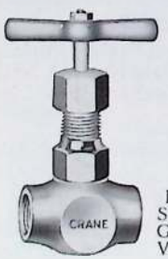
Design: These are bolted bonnet, outside screw and yoke valves. Their body and one-piece bonnet and yoke are made of forged carbon steel. The disc, disc stem ring, and body seat ring are made of Hastelloy "C" to resist the corrosive action of chlorine.

The valves have a 45° narrow bearing seat. The stem is made of Monel and is fitted with a malleable iron handwheel. The gland is forged steel.

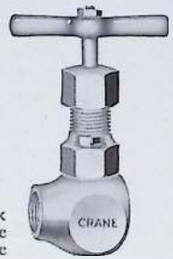
The body-bonnet joint is fitted with a corrugated soft Monel gasket; bonnet bolt studs are Triplex Steel. These valves, when wide open, can be repacked while under pressure.

Flanged valves: Flanged valves are available on special order; prices and information on request.

18-8 Mo Bar Stock Valves



Bar Stock Globe Valve



Bar Stock Angle Valve

These valves are suitable for many corrosive services, being made with Crane 18-8 Mo Alloy Steel body, bonnet, packing nut, gland, and stem. Thread chambers are extra long. The plug type disc accurately regulates flow and resists wear very well.

The line includes, in addition to the female end valves illustrated above, globe and angle valves with male and female ends, and valves made of steel and of Exelloy. See page 236 for prices, dimensions, and complete description.

Pulp Stock Valves

Self-cleaning, non-clogging Crane Iron Body Pulp Stock Valves are specially designed for use in pulp stock lines. In such service they provide a tight shut-off because the wood pulp packs itself around the disc when the valve is closed and effectively seals it against leakage.

The body design features circular end ports and a rectangular shape at the center to assure full flow area. The disc, fully guided, has a sharp cutting edge at the bottom.

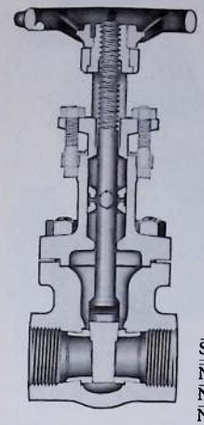


Outside Screw Rising Stem Valve

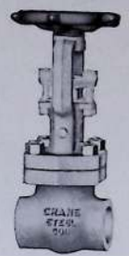
The complete line includes flanged valves in both outside screw, rising stem and quick-opening types. Each of these is available either brass trimmed or all-iron. For prices, dimensions, and complete description, see page 300.

Steel Gate and Globe Valves

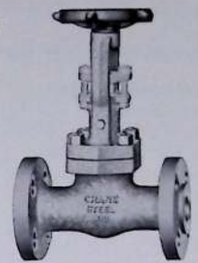
Monel Trimmed



Cross Section No. 3609 A Gate Valve Screwed Bolted Bonnet



No. 3609 A Screwed



No. 3617 A Flanged

Gate Valves

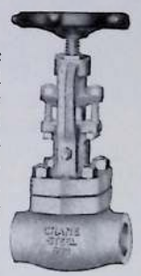
These are unusually sturdy and rugged valves, patterned after the Crane small size 600-Pound Steel Gate Valves shown on page 225. They have a heavy but compact cast steel body and bonnet, tee-head disc-stem connection, male and female bonnet joint with soft iron gasket, bolted gland, and long disc guides. The disc, stem, and body seat rings are made of Monel. The valves have an extra deep stuffing box, providing a tighter stem seal, longer packing life, and greater protection against leakage. The No. 3608 A Valves (not illustrated) have a union bonnet.

List Prices, Each, and Dimensions, in Inches

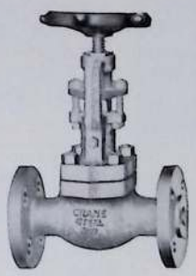
Size	Inches	¼	⅜	½	¾	1	1½	2
No. 3608 A, Union Bonnet, Screwed		20.00	20.00					
No. 3609 A, Bolted Bonnet, Screwed				28.20	34.20	40.80	66.00	90.00
No. 3617 A, Bolted Bonnet, Flanged, F.D. & S.F.				48.00	56.00	69.00	106.00	136.00
End to end, Screwed		2¾	2¾	3	3½	4⅛	4½	5¼
Face to face, Flanged				6½	7½	8½	9½	11½
Center to top, open		6⅛	6⅛	7¼	8¾	10¼	13	15½
Diameter of wheel		3	3	3½	4	5	6	7

Globe Valves

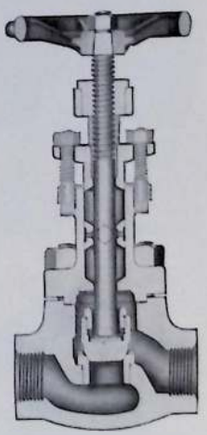
These exceptionally sturdy and rugged globe valves are patterned after the Crane small size 600-Pound Steel Valves shown on page 239. The body and bonnet are cast or forged steel. The male and female bonnet joint is equipped with a soft iron gasket. The valves have a ball-to-35° seat. The disc, body seat ring, disc stem ring, and stem are Monel. The extra deep stuffing box provides a tighter stem seal, longer packing life, and greater safety. No. 3642 A Valves (not illustrated) have a union bonnet.



No. 3646 A Screwed



No. 3658 A Flanged



Cross Section No. 3646 A Globe Valve Screwed Bolted Bonnet

List Prices, Each, and Dimensions, in Inches

Size	Inches	¼	⅜	½	¾	1	1½	2
No. 3642 A, Union Bonnet, Screwed		22.30	22.30					
No. 3646 A, Bolted Bonnet, Screwed				29.50	34.40	40.70	80.40	108.00
No. 3658 A, Bolted Bonnet, Flanged, F.D. & S.F.				56.30	68.00	80.50	123.00	155.00
End to end, Screwed		3	3	3⅝	4⅜	5⅛	7	8⅜
Face to face, Flanged				6½	7½	8½	9½	11½
Center to top, open		7⅛	7⅛	8	9½	9 7/8	12⅜	14⅜
Diameter of wheel		3	3	3½	4	5	7	9

Recommendations: The valves above are used on refining units by the petroleum industry and for various processes in chemical plants where high quality steel valves with Monel trim are desired. They give good service in hydrofluoric alkylation units handling anhydrous H.F., and where mixtures of the acid and hydrocarbons are found. They are not recommended for aqueous solutions of hydrofluoric acid where the concentration drops below 80% H.F.

Stuffing box; packing: The valves have a special design, extra deep stuffing box. A tapped and plugged hole is provided in the bonnet which opens to the spacer between the upper and lower packing; this enables the user to properly lubricate the packing, a necessity on hydrofluoric acid service. These valves are regularly furnished without packing (must be packed in the field); if a packing is specified, prices are quoted on application.

Flanged valves: The end flanges on flanged valves conform to the 600-Pound American Standard (B16e-1939). They have a large male face, ¼-inch high, finished with concentric grooves and known as a "serrated" finish. Prices include drilling to the 600-Pound Standard; for drilling templates, see page 402.

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Y-Pattern Diaphragm Valves

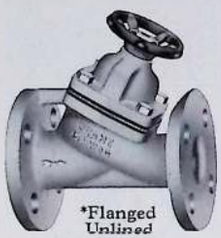
Unlined and Lined — For General and Corrosive Services

With Brass, Iron, Aluminum, or 18-8 Mo Body



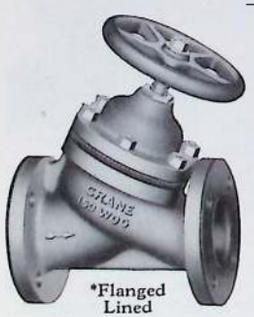
***Screwed Unlined Only**

Sizes ½ to 2-inch with brass, cast iron, aluminum, or 18-8 Mo body and disc; these are furnished with neoprene, Buna N, or natural rubber diaphragm and disc insert.



***Flanged Unlined**

Sizes ½ to 6-inch with cast iron, aluminum, or 18-8 Mo body and disc; these are furnished with neoprene, Buna N, or natural rubber diaphragm and disc insert.



***Flanged Lined**

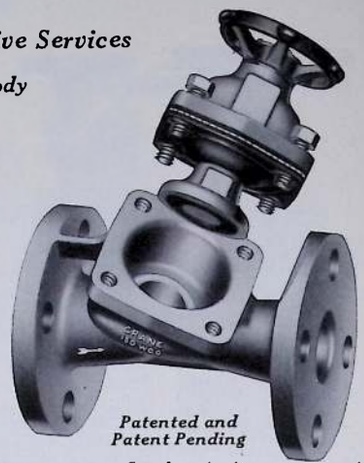
Sizes ½ to 6-inch with cast iron body lined with neoprene or hard natural rubber and disc coated with neoprene or soft natural rubber. Flanged ends only.

**Upper illustrations are typical of ½ to 2-inch sizes; larger sizes have a rising, turning stem as shown in lower illustration.*

Crane Y-Pattern Diaphragm Valves, distinguished by advancements in design and a wide choice of body, disc insert, and diaphragm materials, fulfill the need for moderately priced unlined and lined valves effective on both general and corrosive services.

The valves belong to the general class known as "packless" valves, so called because the customary stuffing box around the stem has been eliminated through the use of a flexible diaphragm mounted between the body and bonnet.

The diaphragm keeps a tight stem seal. There is no chance for leakage and no need for stuffing box maintenance. Because line fluids cannot enter the valve bonnet, operating parts are not exposed to corrosion; nor can costly fluids be contaminated through contact with working parts. Since the diaphragm is used only to form a pressure-tight bonnet closure—and not for seating—it is not subject to cutting, crushing, and rapid wear.



Patented and Patent Pending

A separate, flat-faced disc equipped with a soft insert, or completely coated on lined valves, performs the seating operation. The disc is attached to the end of the stem and fastened to the center of the diaphragm by means of a plunger. When the valve is operated, the stem raises or lowers the non-turning disc and the diaphragm flexes to permit this travel.

Working Pressures

Sizes	Valves For Water, Oil, Air, or Gas 180° F. Max. Temp.	Nos. 1650 and 1651 Valves Only For Vacuum	No. 1652 Valves Only For Oxygen	No. 1652 Valves Only For Acetylene
½ to 4-inch	150 pounds	29 inches hg. (mercury)	150 pounds	15 pounds
6-inch	125 pounds			

Air Tested

Service Recommendations

Crane Diaphragm Valves are built for hard usage. Being packless, they are used for many services where ordinary valves may fail, or be only moderately effective, due to difficulties with stuffing box leakage. All parts exposed to line fluids are available in a choice of corrosive-resistant materials, making the valves suitable for an extensive list of corrosive services.

The selection of proper materials combined with the "packless" construction and tight-seating design render both unlined and lined valves ideal for use on compressed air, compressed and liquefied gases of many commercial kinds, corrosive gases, solvents, natural and corrosive waters such as mine water, process fluids such as alcohols, sodiums, and potassiums, pulp and paper mill liquors, etc.

Included in the category of unlined valves are those recommended for vacuum service and Underwriters' approved valves for sprinkler systems and for oxygen or acetylene service.

On lined valves, the body is lined and the disc is coated with neoprene or natural rubber. Such valves are recommended for fluids corrosive to metals but non-active chemically upon neoprene or rubber. In addition to the recommendations above, the valves offer excellent resistance to the action of many types of corrosive process fluids, to sandy waters, sludges, slurries, sewage, liquids with solids in suspensions, etc. The neoprene-lined valves are particularly effective where abrasion is a destructive factor.

Specific advice on handling corrosive fluids will be furnished on request.

Y-Pattern Diaphragm Valves

Crane Design Offers Many Advantages

Long diaphragm life is assured. Since the diaphragm is not the seating member, it is not subjected to the crushing, cutting, and abrasion incident to seating.

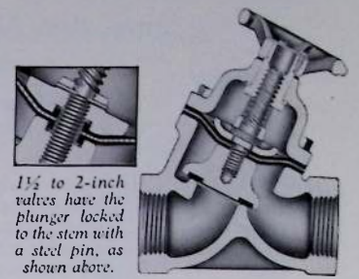
No escape of fluids even if the diaphragm should fail. Flow through the seat opening is regulated by the disc and is independent of the diaphragm. Costly or hazardous fluids are always under control.

"Packless" construction eliminates the annoyance and expense of stuffing box leakage.

Y-pattern body design offers less resistance to flow and minimizes pressure drop.

Easy operation because the Crane design reduces the torque—and number of turns—needed to open and close the valves.

Easy maintenance because all parts are readily accessible. Simply unbolt the bonnet and diaphragm; the working parts can then be lifted out without removing the body from the line.



1½ to 2-inch valves have the plunger locked to the stem with a steel pin, as shown above.

Cross Section, Unlined Screwed Valve

Typical construction of 1½ to 2-inch valves

High Quality Materials and Rugged Construction

Crane Diaphragm Valves are the compact, bolted bonnet type. They are built for long service.

Unlined valves have a brass, cast iron, aluminum, or 18-8 Mo body and disc. Each of these combinations is furnished with a neoprene, Buna N, or natural rubber diaphragm and disc insert.

Tight seating is accomplished by the disc operating on the end of the stem. A thick neoprene, Buna N, or natural rubber insert, vulcanized into a recess in the face of the disc, closes against the crowned seating surface in the body. The disc insert is pliable enough to absorb small particles of foreign matter that might otherwise cause leakage.

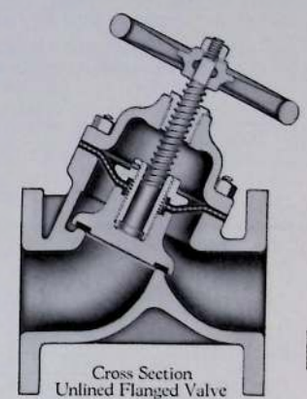
The diaphragm, having a hole through its center, is locked between the disc and a plunger. The diaphragm is not used as the seating member; it merely retains the fluid. When the valve is being operated, the diaphragm flexes enough to accommodate the travel of the disc.

Valves ½ to 2-inch have a concealed non-turning brass stem operating in a brass yoke sleeve. Guide lugs on the plunger above the diaphragm ride in recesses in the bonnet to keep the stem from turning. Valves with exposed stem threads are also available; data on request.

Valves 2½-inch and larger have a turning bronze stem operating in a bronze bonnet bushing. The disc is held to the stem by a threaded brass sleeve on the plunger which allows the stem to rotate freely.

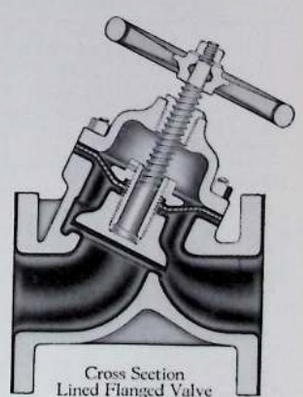
All valves have a cast iron bonnet and a malleable wheel. The plunger is brass on sizes 1-inch and smaller and cast iron on larger sizes.

Lined valves are the same as unlined valves, except the body and flange faces are neoprene or hard rubber lined and the disc is neoprene or soft rubber coated. Thus, all parts contacting the fluid in the line are protected. The lining is 1/16-inch thick on 1¼-inch and smaller valves, ⅛-inch thick on 1½ to 4-inch valves, and 3/16-inch thick on 6-inch valves.



Cross Section Unlined Flanged Valve

Typical construction of 2½ to 6-inch valves



Cross Section Lined Flanged Valve

Lined Valves are available in sizes ½ to 6-inch with flanged ends only. Except for their body lining and coated disc, they are the same, size for size, as Unlined Valves.

Underwriters' Approved Valves

Valves tested and approved by the Underwriters' Laboratories, Inc., include the No. 1610 for sprinkler service and the No. 1652 for oxygen and acetylene service. For complete details, see page 390.

Conformance to Standards

The dimensions (excluding lining) and drilling of end flanges on valves 1-inch and larger conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). Sizes ½ and ¾-inch have the same diameter and drilling as 150-Pound American Standard Steel Flanges, but the thickness and facing are different.

The face to face dimensions of unlined flanged valves 2-inch and larger conform to the American Ferrous Flanged Valve Standard, B16.10-1939, for 125-Pound Cast Iron Globe Valves. Lined valves are longer because of the lining. The Standard does not include valves smaller than 2-inch.

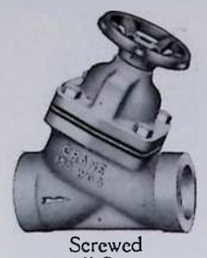
Prices, dimensions, and catalog numbers.... pages 390 and 391

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Y-Pattern Diaphragm Valves

Brass, Iron, Aluminum, or 18-8 Mo Body—Unlined

For General and Corrosive Services

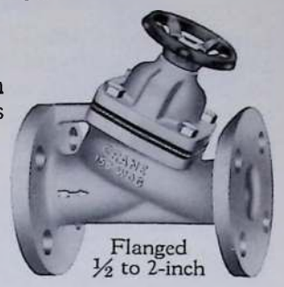


Screwed
All Sizes

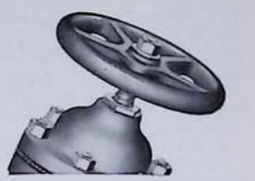
***Working Pressures:** Water, Oil, Air, or Gas, **180°** F. Maximum
Sizes ½ to 4-inch—**150** pounds 6-inch size—**125** pounds
Air Tested

Screwed: Body and disc are made of brass, cast iron, aluminum, or 18-8 Mo; these are available with neoprene, Buna N, or natural rubber diaphragm and disc insert.

Flanged: Body and disc are made of cast iron, aluminum, or 18-8 Mo; these are available with neoprene, Buna N, or natural rubber diaphragm and disc insert.



Flanged
½ to 2-inch



2½ to 6-inch flanged valves have a rising, turning stem.

***Vacuum, oxygen, or acetylene service:** The Crane line of valves having a cast iron body and disc and neoprene diaphragm and disc insert includes:

Nos. 1650 and 1651—prepared for vacuum service up to 29 inches hg. (mercury); specify conditions. Valves for higher degree of vacuum are also available.

No. 1652—for 150 pounds oxygen and 15 pounds acetylene. Valves are specially handled and all working parts are treated with a non-inflammable lubricant.

List Prices, Each

Trim	Size	With Brass Body	With Cast Iron Body		With Aluminum Body		With 18-8 Mo Body		With Cast Iron Body For Special Services		
									Vacuum		Oxygen or Acetylene
	Inches	Screwed	Screwed	Flanged F. & D.	Screwed	Flanged F. & D.	Screwed	Flanged F. & D.	Screwed	Flanged F. & D.	Screwed
		No. 1600	†No. 1610	No. 1611	No. 1620	No. 1621	No. 1630	No. 1631	No. 1650	No. 1651	†No. 1652
Neoprene Diaphragm and Disc Insert	½	20.60	6.00	11.00	18.80	27.40	23.60	43.90	6.00	11.00	6.50
	¾	22.40	7.40	12.40	19.60	29.00	24.40	45.40	7.40	12.40	7.90
	1	26.00	8.60	17.30	22.40	33.40	35.20	61.80	8.60	17.30	9.10
	1¼	32.20	13.70	22.60	27.70	39.60	43.30	73.00	13.70	22.60	14.30
	1½	45.50	23.10	31.00	38.30	53.00	62.10	94.30	23.10	31.00	23.70
	2	69.60	30.90	42.00	52.00	70.60	96.30	136.70	30.90	42.00	31.50
	2½			59.00		97.50		174.80		59.00	
	3			71.00		115.30		250.00		71.00	
	4			107.00		192.00		413.50		107.00	
	6			245.30		342.00		716.00		245.30	
		No. 1600-SB	No. 1610-SB	No. 1611-SB	No. 1620-SB	No. 1621-SB	No. 1630-SB	No. 1631-SB			
Buna N Diaphragm and Disc Insert	½	20.60	6.00	11.00	18.80	27.40	23.60	43.90			
	¾	22.40	7.40	12.40	19.60	29.00	24.40	45.40			
	1	26.00	8.60	17.30	22.40	33.40	35.20	61.80			
	1¼	32.20	13.70	22.60	27.70	39.60	43.30	73.00			
	1½	45.50	23.10	31.00	38.30	53.00	62.10	94.30			
	2	69.60	30.90	42.00	52.00	70.60	96.30	136.70			
	2½			59.00		97.50		174.80			
	3			71.00		115.30		250.00			
	4			107.00		192.00		413.50			
	6			245.30		342.00		716.00			
		No. 1600-RN	No. 1610-RN	No. 1611-RN	No. 1620-RN	No. 1621-RN	No. 1630-RN	No. 1631-RN			
Natural Rubber Diaphragm and Disc Insert	½	20.60	6.00	11.00	18.80	27.40	23.60	43.90			
	¾	22.40	7.40	12.40	19.60	29.00	24.40	45.40			
	1	26.00	8.60	17.30	22.40	33.40	35.20	61.80			
	1¼	32.20	13.70	22.60	27.70	39.60	43.30	73.00			
	1½	45.50	23.10	31.00	38.30	53.00	62.10	94.30			
	2	69.60	30.90	42.00	52.00	70.60	96.30	136.70			
	2½			59.00		97.50		174.80			
	3			71.00		115.30		250.00			
	4			107.00		192.00		413.50			
	6			245.30		342.00		716.00			

***Description and recommendations**....pages 388 and 389* *Dimensions**....page 391*

Drilling: Flanged valves 1-inch and larger are faced and drilled to the American Cast Iron Flange Standard, Class 125; sizes ½ and ¾-inch are drilled to the 150-Pound American Steel Flange Standard, but the facing is different.

Flanges are plain faced with a smooth finish. Prices include facing and drilling; no deduction is made if valves are ordered faced only.

†**Underwriters' Approved**
No. 1610 Valves (for sprinkler service) and No. 1652 (for oxygen or acetylene) have been tested and approved by the Underwriters' Laboratories, Inc., Chicago. They are marked "UL".

Y-Pattern Diaphragm Valves

Iron Body—Lined with Neoprene or Hard Natural Rubber

For Corrosive Process Fluids, Sludges, and Slurries

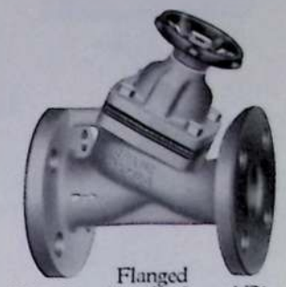
Working Pressures: Water, Oil, Air, or Gas, **180°** F. Maximum
Sizes ½ to 4-inch—**150** pounds 6-inch size—**125** pounds
Air Tested

Diaphragm Valves having a cast iron body lined on the inside and on the flange faces with neoprene or hard natural rubber are specially designed for services corrosive to iron but non-active chemically upon neoprene or rubber. For further recommendations and general description, see pages 388 and 389.

Drilling: Valves 1-inch and larger are faced and drilled to the American Cast Iron Flange Standard, Class 125; sizes ½ and ¾-inch are drilled to the 150-Pound American Steel Flange Standard, but the facing is different. Flange are plain faced with a smooth finish. No deduction in price is made for valves ordered faced only.

List Prices, Each

Size	Flanged F. & D.	
	No. 1615	No. 1615-RN
Inches	Neoprene Lined	Rubber Lined
½	44.70	44.70
¾	46.20	46.20
1	51.30	51.30
1¼	59.00	59.00
1½	65.00	65.00
2	80.30	80.30
2½	111.20	111.20
3	147.00	147.00
4	205.00	205.00
6	410.00	410.00



Flanged
With Cast Iron Body and Disc

***No. 1615**
Body.....lined with neoprene
Disc.....neoprene-coated
Diaphragm.....made of neoprene

***No. 1615-RN**
Body.....lined with hard natural rubber
Disc.....soft natural rubber-coated
Diaphragm.....made of natural rubber

**Sizes 2-inch and smaller have a non-turning, rising stem, as shown above. Larger sizes have a rising, turning stem identical to that used on larger size unlined valves; see cutaway illustration on the preceding page.*

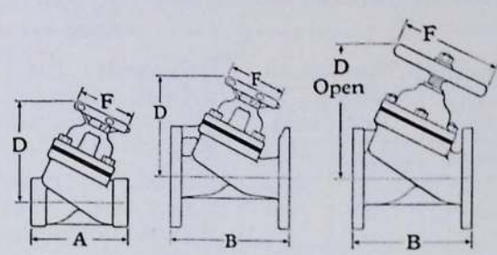
Dimensions of Diaphragm Valves

Standards: The dimensions (excluding lining) and drilling of end flanges on sizes 1-inch and larger conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948); this Standard does not include sizes smaller than 1-inch.

Sizes ½ and ¾-inch have the same diameter and drilling as 150-Pound American Standard Steel Flanges, but the thickness and facing are different.

The face to face dimensions of unlined valves 2-inch and larger conform to the American Ferrous Flanged Standard, B16.10-1939, for 125-Pound Cast Iron Globe Valves. The lined valves are longer because of the thickness of the lining. This Standard does not include valves smaller than 2-inch.

For additional description, see pages 388 to 390.



Screwed All Sizes | Flanged ½ to 2-inch | Flanged 2½ to 6-inch | Flanged ½ to 2-inch | Flanged 2½ to 6-inch

Unlined Valves
For prices, see table on page 390.

Lined Valves
For prices, see table above.

Dimensions, in Inches

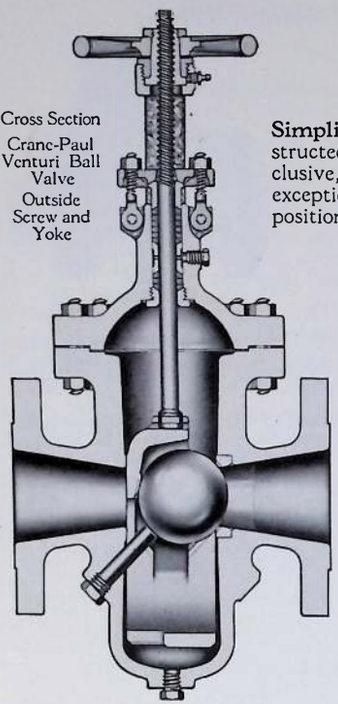
Size	A	B	C	D	E	F	End Flanges Diameter	End Flanges Thickness†	Diam. of bolt circle	No. and diam. of bolts	No. of turns to open
½	3	4¼	4⅜	3 5/16	3 5/16	2	3½	⅜	2⅜	4-½	1½
¾	3½	4½	4⅝	3 15/16	3 15/16	2¼	3⅞	13/32	2¾	4-½	2
1	4¼	5¼	5⅜	4⅜	4⅜	2½	4¼	7/16	3⅛	4-½	2¼
1¼	5¼	5¾	5⅞	5¼	5¼	3	4⅝	½	3½	4-½	3½
1½	6	6½	6¾	6⅛	6⅛	4	5	9/16	3⅞	4-½	3¾
2	7	8	8¼	7¼	7¼	5	6	⅝	4¾	4-⅝	3½
2½		8½	8¾	9⅞	10	7	7	11/16	5½	4-⅝	4¼
3		9½	9¾	11⅜	11½	8	7½	¾	6	4-⅝	4
4		11½	11¾	13⅞	14	10	9	15/16	7½	8-⅝	5¼
6		14	14⅜	17½	17 11/16	14	11	1	9½	8-¾	7½

†Thickness of flange dimensions do not include the lining on neoprene or rubber lined valves; the lining is 1/16" thick on ½ to 1¼-inch sizes, 1/8" thick on 1½ to 4-inch sizes, and 3/16" thick on the 6-inch size.

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Crane-Paul Venturi Ball Valves

(Patented and Patent Pending)



Cross Section Crane-Paul Venturi Ball Valve Outside Screw and Yoke

Free, Easy Operating Valves
For Full Flow, Throttling, or Tight Shut-Off

Simplified operation: Ruggedly constructed Crane-Paul Valves feature an exclusive, venturi ball design which provides exceptionally accurate flow control in all positions from wide open to a tight shut-off. The valves resemble rising stem gate valves but have a loose ball disc instead of the conventional type. The ball is actuated and carried by a cage attached to the valve stem. The rolling action of the ball permits unusually free, easy operation.

In operation, the ball moves to and from the center of flow, rolling into and out of the body seat ring. In the closed position, the ball is mechanically locked against the seat by a wedging surface on the ball cage.

Cast Steel Valves: Cast steel valves have a body, integral bonnet and yoke, and ball cage made of carbon steel in the 150-Pound pressure class; in the 300 and 600-Pound pressure classes, these parts are made of Crane No. 4 Carbon-Molybdenum Alloy Steel.

Cast steel valves 2-inch and smaller have an Exelloy, shoulder-type, screwed-in body seat ring; larger sizes have a Stellite-faced, steel seat ring which is slipped in and welded. The stem and guide pin are Exelloy. Smaller sizes have a one-piece, forged steel gland; larger sizes have a two-piece gland consisting of an Ihrigized steel gland and a forged steel gland flange. Triplex Steel bolt-studs produce a tight body-bonnet joint.

18-8 Mo Valves: 18-8 Mo Valves have an 18-8 Mo Alloy Steel body, integral bonnet and yoke, ball cage, stem, guide pin, and bolt-studs. The body seat ring is integral with the body. Smaller sizes have a one-piece 18-8 Mo gland; larger sizes have a two-piece 18-8 Mo gland and gland flange.

Ball cage: In all valves, the ball cage is finished with a Stellite-faced wedging surface.

Ball guide: The ball disc is directed to the seat at the point of closure by a center guide pin in the smaller sizes and by a side guide pin in the larger sizes.

Stuffing box; repacking: The valves have a large, deep stuffing box. When wide open, they can be repacked while under pressure.

Lubrication: Larger sizes of all valves are equipped with a lubricating fitting to facilitate lubrication of the yoke sleeve.

Sliding stem valves: Valves with a sliding stem and without a handwheel and yoke sleeve, suitable for assembly with power operators, are also available. Such valves are generally used for special flow control services. Prices and information will be furnished on application.

Working Pressures—Pounds per Sq. Inch, Non-Shock

Fluid	Temp. Deg. Fahr.	[1]With Standard Facings Other Than Ring Joint: 150-Lb. Carbon Steel or 18-8 Mo[3]	300-Lb. Steel or No. 4 or 18-8 Mo[3]	600-Lb. No. 4 Steel	With Ring Joint Facing: 300-Lb. No. 4 Steel	600-Lb. No. 4 Steel
[3]Steam, Water, Air, Gas, Oil, or Oil Vapor	100	230	600	1200	720	1440
	150	220	590	1180	710	1420
	200	210	580	1160	700	1400
	250	200	570	1140	690	1380
	300	190	560	1120	680	1365
	350	180	550	1095	675	1350
	400	170	540	1075	665	1330
	450	160	525	1050	660	1320
	500	**150**	500	1000	625	1250
	550	140	475	950	590	1180
	600	130	445	890	555	1110
	650	120	415	830	515	1030
	700	110	380	760	470	940
	750	100	360	720	425	850
	800	92	340	680	375	750
	850	82	320	640	350	700
	900	70[2]	**300**	**600**	325	650
	950	55[2]	265[2]	530[2]	**300**	**600**
	1000	40[2]	190[2]	380[2]	230[2]	470[2]

[1]When an all-metal gasket (corrugated or flat) is used with raised face, lapped, or large male and female facings, these ratings will apply only when the contact area of the gasket is not greater, and the inside diameter of the gasket is not less, than that of a large tongue and groove gasket.

[2]These ratings apply only to oil or oil vapor service.

[3]**Ratings for 18-8 Mo Valves:** 18-8 Mo Valves are recommended for liquid or gas service only and for a maximum temperature of 500° F. For flange facings furnished with 18-8 Mo Valves, refer to page 393.

Hydrostatic Test Pressures, in Pounds

Material and Pressure Class		With Facing Other Than Ring Joint: Shell	Seat	With Ring Joint Face: Shell	Seat
*Cast Steel	150-Lb.	350	350	425	350
	300-Lb.	900	775	1100	775
	600-Lb.	1800	1550	2175	1550
18-8 Mo	150-Lb.	300	275	—	—
	300-Lb.	900	775	—	—

*Valve seats are tested 100 pounds air-under-water.

For prices and dimensions, see next page.

Crane-Paul Venturi Ball Valves

(Patented and Patent Pending)

For working pressures and description, see the preceding page.

Standards: The end flanges of all Cast Steel Valves and of the 300-Pound 18-8 Mo Valves conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939, for their respective pressure class.

Face to face dimensions of all Cast Steel Valves and of the 300-Pound 18-8 Mo Valves conform to the American Standard for Face-to-Face Dimensions of Steel Flanged Globe Valves, B16.10-1939, for their respective pressure class. This Standard does not include 150 and 300-Pound Valves in sizes smaller than 2-inch.

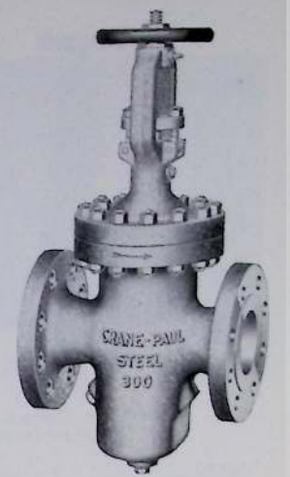
End flanges and face to face dimensions of the 150-Pound 18-8 Mo Valves conform to the MSS Corrosion Resistant Standard, No. SP-42-1951, for Cast Flanged Globe Valves, Fittings, and Flanges.

Flange facings: End flanges of 150-Pound 18-8 Mo Valves are regularly furnished plain faced with two V-shaped concentric grooves between the port and bolt holes.

150 and 300-Pound Cast Steel Valves and 300-Pound 18-8 Mo Valves are regularly furnished with a 1/16-inch raised face on the end flanges. 600-Pound Valves are regularly furnished with a 1/4-inch male face (large male) on the end flanges.

The 1/16-inch raised and 1/4-inch male facings are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish. A smooth finish can be furnished to order; see the Crane Discount Sheet for prices.

Cast Steel Valves are available with other types of flange facings when so specified; see the Crane Discount Sheet for prices.



150-Pound
No. 19901, Carbon Steel
No. 19951, 18-8 Mo Alloy

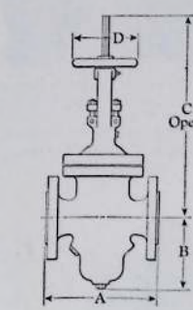
300-Pound
No. 19903, No. 4 Carbon-Moly
No. 19953, 18-8 Mo Alloy

600-Pound
No. 19905, No. 4 Carbon-Moly.

List Prices and Dimensions

Class	Size Inches	List Prices, Each Flanged, F.D. & S.F.: Carbon Steel	No. 4 Carbon-Moly.	18-8 Mo Alloy Steel	Dimensions, in Inches: A*	B	C	D
150 Pound		No. 19901		No. 19951				
	1	120.00		168.00	5	2 7/8	9 3/8	3
	1 1/4	127.00		192.00	5 1/2	3 1/2	10 1/4	3
	1 1/2	144.00		214.00	6 1/2	3 3/4	11 5/8	4
	2	185.00		308.00	8	4 7/8	15 3/8	6
	2 1/2	241.00		385.00	8 1/2	5 3/8	17 1/2	6
	3	289.00		481.00	9 1/2	6 1/2	19 5/8	6
	4	481.00		795.00	11 1/2	8 1/4	25	8
	6	963.00		1565.00	16	11 1/2	35 5/8	10
300 Pound			No. 19903	No. 19953				
	1		132.00	195.00	8	2 7/8	10 5/8	4
	1 1/4		144.00	216.00	8 1/2	3 1/2	11 1/2	4
	1 1/2		178.00	279.00	9	3 7/8	13 5/8	6
	2		229.00	361.00	10 1/2	4 7/8	15 3/8	6
	2 1/2		289.00	481.00	11 1/2	5 3/8	17 1/2	6
	3		349.00	626.00	12 1/2	6 1/4	21	8
	4		554.00	1035.00	14	8 1/2	24 5/8	8
	6		1084.00	1926.00	17 1/2	11 1/2	38	14
	8		1806.00	3372.00	22	15	44 5/8	14
600 Pound			No. 19905					
	1		142.00		8 1/2	2 7/8	10 5/8	4
	1 1/4		163.00		9	3 1/2	11 5/8	4
	1 1/2		204.00		9 1/2	3 7/8	13 5/8	6
	2		265.00		11 1/2	4 5/8	17 1/4	8
	2 1/2		325.00		13	5 1/2	18 7/8	8
	3		421.00		14	6 1/4	22 1/8	9
	4		722.00		17	8 1/4	27 7/8	10

*Dimension "A" includes the 1/16-inch raised faces on the 150 and 300-Pound Valves and the 1/4-inch male faces on the 600-Pound Valves.



Dimensions—All Valves

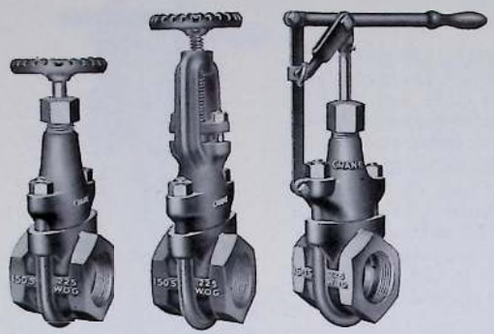
Drilling: Unless otherwise ordered, valves are furnished with the end flanges faced, drilled, and spot faced. Prices include drilling to the corresponding pressure class of the Standard applying; no deduction is made if valves are ordered faced only.

For description of materials, see pages 1 to 9.

For templates for drilling and flange dimensions, see pages 458, 461, and 462.

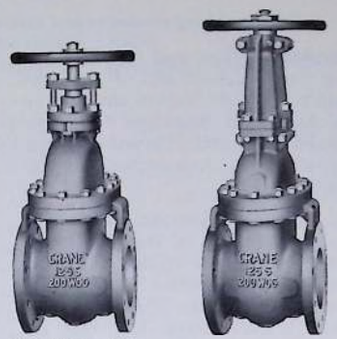
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All-Iron Valves



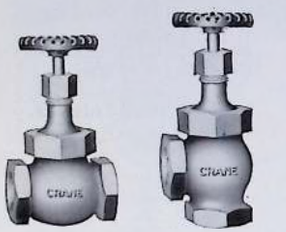
Inside Screw Valve | O.S. & Y. Valve | Quick-Opening Valve

For All-Iron Clamp Gate Valves, see pages 74 and 75.



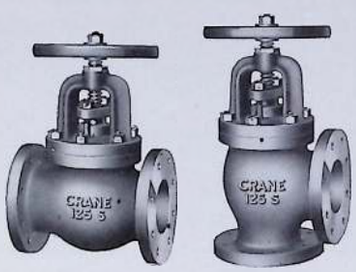
Non-Rising Stem Valve | O.S. & Y. Valve

For All-Iron Wedge and Double Disc Gate Valves, see pages 79, 83, and 97.



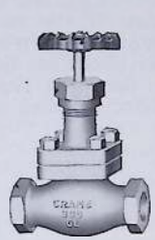
Union Bonnet Globe Valve | Union Bonnet Angle Valve

For All-Iron Union Bonnet Globe and Angle Valves, see page 105.



Bolted Bonnet Globe Valve | Bolted Bonnet Angle Valve

For All-Iron Bolted Bonnet Globe and Angle Valves, see page 108.



Ferrosteel Bolted Bonnet Globe Valve With Lead-Faced or Steel Disc

For Ferrosteel Globe and Angle Valves, see page 411.



Relief Valve

For All-Iron Relief Valves, see page 331.

Crane manufactures an unusually complete assortment of All-Iron Gate, Globe, Angle, and Check Valves, including a wide variety of types and a full range of sizes.

Although cast iron cannot be listed specifically as one of the corrosion resisting metals, all-iron valves find wide application in many services where brass or brass trimmed valves are not entirely suited. Without good inherent resistance to corrosion, cast iron frequently depends for its general serviceability upon the fact that, in many situations, the initial corrosion is followed by the formation of protective coatings which slow up the rate of corrosion or entirely prevent it.

For greater convenience, All-Iron Valves are listed with related products in other sections of this catalog. A few of the common types are illustrated above, together with page references.



Malleable Iron Swing Check Valve

For Malleable Iron Swing Check Valves, see page 114.



All-Iron Swing Check Valve

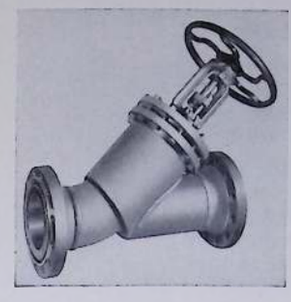
For All-Iron Swing Check Valves, see page 117.



Ferrosteel Lift Check Valve

For Ferrosteel Lift Check Valves, see page 412.

Other Corrosion-Resisting Products

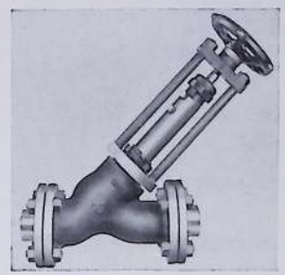


18-8 Stainless Steel Bellow Sealed Fabricated Valve For Extreme Vacuum

In addition to the corrosion-resistant materials described on the foregoing pages, Crane is equipped to furnish on special order most regular designs in a variety of alloys, or combination of special alloys, to suit almost any corrosive condition existing in the chemical process and food industries. Our foundries are skilled in the production of a wide range of special alloys, including the austenitic and ferritic stainless steels, acid and silicon bronzes, nickel and nickel alloys, aluminum and aluminum base alloys. Crane metallurgists are constantly searching for improved metals and methods to meet the ever changing needs of the chemical industries.



Clad 18-8 Stainless Steel Fabricated Wood Chip Valve



25–20 Per Cent Chrome-Nickel Steel Y-Valve with Extended Bonnet For High Temperature Service

Where metallic materials are not available in the desired form nor suitable for the corrosive conditions, iron valve and fitting castings or fabricated piping can be coated with rubber, glass, synthetic resin, or other types of linings. Every part of the valve, fitting, or piping that comes in contact with the corrosive fluid in the line is covered with a protective coating.

Crane is also prepared to furnish especially designed valves and piping materials in corrosion-resisting alloys to meet unusual requirements. The photographs on this page illustrate some of the unusual designs manufactured to meet the particular needs of an individual customer.

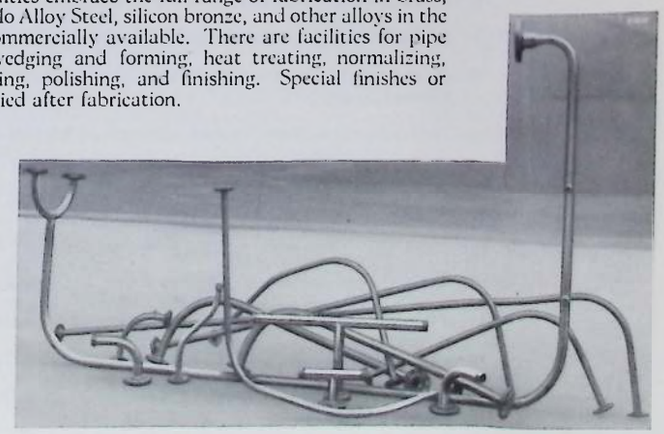


Block Stainless Steel Angle Valve For High Pressure Processing

Crane pipe fabricating shop facilities embrace the full range of fabrication in brass, aluminum, nickel, Monel, 18-8 Mo Alloy Steel, silicon bronze, and other alloys in the sizes, thicknesses, and ranges commercially available. There are facilities for pipe bending, welding, flanging, swedging and forming, heat treating, normalizing, quenching, pickling, sand-blasting, polishing, and finishing. Special finishes or polishing operations can be applied after fabrication.

A major part of the facilities of the Crane Engineering Laboratories is devoted to the improvement of piping materials for the chemical process and food industry.

Crane engineers, backed by the facilities of the Crane Engineering Division, are always available for field surveys of unusual corrosion problems and to render technical assistance to overcome them.



Typical Austenitic Stainless Steel Piping Fabricated by Bending and Welding

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Corrosion Questionnaire

Information Required for Developing Recommendations

The behavior of metals and alloys in contact with corrosive fluids is often affected by factors which are not obvious. Because of this, it is difficult to submit a sufficiently comprehensive questionnaire without appearing unduly inquisitive. The questions below are those which apply to practically any installation; and the answers to them will, in many cases, provide all the necessary information. It is not to be expected, however, that the information so obtained will be sufficient in all cases; and it is hoped that the questions will be considered as a guide to the type of information desired rather than as a limitation to the amount that is needed.

Since apparently extraneous physical factors often exert a tremendous influence on the progress of corrosion, it is also desirable to know something about the installation itself. This is particularly true when there is a background of previous experience; and when a rough sketch of the layout of tanks, piping, etc. can be accompanied by notations showing the locations at which corrosion has been the most severe. An opportunity to examine corroded pipe, valves, or fittings will often aid materially in the making of recommendations.

1. What is the name or composition of fluid to be handled?
2. What is the concentration (percentage strength, specific gravity, pH value, etc.)?
3. What is the operating temperature and pressure in pipe lines?
4. If the fluid is not a water solution but a gas, organic fluid, etc., is water or water vapor apt to be present at any time or at any particular location? If so, explain.
5. If the fluid is a water solution, are substances other than water (abrasive solids, oil, etc.) present at any time or at any particular location? If so, explain.
6. Is there much opportunity for air in-leakage?
7. Is the flow through the system intermittent or continuous?
8. If intermittent, is the system ever drained entirely of fluid and allowed to dry?
9. Is the piping system washed or rinsed at regular intervals, and if so, with what materials?
10. Is a slight amount of corrosion objectionable from the standpoint of contamination or discoloration of product?
11. If so, what metals are particularly objectionable?
12. What materials are being used or proposed for piping, tanks, etc.?
13. Has any specific trouble been experienced with these materials?
14. What materials have been used for valves and fittings?
15. In general, what is the comparative life of the different materials which have been used?
16. What packings give the best service?

Valves and Fittings For Marine Service

Regulations and Material Specifications.....page 398
General Requirements.....pages 398 and 399

Recommendations for Class I and Class II Piping
Brass and Iron Valves.....page 400
Fittings and Flanges.....page 399
Steel Valves.....page 401

Brass Valves
Gate.....page 404
Globe and Angle.....page 404
Check.....page 404
Hose Gate.....page 403
Chronometer.....page 403

Iron Valves
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Check.....page 406

Steel Valves
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Check.....page 407
Pressure-Temperature Ratings.....page 402

Miscellaneous Valves
Main Injection.....page 406
Manifold.....page 408
Screw-Down Check.....page 408

Part of this section is devoted to comments on the "Marine Engineering Regulations and Material Specifications" issued November, 1949 by the United States Coast Guard, and its requirements in general. In addition, there are recommendations of Crane Valves, Fittings, and Flanges as regularly manufactured for commercial purposes, which also conform to the requirements for marine service, valves made especially for marine service, and valves most commonly used in marine piping.

The extra quality built into Crane Valves and Fittings makes them accepted everywhere. It is this quality that has long maintained for Crane its enviable position for meeting marine requirements—safety, ruggedness, and durability. Then too, the completeness of the Crane line is important. Whether it be the smallest tug or the largest passenger liner—a vessel for river, lake, or ocean service—a wide selection of Crane products is available.

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Valves and Fittings for Marine Service

Marine Engineering Regulations and Material Specifications

The "Marine Engineering Regulations and Material Specifications" issued by the United States Coast Guard set forth the requirements for valves, fittings, and other products used for marine service.

These Regulations meet the requirements specified in the Rules for Building and Classing Steel Vessels (1952) in accordance with the American Bureau of Shipping.

There are numerous requirements and limitations governing marine service which prohibit the use of many ordinary commercial items. For convenient reference, the most important of these are given on this and the opposite page.

Although certain types of piping, like fuel oil service piping and boiler mountings and attachments, are covered separately, as explained later, the Marine Engineering Regulations divide piping on board ship into two general classes, as follows:

Class I Piping which includes the various systems conveying mediums exceeding either pressures or temperatures as shown in the following table:

Pressure and Temperature Limitations

Service	Pressure Psi	Temperature Degree F.
Lethal gases and liquids	Any	Any
Gases or vapors	Over 150	Over 500°–*650°
Water	Over 150	Over 300°
Fuel oil	Over 150	Over 150°
Lubricating oil	Over 150	Over 200°
Compressed gases	Over 150	.....

*For temperatures exceeding 500° F., the pressures shall exceed the following:

150 psi at 500° F. 130 psi at 600° F.
140 psi at 550° F. 120 psi at 650° F.

Class II Piping includes all piping for pressures and temperatures that do not require Class I Piping. (Products suitable for Class I can, of course, be used on Class II.)

General Requirements

The limitations given below are based on the Marine Engineering Regulations (November, 1949) and do not necessarily agree with Crane recommendations for commercial services.

Metals: Regular Crane metals comply with the requirements for marine service as outlined below:

Grade A Bronze for valves and fittings for pressures up to 150 psi and/or temperatures not exceeding 366° F. (This is Crane Steam Brass.)

Grade B Bronze for valves, fittings, boiler mountings, expansion joints, and similar appliances for steam pressures up to 300 psi or temperatures not exceeding 450° F., and for air or water at pressures over 300 psi but at temperatures not exceeding 150° F. (This is Crane Special Bronze.)

Gray Iron Castings for valves, fittings, and flanges for pressures and temperatures not exceeding 125 psi or 450° F. (This is Crane Cast Iron, Ferrosteel, and High Tensile Iron.)

Malleable Iron Castings (cupola process) for fittings, flanges, and valve parts for pressures and temperatures not over 150 psi or 450° F. (This is Crane Malleable Iron.)

Forged or Cast Carbon Steel for temperatures not exceeding 800° F. and Forged or Cast Alloy Steel for temperatures not exceeding 1000° F., for flanges, fittings, and valves. (These are Crane Carbon Forged or Cast Steel and †No. 4 Carbon-Molybdenum Alloy Forged or Cast Steel, respectively.)

Working pressures: Working pressures shall not be higher than those outlined above for the material specified. For ratings for Crane Brass, Bronze, Iron, and Steel Valves, see pages 400 to 402. In addition, for boiler feed or blow-off service, valves and fittings can only be used for working pressures up to 83⅓% of the recommended steam working pressure.

Tests: Brass, bronze, malleable iron, and cast iron valves and fittings for steam service must be given a hydrostatic shell test equal to 2 times the primary pressure rating marked thereon; brass, bronze, or malleable iron valves and fittings for liquid or gas service at 150° F. maximum temperature must be given a hydrostatic shell test equal to 1½ times the secondary pressure rating marked thereon. In many cases, regular Crane tests comply, but in others, products must be specially tested.

Tests on steel valves and fittings must comply with those specified in American Standard B16e6-1949; regular Crane tests meet these requirements.

Boilers must be hydrostatically tested to 1½ times the working pressure; Stop-Check Valves also are subject to this requirement.

Pipe connections: For Class I piping, screwed, socket-welding, and slip-on welding joints are restricted to sizes 2-inch and smaller. Sizes 2½-inch and larger must have flanged or butt-welded joints; flanged joints must be made with lap joint (Cranelap) flanges or Welding Neck Flanges.

For boiler mountings and attachments, flanged joints must be used on sizes 1½-inch and larger.

For Class II Piping, there is no limitation on the size of screwed, slip-on welding, or socket welding joints.

Carbon-Molybdenum Steel is not permitted for design temperatures exceeding 900° F.

(*continued on the next page*)

General Requirements (Cont.)

Marking: Regular Crane markings comply with marine requirements, except that 125-Pound Cast Iron Screwed Fittings are not marked to show the pressure rating, this being manufacturers' standard practice.

Valve design: For Class I Piping, brass, bronze, cast iron, and steel valves sizes 2-inch and smaller can have screwed bonnets but they must be of the union type, except that check valves can have ordinary screwed caps. In sizes 2½-inch and larger, brass, bronze, and cast iron valves must have a bolted bonnet; steel valves in those sizes must have a bolted or pressure-seal bonnet. Non-rising stem valves must have approved indicators. Discs, disc faces, seats, stems, and other wearing parts should be made of noncorrosive material.

For Class II Piping, brass valves can have ordinary screwed bonnets on all sizes, and non-rising stem valves for oil transfer and filling systems need not have an indicator.

Boiler mountings and attachments: All valves, fittings, and flanges must be cast or forged steel, except that Crane Special Bronze may be used where the temperature does not exceed 450° F. and cast iron may be used where the pressure is 30 pounds or less. Sizes 1½-inch and larger must be flanged end. Main and auxiliary globe stop valves must be installed with the pressure under the disc, and sizes larger than 6-inch require a by-pass.

Fuel oil service piping: Valves and fittings for fuel oil pressure piping from pumps to burners (not including cargo oil transfer or discharge piping) must conform to Class I requirements and, in addition, be designed for at least 250 pounds steam working pressure. Cast iron valves and fittings are not permitted; bushings and street elbows are not permitted.

Cocks: For Class I Piping, cocks must be designed so that the cap holds the plug in place; the conventional type with a nut holding the plug is not allowed. There are no restrictions on cocks for Class II Piping.

Specialties: Relief valves, safety valves, expansion joints, fusible plugs, and similar specialties must be of approved design.

Fittings and Flanges for Class I and Class II Piping

Numerous Crane Valves and Fittings as regularly manufactured conform to the requirements for marine service, and these fill the need for a large majority of Class I and Class II Piping.

The valves most commonly used are itemized on pages 400 and 401. In addition, the following Crane Fittings are acceptable, within the limitations mentioned:

Brass screwed fittings: 125-Pound Brass Screwed Fittings are suitable for a maximum of 125 psi, 353° F. All sizes can be used for Class II Piping, and sizes 2-inch and smaller for Class I Piping except for gases or vapors. See pages 184 and 185.

250-Pound Brass Screwed Fittings are suitable for a maximum of 150 psi, 366° F. All sizes can be used for Class II Piping, and sizes 2-inch and smaller for Class I Piping except gases or vapors. See page 186.

Brass screwed unions: Brass screwed unions, page 187, can be used for Class II Piping in all sizes and for Class I Piping in sizes 2-inch and smaller except the No. 523½ and No. 524½ which are not suitable on gases or vapors. Maximum ratings for unions are as follows: Nos. 523½ and 524½, 150 psi—366° F.; and No. 696 E, 300 psi—450° F.

Brass flanges: Brass flanges, page 188, can be used in all sizes on Class II Piping. For Class I Piping, the flanges are permitted in sizes 2-inch and smaller only except on gases or vapors. The 150-Pound are suitable for a maximum of 150 psi, 366° F.; and the 300-Pound, 300 psi, 450° F.

Cast and malleable iron screwed fittings: 125-Pound Cast Iron Screwed Fittings (pages 150 to 150) are suitable for a maximum of 125 psi and 353° F.

150-Pound Malleable Iron Screwed Fittings (pages 140 to 144) are suitable for a maximum of 150 psi and 366° F. All sizes of cast iron and malleable iron fittings can be used for Class II Piping. Malleable iron fittings in sizes 2-inch and smaller can be used for Class I Piping, except on gases or vapors.

Cast iron flanged fittings and flanges: 125-Pound Cast Iron Flanged Fittings and Flanges (pages 196 to 203) are suitable for a maximum of 125 psi, 353° F. on sizes 12-inch and smaller, and 100 psi, 338° F. on sizes 14-inch and larger. On Class II Piping, both the fittings and flanges are acceptable.

Steel screwed fittings: All sizes of Crane Steel Screwed Fittings (pages 258 to 261) are suitable for Class II Piping, and sizes 2-inch and smaller are also suitable for Class I.

Steel flanged fittings and flanges: Crane Cast Steel Flanged Fittings (pages 267 to 273) and Crane Forged Steel Flanges (pages 291 to 298) are suitable for both Class I and Class II Piping, but they are not suitable for gases or vapors for Class I. For Class I Piping, screwed, slip-on welding, and socket-welding flanges can only be used in sizes 2-inch and smaller. See page 402 for ratings.

Welding fittings: Crane Forged Steel Socket-Welding Fittings, which are made in sizes 2-inch and smaller (see pages 276 to 279), and Steel Butt-Welding Fittings (see pages 280 to 286) can be used for either Class I or Class II Piping.

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Valves for Class I and Class II Piping

Explanation: The tables on this and the following page show the Crane Brass, Bronze, Iron, and Steel Valves most commonly used in marine service. For the "Class" of piping indicated and within the pressure and temperature ratings shown, all of them comply with the †"Marine Engineering Regulations and Material Specifications" issued by the United States Coast Guard. The tables show not only the type of valve and catalog number but also whether suitable for Class I or Class II Piping, and the maximum pressure-temperature ratings for each of the several fluids involved. The ratings are not necessarily the same as those for ordinary commercial service; marine ratings are governed by valve design, materials, end connections, and other limitations as set forth in the Marine Engineering Regulations.

Brass, Bronze, and Iron Valves for Class I or Class II Piping

Class I Piping				Crane Valves Recommended					Class II Piping			
Steam Over 150 Psi	Hot Water Over 300° Fahr.	Hot Oil Over 150° Fahr.	Cold Water, Oil, or Gas	Sizes for Class I Inches	Valve Type and Catalog Numbers		See Page	Sizes for Class II Inches	Steam 150 Psi *Max.	Hot Water 300° Fahr. *Max.	Hot Oil 150° Fahr. *Max.	Cold Water, Oil, or Gas
Maximum Ratings				Brass and Bronze Valves					Maximum Ratings			
...	...	...	...	....	Hose Gate	No. 4448	403	1½-2½	...	...	...	100 psi
...	...	...	...	....		No. 4449	403	1½-2½	...	...	...	
...	...	...	...	....		No. 453	60	1½, 2½	...	...	...	150 psi
...	...	...	...	....	Angle Hose	No. 117	61	¾-2	...	...	...	
...	...	...	...	....	Gate Scrd.	No. 4436	15	2-3	100 psi 338° F.	100 psi		100 psi
...	100 psi-338°F.		...	2-10	Gate Flgd.	No. 4437	15	2-10		... ...		
...	...	...	...	....	Gate Q.O.	No. 432	56	2½, 3		100 psi		
...	...	...	...	....		No. 432	56	½-2	125 psi 353° F.	125 psi		125 psi
...	...	...	...	....	Gate Scrd.	No. 428, 430, 440	16	¼-3				
...	...	...	...	....	Globe Scrd.	No. 1	26	⅛-3		150 psi		
...	...	...	...	....	Angle	No. 2	26	⅛-3		... ...		
...	...	...	...	....	Gate Scrd.	No. 431	17	¼-3		... ...		
...	...	...	...	....	Globe or Angle Scrd.	No. 85, 88, 89	27	⅛-¾	366° F.	150 psi		150 psi
...	150 psi-366° F.		...	⅛-2		No. 7	28	⅛-2		... ...		
...	...	...	...	⅛-2		No. 14½ P, 16½ P	29	⅛-2		... ...		
...	...	...	...	....		No. 7	28	2½, 3		... ...		
...	...	...	...	....		No. 14½ P, 16½ P	29	2½, 3		... ...		
...	...	...	...	1-3	Flgd.	No. 9	28	1-3				
...	150 psi-366° F.		...	1-2		No. 71	32	1-3	...	... ...	...	...
...	...	...	...	1½-6		No. 4197, 4199	34	...				
...	...	...	...	1½-6		No. 4297, 4299	408	...				
...	...	...	...	1-3	Check Flgd.	No. 38	48	1-3	366° F.	... ...		150 psi
...	...	...	...	2-6		No. 4033, 4063	50	2-6		... ...		
200 psi-388° F.	...		...	⅜-1	Radiator	No. 4270	58	...	...	... ...	...	...
200 psi-388° F.			200 psi	¼-2	Gate Scrd.	No. 422, 423	18	2½, 3	366° F.	150 psi		
...	...	...	...	....	Gate Flgd.	No. 429	17	1-3				
				⅛-2	Globe or Angle Scrd.	No. 70	33	2½, 3	...	... ...	...	...
				¼-2		No. 212 C, 214 C	32	...				
				¼-2		No. 212 P, 214 P	32	2½, 3				
200 psi-388° F.			200 psi	1½-2		No. 4196, 4198	34	2½, 3	366° F.	150 psi		
				1½-2		No. 4296, 4298	408	2½, 3				
				¼-2	Check Scrd.	No. 36, 72	48	2½, 3				
				1½-2		No. 4032, 4062	50	2½, 3				
			1000 psi	¼-2	Gate Scrd.	No. 622 E, 623 E	21	2½, 3	...	... ...	...	...
			500 psi	1-3	Flgd.	No. 623½ E	21	...	366° F.	150 psi		
300 psi-450° F.			1000 psi	¼-2	Globe or Angle Scrd.	No. 382 P, 384 P	36	2½, 3	...	... ...	...	...
			500 psi	1-3	Flgd.	No. 383 P, 385 P	36	...				
			1000 psi	1½-3		No. 87 P, 87½ P	37	...	366° F.	150 psi		
			500 psi	¼-2	Check Scrd.	No. 76 E, 366 E	51	2½, 3	...	... ...	...	...
				1-3	Flgd.	No. 77 E	51	...				
				Iron Valves					Maximum Ratings			
				Gate	Flgd.	No. 4461, 4465	405	2-12		...		
						No. 4467	405	3-12	125 psi 353° F.	125 psi 200° F.	...	125 psi
				Globe	Flgd.	No. 351	108	2-10		...		
				Angle	Flgd.	No. 353	108	2-10		...		
				Check	Flgd.	No. 373	117	2-24		...		

†November, 1949 issue

*Brass and Bronze Valves for Class II Piping are recommended for the maximum ratings if not otherwise indicated.

Valves for Class I Piping can also be used for Class II.

(Continued on the page following)

Valves for Class I and Class II Piping (Cont.)

Boiler feed or blow-off service: For boiler feed or blow-off service, the Marine Engineering Regulations specify that valves and fittings can only be used for working pressures up to 83⅓ per cent of the recommended steam working pressure.

Iron valves: Iron valves can be used on steam, water, and oil transfer and filling systems (not fuel oil pumps to burners), and for boiler mountings where the maximum pressure does not exceed 30 pounds.

Fuel oil service piping: For fuel oil pressure piping from pumps to burners (not including cargo oil transfer or discharge piping), valves and fittings must conform to Class I requirements and be designed for at least 250 pounds steam working pressure; cast iron valves and fittings, and bushings and street elbows, are not permitted.

Steel valves: In addition to the types shown in the table below, other Crane Steel Valves are available, as follows:

Bolted bonnet valves in sizes 2-inch and larger are available with screwed and butt-welding ends and also in the 900 and 1500-Pound pressure classes.

Pressure-Seal Bonnet Valves are available in sizes 1-inch and larger in 600, 900, and 1500-Pound pressure classes; Lip-Seal Bonnet Globe and Angle Valves are available in sizes ½ to 2-inch in 1500 and 2500-Pound pressure classes. Refer to Section 21 for complete details.

Flanged End Steel Valves in sizes ½ to 2-inch are available with 150-Pound end flanges; these are made special from patterns of the Nos. 3615 XW, 3656 W, 3657 W, and 3686 X; see 600-Pound Valves in the left hand portion of the table below.

Body and bonnet materials: The body and bonnet of all of the 600-Pound Valves shown in the left hand portion of the table below except the No. 174 X Swing Check Valves are made of carbon steel. The No. 174 X and the 1500-Pound Valves have these parts made of Crane No. 4 Carbon-Molybdenum Alloy Steel.

Of the valves shown in the right hand portion of the table, the 150-Pound Valves have a carbon steel body and bonnet and the 300, 400, and 600-Pound Valves have Crane No. 4 Carbon-Molybdenum Alloy Steel bodies and bonnets.

Flange facings: Crane 150 and 300-Pound Flanged Steel Valves are regularly furnished with 1/16-inch raised "serrated" faces. The 400 and 600-Pound Valves are regularly furnished with ¼-inch large male "serrated" faces.

Other types of facing, such as ring joint, can be supplied when ordered, but those just mentioned are most commonly used on marine piping.

Other valves for marine service: The tables on this and the preceding page show the Crane Valves that are most popular for marine piping. Other sizes, types, and designs also are available; additional information will be furnished on request.

Steel Valves for Class I Piping

Sizes ¼ to 2-inch, inclusive (Screwed, Socket-Welding, and Flanged Valves)								Sizes 2-inch and larger (Flanged Valves Only)				
Pressure Class and Type of Valve		Type of Ends	Crane Valves Recommended Catalog Nos. With Union Bonnet	With Bolted Bonnet	Range of Sizes	For ratings, see page 402	For data, see page	Pressure Class	Crane Valves Recommended Type of Valve and Catalog Nos.	Range of Sizes	For ratings, see page 402	For data, see page
600 Pound	Gate	Screwed	3602XW		¼-2"	Col. 1	223	150 Pound	Gate	47 XR	2-24"	Col. 4	229
		Socket-Weld.		3607 XW	½-2	Col. 1	225			47 U	2-24	Col. 4	229
		Flanged		3611 XW	½-2	Col. 1	225		Globe	143 XR	2-8	Col. 4	246
				3615 XW	½-2	Col. 2	225		Angle	145 XR	2-8	Col. 4	246
	Globe	Screwed	3640 W		¼-¾	Col. 1	239		Check	147 X	2-8	Col. 4	255
				3644 W	½-2	Col. 1	239	300 Pound	Gate	33 XR	2-24	Col. 10	229
		Socket-Weld.	3648 W		¼, ⅜	Col. 1	239			33 U	2-24	Col. 10	229
				3652 W	½-2	Col. 1	239		Globe	151 XR	2-8	Col. 10	246
		Flanged		3656 W	½-2	Col. 2	239			151 U	2-8	Col. 10	246
	Angle	Screwed	3641 W		¼-¾	Col. 1	239		Angle	153 XR	2-8	Col. 10	246
				3645 W	½-2	Col. 1	239			153 U	2-8	Col. 10	246
		Socket-Weld.	3649 W		¼, ⅜	Col. 1	239		Check	159 X	2-12	Col. 10	255
				3653 W	½-2	Col. 1	239	400 Pound	Gate	61 XR	4-24	Col. 11	229
		Flanged		3657 W	½-2	Col. 2	239			61 U	4-24	Col. 11	229
	Lift Check	Screwed	3670 X		¼-¾	Col. 1	250		Globe	161 XR	4-8	Col. 11	246
				3674 X	½-2	Col. 1	251			161 U	4-8	Col. 11	246
		Socket-Weld.	3678 X		¼, ⅜	Col. 1	250		Angle	163 XR	4-8	Col. 11	246
				3682 X	½-2	Col. 1	251			163 U	4-8	Col. 11	246
		Flanged		3686 X	½-2	Col. 2	251		Check	169 X	4-12	Col. 11	255
	Swing	Screwed		174 X	½-2	Col. 12	255	600 Pound	Gate	76 XR	2-24	Col. 12	229
1500 Pound	Globe	Screwed		3844 U	½-2	Col. 3	241			76 U	2-24	Col. 12	229
		Socket-Weld.		3852 U	½-2	Col. 3	241		Globe	171 XR	2-6	Col. 12	246
	Angle	Screwed		3845 U	½-2	Col. 3	241			171 U	2-6	Col. 12	246
		Socket-Weld.		3853 U	½-2	Col. 3	241		Angle	173 XR	2½-6	Col. 12	246
										173 U	2½-6	Col. 12	246
									Check	175 X	2-12	Col. 12	255

For marine ratings of steel valves, see page 402.

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Pressure-Temperature Ratings—Steel Valves for Marine Service

Based on Marine Engineering Regulations—U.S. Coast Guard

The pressure-temperature ratings shown below apply to Crane Steel Valves and also to Crane Steel Flanged Fittings and Flanges when used in piping aboard ship. They were taken from the Marine Engineering Regulations issued November, 1949 by the United States Coast Guard, and are the same as ratings published in the American Standard for Steel Pipe Flanges and Flanged Fittings, ASA B16e6-1949 up to the maximum ratings established in the Regulations. No ratings are shown in the Marine Engineering Regulations for steel screwed and socket-welding valves; those in Columns 1 and 3 are, therefore, Crane ratings.

Flanged fittings and flanges: Flanged fittings in the 150-pound class are carbon steel and in the 300 to 1500-pound classes are Crane No. 4 Carbon-Molybdenum Alloy Steel. 150 and 300-Pound classes have 1/16-inch raised faces; 400-pound and higher pressure classes have 1/4-inch high large male faces.

Flanges in all pressure classes are carbon steel with a 1/16-inch raised face on 150 and 300-pound classes and a 1/4-inch large male or, if specified, a 3/16-inch large female face on 400 to 1500-Pound pressure classes. When so specified, 300, 400, 600, 900, and 1500-Pound Flanges can be furnished of Crane No. 4 Carbon-Molybdenum Alloy Steel.

Valve trim recommendations: ***Valves with XR trim*** (Exelloy to No. 49 Nickel Alloy) are particularly satisfactory for steam, water, air, gas, and other non-lubricating and relatively non-corrosive fluids such as gasoline, fuel oil, etc. They also are well suited for oil having low viscosity such as used in hydraulic systems especially where seating loads are extremely high. Maximum recommended temperatures for "XR" trimmed valves are: 850° F. on steam and 500° F. on all other services.

W and XW trim ("W" is hardened stainless steel), supplied only in the small 600-Pound Gate, Globe, and Angle Valves, may be used for the services mentioned below; the maximum recommended temperature is the same as for the valves.

U trim (Stellite) is provided primarily for high temperature steam lines up to the maximum temperature limitation on valves in which this trim is used.

X trim (Exelloy) as used in Check Valves, because of the particular operating conditions to which check valve seating surfaces are subjected, is recommended for any fluid requiring "W", "XR", "U", "XW", or "X" trimmed Gate, Globe, and Angle Valves. The maximum steam temperature limitation is the same as for the Check Valves in which this trim is used.

Since "X" trimmed Gate, Globe, and Angle Valves are infrequently used in marine service, they are not covered in the table or on page 401; for details, refer to Section 22 for Gate Valves and Section 23 for Globe and Angle. "X" trimmed Gate, Globe, and Angle Valves should be used for all oil and oil vapor service at temperatures over 500° F. and for most corrosive and unrefined oils, regardless of temperature. For lubricating oils up to 500° F., either "X" or "XR" trim should give equal satisfaction.

Valve Trim	Temp. Deg. F.	Maximum Non-Shock Working Pressures—Pounds per Square Inch														
		Valves—1/4 to 2-inch			Valves—2-inch and Larger Flanged Fittings and Flanges—All Sizes											
		Carbon Steel		No. 4 Steel	Carbon Steel 150-Pound Flanged Valves 150-Pound Flanged Fittings 150 to 1500-Pound Flanges						No. 4 Alloy Steel Flanged Valves Flanged Fittings Flanges					
		Screwed and Socket-Welding	Flanged with 1/4-inch Male Face	Screwed and Socket-Welding	1/16" Raised Face		1/4" Large Male Face				1/16" Raised Face		1/4" Large Male Face			
See explanation above		600 Lb. Col. 1	600 Lb. Col. 2	1500 Lb. Col. 3	150 Lb. Col. 4	300 Lb. Col. 5	400 Lb. Col. 6	600 Lb. Col. 7	900 Lb. Col. 8	1500 Lb. Col. 9	300 Lb. Col. 10	400 Lb. Col. 11	600 Lb. Col. 12	900 Lb. Col. 13	1500 Lb. Col. 14	
Class XR 850° F. Max.	100	2000	1200	3600	230	600	800	1200	1800	3000	600	800	1200	1800	3000	
	150	1910	1180	3550	220	590	785	1180	1770	2950	590	785	1180	1770	2950	
	200	1820	1160	3500	210	580	770	1160	1740	2900	580	770	1160	1740	2900	
	250	1730	1140	3450	200	570	760	1140	1710	2850	570	760	1140	1710	2850	
Class X For Check Valves on Steam	300	1640	1120	3415	190	560	740	1120	1680	2800	560	740	1120	1680	2800	
	350	1550	1095	3375	180	550	725	1095	1645	2740	550	725	1095	1645	2740	
	400	1460	1075	3330	170	540	710	1075	1615	2690	540	710	1075	1615	2690	
	450	1370	1050	3295	160	525	700	1050	1580	2630	525	700	1050	1580	2630	
	500	1280	1000	3125	150	500	665	1000	1500	2500	500	665	1000	1500	2500	
	550	1190	950	2955	140	475	630	950	1420	2370	475	630	950	1420	2370	
	600	1110	890	2770	130	445	590	890	1330	2220	445	590	890	1330	2220	
	650	1030	830	2580	120	415	550	830	1240	2070	415	550	830	1240	2070	
Class U W or XW	700	940	760	2350	110	380	500	760	1140	1900	380	500	760	1140	1900	
	750	850	680	2125	100	340	450	680	1020	1700	360	475	720	1080	1800	
	800	780	600	1875	92	300	400	600	900	1500	340	450	680	1020	1700	
	850			1750							320	425	640	960	1600	
	900			1625							300	400	600	900	1500	

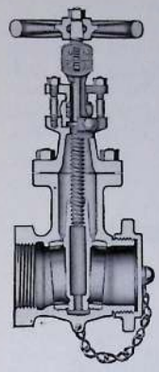
For limitations on boiler feed service, see page 401.

Ratings for steel flanged valves with other types of flange facings will be furnished on request.

Brass Hose Gate Valves

Non-Rising Stem Type with Indicator

100 pounds cold water working pressure



Cross Section No. 4448 Screwed

These are strong, durable valves with non-rising stems. An approved type indicator shows whether the valve is open or closed.

The body, bonnet, stem, body seat rings, and solid wedge disc are brass. Sizes 1½ and 2-inch have a screwed bonnet and integral seats; their hexagonal packing nut and gland are brass. The 2½-inch size has a bolted bonnet, renewable seats, and a brass bolted gland.

Stuffing box; repacking: The stuffing box is deep, and is filled with high grade packing. The valves, when wide open, can be repacked while under pressure.

Flanged valves: End flanges conform to the MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). They are plain faced, with two V-shaped concentric grooves between the port and the bolt holes. Prices include drilling; no duction for valves ordered faced only. Use full face gaskets; see page 472.

Hose Thread: These valves will be regularly furnished with any recognized standard hose thread used in marine work; see page 59. Orders must specify the type of hose thread desired. When other hose threads are required, send detailed information or a sample, preferably the male end of a hose coupling, and special prices will be quoted.

Globe and angle hose valves: Brass globe and angle hose valves made from the patterns of the No. 7 and No. 9 valves shown on page 28 can be made to order; prices on application.



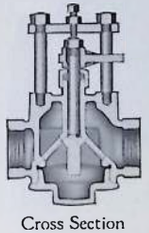
No. 4449 Flanged

List Prices, Each, and Dimensions, in Inches

Size Inches	1½	2	2½
No. 4448, Screwed	53.50	80.50	107.00
No. 4449, Flanged, F. & D.	62.50	98.00	134.00
Center to female end, Screwed	1 5/8	1 7/8	2 3/4
Center to face, Flanged	2 3/16	2 3/4	2 1/2
Center to hose end	2 1/16	2 5/16	2 5/8
Center to top	8 5/8	9 3/4	11 1/2
Diameter of wheel	3 5/8	4 1/16	6
Diameter of flanges	5	6	7
Thickness of flanges	7/16	1/2	9/16

Bronze Chronometer Valves

250 pounds saturated steam working pressure



Cross Section No. 4382, Screwed

Recommendations: Crane Bronze Chronometer Valves are designed for regulating and governing purposes and should not be used as stop valves.

The valves open or close completely in one-eighth turn of the lever. The pressure of the disc against the seat bearing can be adjusted, when easier operation is desired, by means of the screw at the stem end. With proper adjustment, the valves can be operated by a float.

Design: The valves have a Crane Special Bronze body, cap, and disc, brass stem, and malleable iron lever. Sizes 1½-inch and smaller have a screwed cap and packing nut; larger sizes have a bolted cap and gland.

Flanged valves: End flanges conform to the MSS 250-Pound SP Bronze Flange Standard (No. SP-2-1937). They are plain faced, with two V-shaped concentric grooves between the port and bolt holes.



No. 4383, Flanged

Drilling: Prices of flanged valves include drilling to the MSS 250-Pound Standard; no deduction is made if valves are ordered faced only. Full face gaskets should be used; see page 472.

List Prices, Each, and Dimensions, in Inches

Size Inches	½	¾	1	1¼	1½	2	2½
No. 4382, Screwed	82.50	82.50	82.50	121.00	121.00	242.00	363.00
No. 4383, Flanged, F. & D.				161.00	161.00	314.00	468.00
End to end, Screwed	5 1/4	5 1/4	5 1/4	6 1/2	6 1/2	8 3/4	10 3/4
Face to face, Flanged				7	7	9 3/4	11 3/4
Center of valve to top	5 3/4	5 3/4	5 3/4	7	7	8 1/2	9 3/4
Center of stem to end of handle	4 3/4	4 3/4	4 3/4	6 1/4	6 1/4	7 1/2	8 3/4
Diameter of flange				5 1/4	6 1/8	6 1/2	7 1/2
Thickness of flange				17/32	9/16	5/8	11/16

Templates for drilling . . . page 458

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Comments

Illustrated in this section are some of the valves regularly manufactured for commercial use, which also conform to the requirements for Class I or Class II Piping in marine service.

For information on maximum pressure-temperature ratings to which these valves may be subjected, as defined in the Marine Engineering Regulations, see pages 398 to 402. Commercial service ratings other than those referred to will be found on the pages on which the valves are regularly listed.

Regularly manufactured valves used primarily for marine installations—hose gate valves and chronometer valves—are illustrated and listed on page 403. Other valves furnished especially to order, such as: iron body gate valves with cleanouts, steel main injection valves, manifold valves of brass, ferro-steel, or cast steel, and screw-down check valves of brass, iron, or steel are shown on pages 405, 406, and 408.

Brass Gate Valves



No. 428 Gate Screwed

Crane Brass Gate Valves are liberally proportioned to assure a high factor of safety against pressure, operating strains, and expansion and contraction of piping.

No. 428 Valves: These valves are of the inside screw, rising stem type, with screwed ends and solid wedge disc and are made in sizes ¼ to 3-inch. Recommended commercially for 125 pounds saturated steam and 200 pounds cold water, oil, or gas pressure.

No. 4437 Valves: These valves are of the bolted bonnet, non-rising stem type, with flanged ends and solid wedge disc and are made in sizes 2 to 10-inch. They are regularly furnished with an indicator but are also available without this feature. The body seat rings are renewable. Valves with screwed ends (No. 4436), in sizes 2 to 3-inch are also available. All are rated commercially for 100 pounds saturated steam, 125 pounds water at 200° F., and 125 pounds oil or gas at 150° F.



No. 4437 Gate, Flanged with Indicator

Bronze Globe and Angle Valves

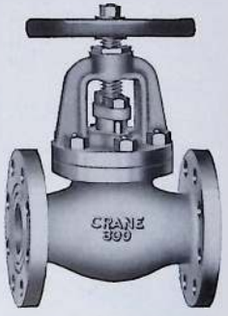


No. 70 Globe Screwed

Both of the conventional types of valves illustrated are also available in the screw-down check type, shown on page 408.

No. 70 Valves: This line of union bonnet, integral seat, regrinding type valves consists of both the globe and angle patterns with screwed ends (No. 70), sizes ⅛ to 3-inch, and with flanged ends (No. 71), sizes 1 to 3-inch. They are rated commercially for 500° F. steam—at 200 pounds pressure on the screwed end valves and 150 pounds pressure on the flanged end valves.

No. 87 P Valves: These bolted bonnet, outside screw and yoke valves with renewable seat ring and plug type disc and seat combination are made in the globe (No. 87 P) and angle (No. 87½ P) patterns with flanged ends only, in sizes 1½ to 3-inch. They are rated commercially for 550° F. steam at 300 pounds pressure.



No. 87 P Globe, Flanged

Bronze Swing Check Valves



No. 36 Y-Pattern Swing Check Screwed

The swing check valves illustrated have integral seats. The seats in all sizes on the No. 36 line with threaded cap, and sizes 4-inch and smaller on the No. 4033 line with bolted cap, can be reground without removing the bodies from the line. All sizes are rated commercially for 500° F. steam—at 200 pounds pressure on the screwed valves and 150 pounds pressure on the flanged valves.

No. 36 Valves: This line includes the screwed end pattern (No. 36) in sizes ¼ to 3-inch, and the flanged end pattern (No. 38) in sizes 1 to 3-inch.

No. 4033 Valves: These valves are available with screwed ends (No. 4032) in sizes 2 to 3-inch, and with flanged ends (No. 4033) in sizes 2 to 6-inch



No. 4033 Swing Check Flanged

For prices, dimensions, complete descriptions, and other ratings on above valves, refer to the following:
Gate . . . . pages 15 and 16 *Globe and angle . . . . pages 33 and 37* *Swing check . . . . pages 48 and 50*

Iron Body Wedge Gate Valves

WORKING PRESSURE
125 pounds saturated steam, water, or oil

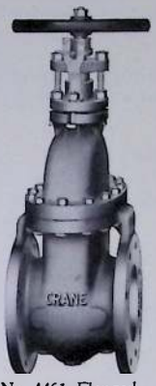
Prices on application

These valves are similar in design to the regular Crane 125-Pound Iron Body Wedge Gate Valves shown on pages 77 to 81, but are specially fitted for marine service.

The Nos. 4461 and 4465 valves are regularly made in sizes 2 to 12-inch, inclusive, flanged end only.

The No. 4467 valve, recommended for marine cargo oil systems, is regularly made in sizes 3, 4, 6, 8, 10, and 12-inch, flanged end only.

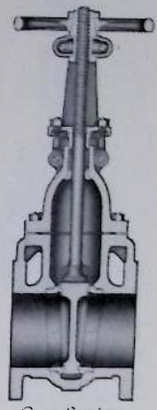
Screwed end valves, specially trimmed valves, other sizes, and other modifications of these valves can be furnished on special order.



No. 4461, Flanged Non-Rising Stem With Indicator



No. 4467, Flanged Non-Rising Stem With Cleanout and Indicator



Cross Section No. 4465, Flanged Outside Screw and Yoke

Body and bonnet: The valves have an oval-shaped cast iron body and bonnet; liberal metal sections combined with proper metal distribution assure maximum strength. Straight through ports with tie ribs between the bonnet flange and the end flanges provide additional resistance to line strains.

No. 4467 valve bodies have a single side cleanout. Bottom cleanouts can be furnished when ordered. They have two tapped and plugged bosses, one on the side opposite the cleanout and one on the bottom, suitable for ¾-inch steaming out connections.

The gland bolts and nuts are brass.

Disc and seats: The body seat rings are brass and are screwed into the body. No. 4467 valves in sizes 10 and 12-inch have pressed-in body seat rings.

All of these valves are regularly furnished with a cast iron disc having brass seating faces; it is brass-bushed where it engages the stem threads. A solid brass disc can be furnished when so ordered.

Stem: The brass stem is of liberal diameter and amply strong. Stem threads have long engagement in the disc or yoke sleeve. Outside screw and yoke valves have a tee-head disc-stem connection.

Gland and stuffing box: These valves have a two-piece ball-type gland, consisting of a gland and a gland flange. This construction maintains an even load on the packing and prevents binding on the stem even when the gland bolt nuts are not pulled up evenly.

Non-rising stem valves have bronze gland bolts holding the gland flange to the stuffing box; the stem collar recess is brass-bushed, top and bottom, to minimize friction and to prevent corrosion. Outside screw and yoke valves have swinging gland eye bolts made of bronze, which move out of the way when the stuffing box is being repacked but which will not become detached and lost.

The stuffing box is exceptionally deep and is filled with high grade packing.

Repacking: These valves, when wide open, can be repacked while under pressure. Outside screw and yoke valves have a brass bonnet bushing, offering a better back seat for the stem and making this point non-corrosive.

Indicator on Non-Rising Stem Valves: No. 4461 Valves are regularly furnished with an approved type indicator to show whether the valve is open or closed. No. 4467 Valves, not regularly furnished with an indicator, will be so equipped when specified on orders.

Flange dimensions and facing: The dimensions and drilling of the end flanges conform to the American Cast Iron Flange Standard, Class 125 (B16.1-1948). The flanges are plain faced, with a smooth finish.

Drilling: Prices include facing and drilling to the American Cast Iron Flange Standard, Class 125. No deduction is made when valves are ordered faced only.

Standards: Flanged valves conform to the American Standard for Face to Face Dimensions of Ferrous Flanged Valves (B16.10-1939) for 125-Pound Cast Iron Wedge Gate Valves.

Flanged valves in the sizes included therein, also conform to the American Petroleum Institute (API) Standard for Valves for Pipe Line Service, No. 6-D, Sixth Edition, May, 1949, except for markings.

Dimensions: Dimensions of these valves are the same as given for the regular line of Crane 125-Pound Iron Body Wedge Gate Valves; see page 81.

For Marine specifications, boiler feed service, general requirements, etc., see pages 398 and 399.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Iron Body Globe and Angle Valves



No. 351
Globe, Flanged
Brass Trimmed



No. 353
Angle, Flanged
Brass Trimmed

These valves, made in sizes 2 to 10-inch, have a cast iron yoke-type bolted bonnet and cast iron body, and are brass fitted throughout. They have a screwed-in brass body seat ring, a solid brass disc on sizes 6-inch and smaller, an iron disc with brass seating face on larger sizes, a Cast Manganese Bronze stem and yoke bushing, a brass stem hole bushing, and bronze gland studs and nuts.

The disc is accurately guided throughout its travel by a guide stem through the bridge which is cast integral with the body seat ring. The gland is of the two-piece ball-type construction, consisting of an Ihrigized steel gland and a malleable iron gland flange.

The valves are rated commercially for 125 pounds saturated steam, and 200 pounds cold water, oil, or gas working pressure.

For prices, dimensions, and complete description, see pages 107 and 108. Screw-down check valves can be made to order; see page 408.

Iron Body Swing Check Valves



No. 373
Swing, Flanged
Brass Trimmed

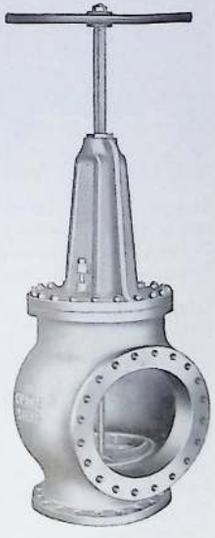
These valves, made in sizes 2 to 24-inch, are sturdily constructed and well proportioned. The body is oval or globular in shape, providing an ample flow area around the disc when the valve is wide open.

The body and cap are cast iron, the body seat ring is brass, screwed into the body; the disc is solid brass on sizes 3-inch and smaller, and cast iron with a brass seating face on larger sizes. Valves with solid brass disc in sizes larger than 3-inch can be made to order; prices will be furnished on application.

For prices, working pressures, dimensions, and complete description, see pages 116 and 117.

Main Injection Valves

Cast Steel
High Lift Angle
Main Injection
Valve

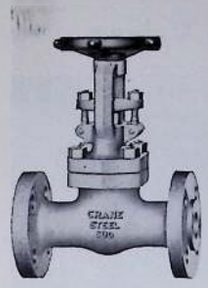


Illustrated at the right is a 20-inch Crane Cast Steel Main Injection Valve with the disc raised out of the path of flow and the disc guide stem extending through the bridge of the body seat ring.

These valves are made to order in a wide range of sizes in either cast steel or iron, with brass trimmings; prices on request.

For Marine specifications, boiler feed service, general requirements, etc., see pages 398 and 399.

Steel Gate Valves



No. 3615 XW
Gate
Flanged

The bolted bonnet gate valves illustrated are of the outside screw and yoke type with cast carbon steel bodies, bonnets, and yokes. The discs are of the solid wedge or solid web type with close-fitting guides to maintain accurate seating and to reduce wear. A tee-head disc-stem connection prevents lateral strains on the Exelloy stem.

These valves are rated commercially for a maximum of 850° F. steam or water, at working pressures shown on pages 224 and 226.

No. 3615 XW Valves: This line of sturdy, compact cast steel gate valves is made in sizes ½ to 2-inch—with screwed ends (No. 3607 XW), socket-welding ends (No. 3611 XW), and flanged ends (No. 3615 XW).

No. 47 XR Valves: This line is made with screwed ends (No. 46 XR) in sizes 2, 2½, 3, and 4-inch; with butt-welding ends (No. 47½ XR) in sizes 2 to 3-inch and 4 to 24-inch, and with flanged ends (No. 47 XR) in sizes 2 to 24-inch.



No. 47 XR
Gate
Flanged

Steel Globe and Angle Valves



No. 3656 W
Globe
Flanged

These valves are all of the bolted bonnet, outside screw and yoke type. All have Exelloy stems; sizes 6-inch and smaller have plug type discs and seats; the 8-inch size has a flat disc and seat. They are rated commercially for a maximum of 850° F. steam or water, at working pressures shown on pages 238 and 243.

No. 3656 W Valves: The Crane line of small forged steel globe and angle valves includes the screwed type (No. 3644 W Globe, No. 3645 W Angle), the socket-welding type (No. 3652 W Globe, No. 3653 W Angle), and the flanged type (No. 3650 W Globe, No. 3657 W Angle), in sizes ½ to 2-inch.

No. 143 XR Valves: Crane 150-Pound Cast Steel Globe and Angle Valves are made with screwed ends (No. 142 XR Globe, No. 144 XR Angle) in sizes 2, 2½, 3, and 4-inch; with butt-welding ends (No. 143½ XR Globe, No. 145½ XR Angle) in sizes 2 to 3-inch and 4 to 8-inch, and with flanged ends (No. 143 XR Globe, No. 145 XR Angle) in sizes 2 to 8-inch.

Screw-Down Check Valves: Refer to page 408 for 150-Pound Cast Steel Globe and Angle Valves made screw-down check type.



No. 143 XR
Globe
Flanged

Steel Check Valves



No. 3682 X
Check
Socket-Welding

These bolted cap check valves are recommended commercially for a maximum temperature of 850° F. steam or water, at working pressures shown on pages 250 and 252.

No. 3682 X Valves: This line, in sizes ½ to 2-inch, consists of the following forged steel lift check valves: screwed ends (No. 3674 X), socket-welding ends (No. 3682 X), and flanged ends (No. 3686 X).

No. 147 X Valves: This line of carbon cast steel swing check valves is made with screwed ends (No. 148 X) in sizes 2, 2½, 3, and 4-inch; with butt-welding ends (No. 147½ X) in sizes 2 to 3-inch and 4 to 8-inch, and with flanged ends (No. 147 X) in sizes 2 to 12-inch.



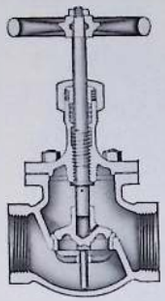
No. 147 X
Check
Flanged

Prices, dimensions, complete description, and ratings on valves:
Gate....pages 221 to 231 Globe and Angle....pages 235 to 248 Check....pages 249 to 256

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Special Valves for Marine Service

Screw-Down Check Valves



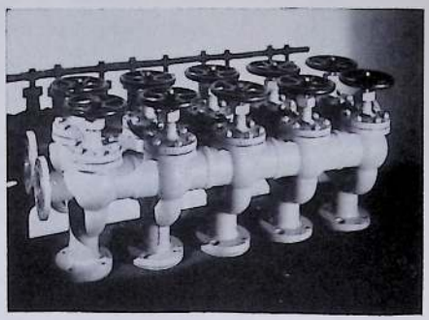
Bronze Screw-Down Check Valves

No. 4296, Globe, Screwed
No. 4297, Globe, Flanged
No. 4298, Angle, Screwed
No. 4299, Angle, Flanged

The cross section above (No. 4296, with stem raised) shows a typical Crane Globe Type Screw-Down Check Valve. The Crane design makes it possible for one valve to serve as both a stop valve and a check valve.

The complete Crane line of Screw-Down Check Valves includes bolted or union bonnet bronze valves with flanged or screwed ends as well as bolted bonnet iron and steel valves with flanged ends. The valves are made to order only; prices will be furnished on application.

Manifold Valves

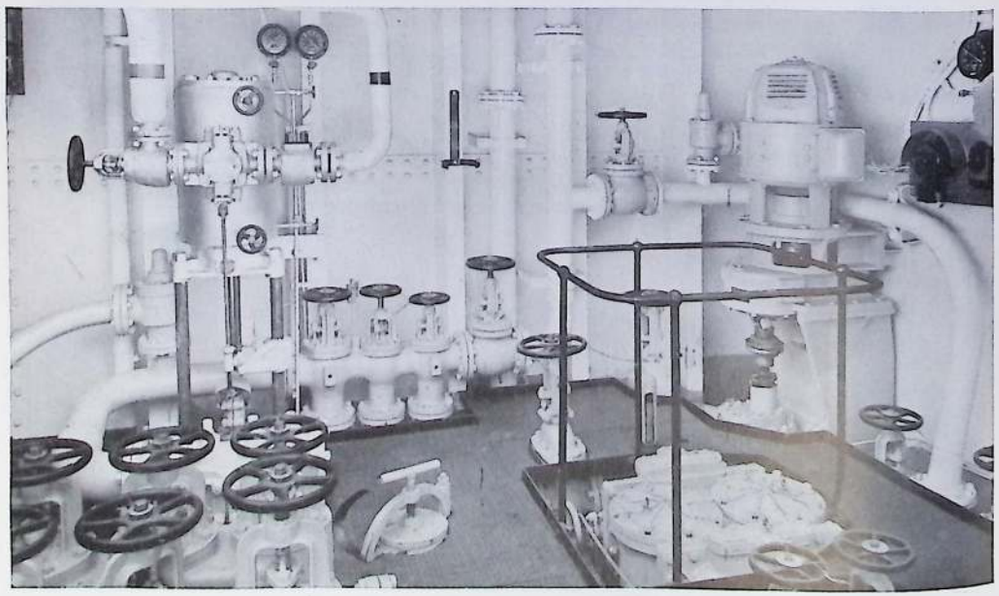


Cast Steel Manifold Valve

The illustration above is that of a ten-valve Crane 150-Pound Cast Steel Manifold Valve.

Manifold valves made of brass, ferrosteel, or fabricated cast steel are ideal for the transfer of cargo oil, bilge water, or salt water from one point to another.

Complete details on types and sizes will be furnished on request.



Crane valves for marine service are used extensively in piping installations aboard ship.

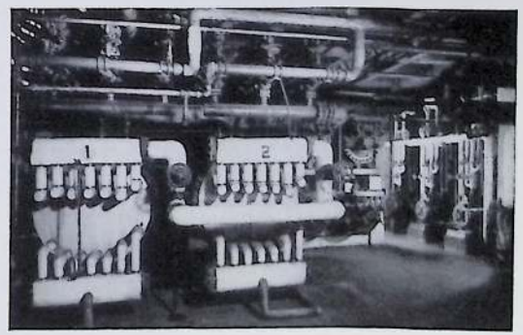
Valves and Fittings for Ammonia

General Description ..... page 410

Valves
Globe and Angle, Bolted Bonnet ..... page 411
Globe and Angle, Union Bonnet ..... page 412
Lift Check ..... page 412
Expansion ..... page 413

Fittings
Flanged ..... page 414
Double Pipe ..... page 415

Other Ammonia Products
Flanges ..... pages 414 and 415
Liquid Gauges ..... page 413
Gaskets ..... page 416
Atmospheric Condensers ..... page 417
Pipe Stands ..... page 417



Crane ammonia products in the refrigeration section of a large hotel.

For greater convenience, the following valves and fittings, suitable for ammonia, are shown in other sections of this catalog because of their adaptability to general piping service:

Screwed Fittings ..... pages 146 and 147
Plugs ..... page 166
Bushings ..... page 167
Wrought Steel Nipples ..... pages 168 and 169
Steel Pipe Couplings ..... page 170
Screwed Unions ..... pages 177 and 263
Flange Unions, Tongue and Groove ..... page 182
Combination Elbows ..... page 266
Welding Fittings ..... pages 275 to 286
Relief Valves ..... page 331
Pressure Gauges ..... pages 366 and 367

Fabricated Double Pipe Heat Exchangers ..... ***page 522***

Valves and Fittings for Ammonia

—From Crane— A Complete Line



Valves of many types, such as bolted and union bonnet globes and angles, expansion type, and lift checks—all with Crane quality and dependability. See pages 411 to 413.



Fittings designed for a variety of needs include elbows, tees, return bends, and double pipe fittings for water cooler use. See pages 414 and 415.



Flanges, both screwed and blind with tongue or groove ends, are shown on pages 414 and 415.



Liquid Gauges feature a special lead seat. See page 413.



Gaskets for ammonia service. See page 416.

On the seven pages that follow, Crane presents a complete line of piping equipment designed specifically for use on hazardous liquids and gases.

Service recommendations are not limited to ammonia. The Crane line, unexcelled for high pressure (300 pounds) ammonia refrigeration service, is equally suited for air, gas, oil, or chemical service, or in special process work where all-iron construction is desired.

The valves, flanged fittings, and liquid gauge are given a 300-pound air-under-water test and, in addition to their ammonia rating, are suitable for:

500 pounds oil (non-shock), gas, or air up to 100° F.
300 pounds oil (non-shock), gas, or air up to 300° F.

The heavy duty, all-iron construction of the valves render them ideal for use in pulp and paper mills, wood treating plants, tanneries, in paint and varnish manufacture, textile and dyeing plants, sugar refineries, and in many other plants, including those manufacturing chemicals.

Metals are chosen for their effectiveness in ammonia service. The valves have durable Crane Ferrosteel bodies and, except for their stem and disc, are all-iron. Crane Ferrosteel is a high grade iron, approximately 35 per cent stronger than cast iron. Fittings are Crane Ferrosteel or malleable iron. Flanges are forged steel or malleable iron, depending on the size and style.

Copper and brass, unsuitable for ammonia, are not used.

Design and construction are pointed toward maximum safety at low cost. Metal sections are massive and rugged to provide a high safety factor and to minimize distortion. The valves have long, sweeping interior body contours to reduce flow resistance. A variety of seating combinations are available.

Stems are made of steel. They have a tapered, machined shoulder which seats against a machined chamfer in the bonnet when the valve is wide open. This seals pressure from the packing, assures tightness at the stuffing box, and enables repacking the valve when it is wide open and under pressure.

Stuffing boxes are unusually deep and are filled with high grade packing. Valves 1½-inch and smaller have a screwed packing nut; larger sizes have a one-piece bolted gland.

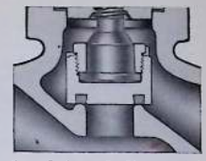
Valve and fitting ends include both flanged and screwed types. Flanged ends have tongue and groove faces to assure tightness at the joints and to protect against gasket blowouts. On valves, the tongue face is on the end flange next to the upper side of the disc.

Screwed ends feature long threads which are recessed to permit soldering the joints.

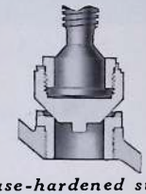
Interchangeability between flanged valves and flanged fittings provides for quick changes when necessary. The center to face and the face to face dimensions are the same for corresponding sizes. Thus, a flanged globe valve, for example, can be substituted for a flanged tee.

For detailed description and prices of the complete Crane line, see pages 410 to 417.

Seating Designed For Long Service



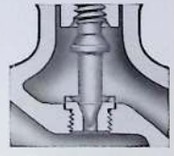
Lead-faced disc—with facing securely rolled into machined dovetail—regularly furnished with bolted bonnet globe and angle valves.



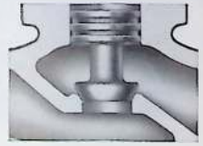
Case-hardened steel disc and steel seat ring for high temperatures and corrosive service. Available on bolted bonnet globe and angle valves when specified.



Plug type disc integral with stem. Furnished on union bonnet globe and angle valves.



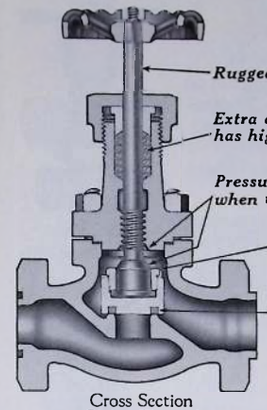
Needle-point stem construction to permit very accurate adjustment. Used on expansion valves.



Check valve disc is cushioned by a dashpot to lengthen service life.

Ferrosteel Globe and Angle Valves for Ammonia

Bolted Bonnet—Special Lead-Faced Disc



Cross Section
Globe, Flanged

300 pounds ammonia working pressure
300-pound air-under-water test

Recommendations: These valves are designed particularly for high pressure ammonia refrigeration service. The special seating design, extra tight stem seal and bonnet joint, and rugged all-iron construction assure safe, economical handling of hazardous liquid and gas refrigerants.

The valves are also excellent for air, gas, and oil service, as well as for corrosive fluids in special process work and chemical plants where all-iron valves are required.



No. 1501
Globe, Flanged
Tongue and Groove



No. 1504
Globe, Screwed



No. 1505
Angle, Screwed

All-iron: Except for the stem and disc, the valves are all-iron. The body and bonnet, made of Crane Ferrosteel, are designed for smooth flow. Unusually massive metal sections provide a high safety factor.

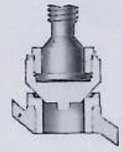
Disc and seat: The disc has a special lead face, securely rolled into a machined dovetail in the disc. The face seats upon a crowned face in the body, assuring tightness in service. On sizes ½-inch and smaller, the disc and stem are integral. On larger sizes, the disc is held to the stem by a threaded stem ring; the stem ring is locked to the disc, preventing the disc from becoming detached in service.

Stem and stuffing box: The stem is steel, nickel-plated and has a tapered, machined shoulder. When the valve is wide open, the shoulder seats against a machined chamfer in the bonnet. This seals pressure from the packing, assures tightness at the stuffing box, and permits repacking the valve when it is wide open and under pressure.

The stuffing box, unusually deep, is filled with high grade packing. Valves 1½-inch and smaller have a screwed packing nut; larger sizes have a bolted gland.

Steel Disc and Seat For High Temperatures And Corrosive Service

Where high temperatures or corrosive action prohibit the use of lead, order the valves with a case-hardened steel disc and a steel seat; extra prices are listed in the table below.



Such valves, when suitable stuffing box packing is used, are recommended for air or gas pressures up to 250 pounds at 500° F.

List Prices and Dimensions

Size	List Prices, per Valve				Dimensions, in Inches							
	With Lead-Faced Disc			Extra Charge for Steel Disc and Seat Ring	No. 1501			No. 1504		No. 1505		Diameter of wheel
Inches	*No. 1501 Globe Flanged F. & D.	No. 1504 Globe Screwed	No. 1505 Angle Screwed	Specify	Style of flanges	Groove bottom to face of tongue	Center to top, open	End to end	Center to top, open	Center to end	Center to top, open	All Valves
¼		16.00	16.00	7.50				4½	7¼	2¼	6¾	3⅝
⅜		16.00	16.00	7.50				4¾	7¼	2⅜	6¾	3⅝
½	19.00	17.50	17.50	8.00	Oval	5 13/16	7¼	5	7¼	2½	6¾	3⅝
¾	21.50	19.50	19.50	9.00		6 5/16	9¼	5½	9¼	2¾	8½	4 1/16
1	24.00	21.50	21.50	10.00		6 11/16	9¼	6¼	9¼	3⅛	8½	4 1/16
1¼	29.50	25.00	25.00	11.50		7⅜	11¼	6¾	11¼	3⅜	10¼	4¾
1½	35.00	29.50	29.50	13.00	Square	8⅛	11½	7½	11½	3¾	10¼	6
2	44.50	37.50	37.50	15.00		9⅛	12¼	8½	12¼	4¼	11	8
2½	56.50	48.50	48.50	20.00		10 5/16	12¾	9½	12¾	4¾	11¼	8
3	80.50	70.00	70.00	23.00	Round	12 13/16	14¼	12	14¼	6	12¾	9
4	121.00			27.00		14 9/16	16¼					10

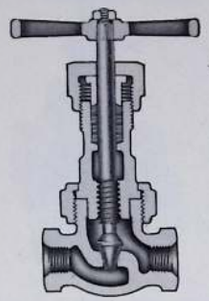
*List prices of No. 1501 Flanged Valves include facing and drilling but not companion flanges, bolts, or gaskets.

General description . . .page 410 *Dimensions of end flanges and facing . . page 416* *Companion flanges . . page 415*

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Ferrosteel Globe and Angle Valves for Ammonia

Union Bonnet — Plug Type Disc



Cross Section
Union Bonnet Globe
With Plug Type Disc

300 pounds ammonia working pressure
300-pound air-under-water test

Recommendations: These valves have a wide application in services where plug type disc valves can be utilized. Recommended primarily for high pressure ammonia refrigeration use, the valves are equally suitable for air, oil, or gas, for corrosive fluids in special process work, and for chemical plants where rugged, all-iron construction is needed.

Construction: The valves are of the inside screw, rising stem type. Their plug type disc is integral with a nickel-plated, steel stem. The union bonnet construction provides a strong, tight joint between the Crane Ferrosteel body and the malleable iron bonnet. The unusually deep stuffing box is filled with high grade packing and equipped with a gland. The valves, when wide open, can be repacked while under pressure.

All-iron: Except for the steel stem with integral disc, the valves are all-iron. Copper and brass, unsuited for corrosive services, are not used in their construction.

Regrinding: The valves may be reground without removing them from the line.



No. 1504½
Globe
Screwed



No. 1505½
Angle
Screwed

List Prices and Dimensions

Size	List Prices, Each		Dimensions, in Inches			
	No. 1504½ Globe Screwed	No. 1505½ Angle Screwed	End to end	Center to end	Center to top, open	Length of tee handle
Inches			Globe	Angle		
¼	15.50	15.50	3	1½	6 9/16	4½
⅜	15.50	15.50	3¼	1⅝	6⅝	4½
½	16.00	16.00	3½	1¾	6⅞	4½
¾	17.50	17.50	4	2	8¼	6
1	19.00	19.00	4½	2¼	8½	6

Ferrosteel Lift Check Valves for Ammonia

300 pounds ammonia working pressure
300-pound air-under-water test



Cross Section
No. 1507½



No. 1507½
Horizontal Lift Check
Screwed

Recommendations: No. 1507½ Lift Check Valves, like all valves in the Crane Ammonia line, are ideal for high pressure ammonia service, for air, gas, or oil, or for corrosive services and special process work requiring heavy duty, all-iron construction.

Construction: Unusually heavy, massive metal sections provide a high safety factor. The valve cap is bolted on by means of four steel bolt-studs. The cap joint is tongue and groove, assuring positive retention of the 1/16-inch thick Cranite gasket.

The upper end of the disc is piston-shaped and fits snugly in the body. This dash-pot type of construction cushions the disc in service and increases the life of the valve. The disc is guided at both ends in sizes 1¼-inch and larger and, in sizes 1½ and 2-inch, is regularly equipped with a piston ring.

Materials: The body and cap are made of Crane Ferrosteel, a high grade iron about 35 per cent stronger than cast iron. The disc in sizes 1-inch and smaller is steel; in larger sizes, it is Ferrosteel.

List Prices and Dimensions

Size	No. 1507½, Lift Check Screwed		
	List Prices	End to end	Center to top
Inches	Each	Inches	Inches
½	27.00	5	2⅝
¾	28.00	5½	3½
1	30.00	6¼	3⅝
1¼	35.50	6¾	4⅛
1½	41.50	7½	4⅜
2	51.00	8½	5⅛

General description .... page 410

Ferrosteel Expansion Valves for Ammonia



No. 1513
Globe, Flanged
Tongue and Groove



No. 1519½
Globe, Screwed



No. 1519¾
Angle, Screwed

300 pounds ammonia working pressure
300-pound air-under-water test

Recommendations: These high grade expansion valves are recommended for high pressure ammonia refrigeration service, and for air or gas lines. They are particularly suited for use on short lines.

Construction and materials: The valves are of the rising stem, bolted bonnet type. They have a needle point stem with fine, close fitting threads to permit very accurate adjustment. The stem is steel and is nickel-plated above the threads. The body and bonnet are made of Crane Ferrosteel. The stuffing box is unusually deep and is fitted with a gland. The wheel is especially made for these valves. When wide open, the valves may be repacked while under pressure.



Cross Section
Globe, Screwed

List Prices and Dimensions

Size	List Prices, Each			Dimensions, in Inches							
				No. 1513			No. 1519½		No. 1519¼		Diameter of wheel
	*No. 1513 Globe	No. 1519½ Globe	No. 1519¾ Angle	Style of flanges	Groove bottom to face of tongue	Center to top, open	End to end	Center to top, open	Center to end	Center to top, open	
Inches	Flanged F. & D.	Screwed	Screwed								All Valves
¼	19.00	18.00	18.00	Oval	5 5/16	7½	4½	7½	2¼	7	3½
⅜	19.00	18.00	18.00		5 9/16	7½	4¾	7½	2⅜	7	3½
½	20.00	18.50	18.50		5 13/16	7½	5	7½	2½	7	3½
¾	21.50	19.50	19.50		6⅝16	7½	5½	7½	2¾	7	3½
1	24.00	21.50	21.50	Square	6 11/16	7½	6¼	7½	3⅛	7	3½

* List prices of flanged valves include facing and drilling but not companion flanges, bolts, or gaskets.

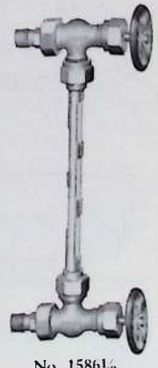
Companion Flanges .... page 415 *Dimensions of end flanges and facing .... page 416*

All-Iron Liquid Gauges for Ammonia

With Special Lead Seat

300 pounds ammonia working pressure
300-pound air-under-water test

Crane Liquid Gauges are recommended for ammonia, air, gas, or oil service. The gauge valves have a ball check valve in their inlet end. Should a glass tube be broken, the check valves close instantly and automatically, preventing the escape of fluid or gas. Unless otherwise ordered, gauges are furnished with 15-inch centers. Centers up to 24-inch are available at an extra charge; see price table.



No. 1586½
Liquid Gauge
With Special
Lead Seat

List Prices

Size	No. 1586½ Liquid Gauge		Parts for No. 1586½					
	With 15-inch centers	For each inch over 15 inches up to 24 inches	Upper or Lower Valve Only *Specify which is wanted*	Gauge Glass only, ⅝" O.D., for 15" centers	Guard only, for 15" centers	Rubber Gauge Glass Gasket only	Flat Steel Gauge Glass Washer only	Steel Stuffing Box Washer only
Inches	Each Complete	Add Per Inch	Each	Each	Each	Each	Each	Each
½	37.00	.55	17.00	.50	2.40	.05	.08	.08
¾	37.00	.55	17.00	.50	2.40	.05	.08	.08

Ammonia Relief Valves .... page 331 *Ammonia Pressure Gauges .... pages 366 and 367*

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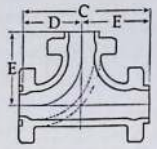
Fittings for Ammonia



No. 1521, 90° Elbow
Tongue & Groove
Flanged—Ferrosteel



No. 1523, Tee
Tongue & Groove
Flanged—Ferrosteel



No. 1521 or No. 1523

300 pounds ammonia working pressure
300-pound air-under-water test

Flanges used: All flanged ammonia fittings, with the exception of the No. 1563 Return Bend, require the No. 1547 Tongue and No. 1545 Groove Flanges shown on the opposite page. The No. 1563 Return Bend requires the No. 1556 Groove Flange shown below.

Fittings ordered with flanges are furnished with bolts, nuts, and Cranite gaskets.

Return bends: The No. 1563 Return Bends are extremely compact. They are ideal for close coupled coil assemblies such as are used in processing coke oven gas.

The No. 1570 Return Bend consists of a gasket, bolts, and two 90° elbows. One elbow has a screwed end and a flanged tongue end; the other, a screwed end and a flanged groove end.

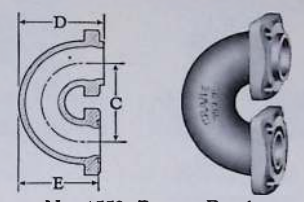
The No. 1570 can be divided and used as two screwed and flanged end elbows, or, by using all parts of a No. 1589 Flange Union (page 182), as two complete combination elbows with flanges, bolts, and gaskets.

List prices of flanged fittings do not include companion flanges, bolts, or gaskets. Prices of companion flanges do not include bolts or gaskets.

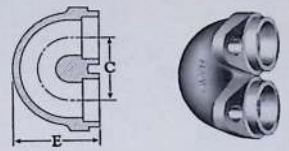
List Prices and Dimensions

Description of Product and Catalog Number		Style of Flanges	Size Inches	List Prices, Each Black	List Prices, Each Galv.	Dimensions, in Inches C	D	E
Flanged 90° Elbows	No. 1521	Oval	½	5.50			2 11/16	3 1/8
			¾	6.00			2 15/16	3 3/8
		Square	1	7.00			3 1/8	3 9/16
			1¼	8.00			3 3/8	4
			1½	9.50			3 3/4	4 3/8
			2	11.25			4 1/4	4 7/8
			2½	13.50			4 3/4	5 9/16
		Round	3	20.00			6	6 13/16
			4	33.50			6 7/8	7 11/16
Flanged Tees	No. 1523	Oval	½	8.25		5 13/16	2 11/16	3 1/8
			¾	9.00		6 5/16	2 15/16	3 3/8
		Square	1	10.50		6 11/16	3 1/8	3 9/16
			1¼	11.25		7 3/8	3 3/8	4
			1½	13.50		8 1/8	3 3/4	4 3/8
			2	16.00		9 1/8	4 1/4	4 7/8
			2½	19.00		10 5/16	4 3/4	5 9/16
		Round	3	28.00		12 13/16	6	6 13/16
			4	47.00		14 9/16	6 7/8	7 11/16
Flanged Return Bends	No. 1559	Square	1¼ × 4	7.50		4	4 5/8	4 1/8
			1¼ × 6	8.50		6	5 5/8	5 1/8
			2 × 6	11.00		6	6 5/16	5 13/16
			2 × 8	12.00		8	7 5/16	6 13/16
	No. 1563	Oval	2 × 3½	11.50	14.00	3½		4 11/16
Screwed Return Bends	No. 1570	–	1¼ × 4	13.00		4	5 3/8	
		–	1¼ × 6	13.50		6	5 3/8	
		–	2 × 3½	16.50		3½	7 1/16	
		–	2 × 4	17.00		4	7 1/16	
		–	2 × 6	18.50		6	7 1/16	
Companion Flanges	No. 1556	Oval	2	1.70	2.80			
	No. 1556½	Oval	2	2.60	3.70			

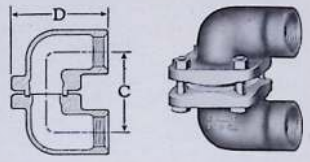
Return Bends for Atmospheric Ammonia Condensers or Pipe Coils



No. 1559, Return Bend
Tongue & Groove–Flanged–Ferrosteel



No. 1563, Return Bend
Tongue—Flanged—Malleable Iron



No. 1570, Divided Return Bend
Screwed—Malleable Iron
Tongue & Groove with Cranite gasket.
Lead gasket furnished when specified.

Companion Flanges for No. 1563 Return Bends



No. 1556, Groove No. 1556½, Tongue
Screwed—Malleable Iron
The No. 1556½ is used with the No. 1556 in or at the ends of coils having No. 1563 Bends.

Malleable Iron Screwed Fittings for Ammonia



See page 146

No. 260 E
90° Elbow

No. 272 E
Return Bend

General description.....page 410
Other Companion Flanges.....page 415
Dimensions of end flanges and facing...page 416

Flanges for Ammonia

Special Forged Steel Screwed Flanges



No. 1582½, Tongue



No. 1583½, Groove

The special flanges above have smaller dimensions than the regular type shown at the right. They are used on:
No. 1591½ Flange Union (see page 182)
No. 1529 Combination Elbow (see page 266)
For dimensions, refer to the No. 1591½.

300 pounds ammonia working pressure

These flanges have a wide application in high pressure ammonia refrigeration service. They are equally suitable for use on air, gas, and oil lines. Sizes 3-inch and smaller are made of forged steel; the 4-inch size is malleable iron.

List Prices

Cat. Nos.	Style of Flange	Size Inches	Prices, Each With Bolts and Gasket	Prices, Each Without Bolts or Gasket
Nos. 1545 1547 1555 1557	Oval	¼	1.20	.95
		⅜	1.45	1.15
		½	1.60	1.30
		¾	1.95	1.50
	Square	1	2.45	1.90
		1¼	2.80	2.25
		1½	3.35	2.50
		2	4.00	3.15
		2½	6.00	4.85
	Round	3	10.25	8.00
		4	13.50	11.25
Nos. 1582½ 1583½	Oval	1	2.20	1.80
		1¼	2.35	1.95
	Square	2	4.00	3.15

Unless otherwise ordered, flanges are furnished without bolts or gaskets.

Reducing flanges can be made to order by drilling and tapping blind flanges; prices on request.

Bolting on companion flanges requires an extra charge; see the Crane Discount Sheet.

For tongue and groove flange unions suitable for 300 pounds ammonia, use the No. 1589 or 1591½ shown on page 182. The latter, made by bolting together the Special Screwed Flanges at the left, is ideal for making up pipe coils with close centers.

Screwed Flanges



No. 1547 Tongue



No. 1545 Groove

Blind Flanges



No. 1555 Tongue



No. 1557 Groove

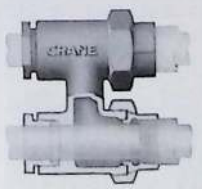
For dimensions of regular screwed and blind flanges, see page 416.

Ferrosteel Double Pipe Fittings

For Water Coolers



No. 1574½ Return Bend With Union Ends

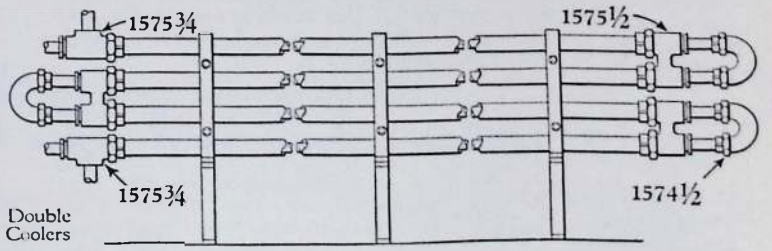


No. 1575½ Double Pipe Return Bend With Union Ends



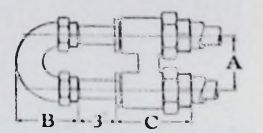
No. 1575¾ Double Pipe Tee With Union End

WORKING PRESSURES
125 pounds saturated steam
175 pounds cold water

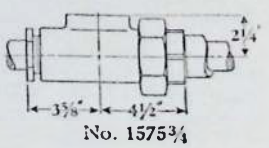


Fittings for Double Pipe Water Coolers

With Crane Double Pipe fittings, the inside and outside pipes are entirely independent of each other, and are free to expand or contract independently without danger of straining the joints. The fittings can be demounted easily and quickly for cleaning or repairs. No. 1574½ Return Bends are cast iron with malleable iron union ends and rubber gaskets. The No. 1575½ Double Pipe Return Bend and No. 1575¾ Tee have Ferrosteel bodies and glands with malleable iron union rings and tailpieces, and rubber gaskets.



No. 1574½ and No. 1575½



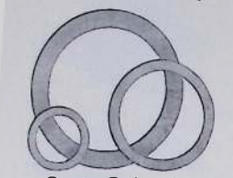
No. 1575¾

List Prices and Dimensions

Catalog No.	Size Inches	Prices, Each Black	Prices, Each Galv.	Dimensions, in Inches A	B	C
No. 1574½	1¼	4.50		4⅝	5 1/16	
	2	8.00		6	6 11/16	
No. 1575½	2×1¼	17.00	23.50	4⅝		6⅜
No. 1575¾	2×1¼×2	11.00	15.50	See illustration at right.		

Fabricated Double Pipe Heat Exchangers....page 522

Gaskets for Ammonia



Cranite Gaskets for Tongue and Groove Joints

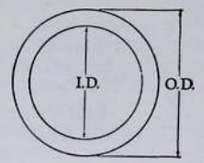


Rubber Gaskets for Boyle Joints

List Prices and Dimensions

Size	Tongue and Groove Gaskets			
	Prices, Each		Inches	
Inches	Cranite	Lead	I.D.	O.D.
¼	.04	.06	19/32	31/32
⅜	.05	.07	23/32	13/32
½	.05	.07	⅞	17/32
¾	.07	.10	1⅛	115/32
1	.07	.13	1⅜	125/32
1¼	.09	.18	111/16	27/32
1½	.09	.18	115/16	215/32
2	.10	.21	27/16	33/32
2½	.11	.24	215/16	321/32
3	.12	.26	39/16	49/32
4	.17	.34	49/16	515/32

Size	Canvas Wrapped Boyle Gaskets		
	Prices, Each	Inches	
Inches	Rubber	I.D.	O.D.
1¼	.20	111/16	2¼

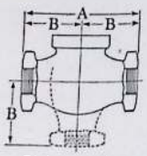


Except for No. 1563 Return Bends and Nos. 1556 and 1556½ Flanges (page 414), all Crane flanged ammonia products listed in this section, as well as flange unions and combination elbows shown on pages 182 and 266 respectively, have the same tongue and groove dimensions for corresponding pipe sizes. Gaskets, are interchangeable, size for size; all are 1/16-inch thick.

Gaskets for the No. 1563 Return Bend and applicable flanges are special; prices and dimensions will be furnished on application.

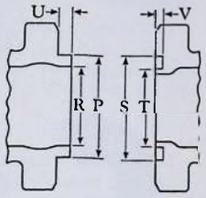
Boyle gaskets: Gaskets (⅜-inch thick) for Boyle joints are rubber and are canvas wrapped; they are used in the double pipe return bends and tees described on the preceding page.

Dimensions of Ammonia Valves, Fittings, Flanges, and Flange Facings



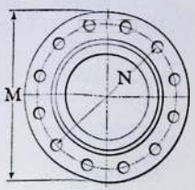
Globe, Angle, or Check Valve Screwed

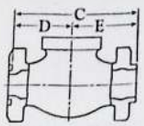
Dimensions of Crane valves and fittings for ammonia service are indicated on individual pages listing the products (411 to 414). Dimensions repeated below point out the wide degree of interchangeability in the Crane line. For example, note flanged valves and tees have the same face to face dimensions; and all screwed valves, with the exception of the union bonnet globe and angle shown on page 412, have the same end to end or center to end.



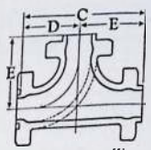








Globe Valve Flanged



90° Elbow or Tee Flanged

The dimensions shown for end flanges apply to all flanged ammonia valves, elbows, and tees. In addition, they apply to the No. 1559 Return Bend (page 414), regular screwed and blind flanges (page 415), and No. 1589 Flange Unions (page 182).

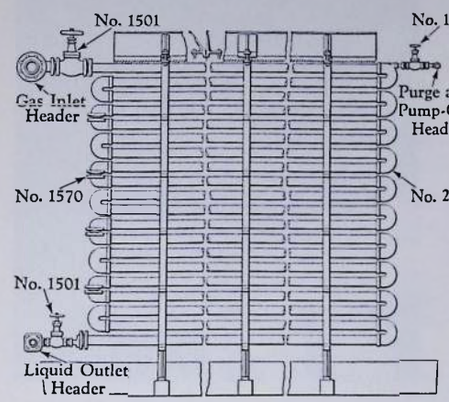
Style of Flanges	Size	A	B	C	D	E	M	N	P	R	S	T	U	V	Bolts	
															No.	Dia.
Oval	¼	4½	2¼	55/16	27/16	2⅞	3⅝	2⅜	31/32	19/32	1	9/16	3/16	⅛	2	½
	⅜	4¾	2⅜	59/16	29/16	3	313/16	29/16	13/32	23/32	1⅛	11/16	3/16	⅛	2	½
	½	5	2½	513/16	211/16	3⅛	4	2¾	17/32	⅞	1¼	27/32	3/16	⅛	2	½
	¾	5½	2¾	65/16	215/16	3⅜	4¾	3¼	115/32	1⅛	1½	13/32	3/16	⅛	2	⅝
Square	1	6¼	3⅛	611/16	3⅛	39/16	39/16	3¼	125/32	1⅜	113/16	111/32	3/16	⅛	4	½
	1¼	6¾	3⅜	7⅜	3⅜	4	315/16	3¾	27/32	111/16	2¼	121/32	¼	3/16	4	½
	1½	7½	3¾	8⅛	3¾	4⅜	411/16	4½	215/32	115/16	2½	129/32	¼	3/16	4	⅝
	2	8½	4¼	9⅛	4¼	4⅞	5⅛	5	33/32	27/16	3⅛	213/32	¼	3/16	4	⅝
	2½	9½	4¾	105/16	4¾	59/16	515/16	5⅞	321/32	215/16	311/16	229/32	5/16	¼	4	¾
Round	3	12	6	1213/16	6	613/16	8¼	6⅝	49/32	39/16	45/16	317/32	5/16	¼	8	¾
	4			149/16	6⅞	711/16	10	7⅞	515/32	49/16	5½	417/32	7/16	¼	8	¾

On valves, the tongue face is on the end flange next to the upper side of the disc.

All dimensions in inches.

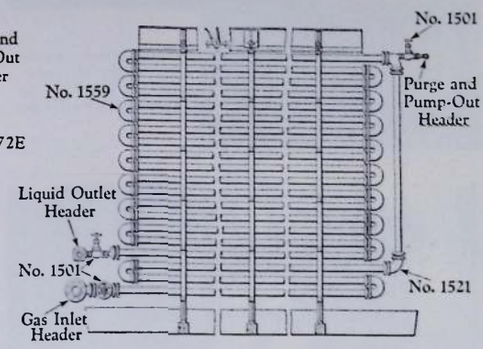
Atmospheric Ammonia Condensers

The illustrations below show two common types of atmospheric condensers, and indicate the application of the return bends and fittings shown on page 414. Either type, or any other type, can be made with flanged, screwed, or divided return bends, or combinations of all three; if welded joints are preferred, welding fittings (see pages 275 to 280) and flanges (see pages 291 to 298) can be used.



Atmospheric Condenser

The atmospheric ammonia condenser above is the simplest type. The hot gas from the compressor enters at the top and the condensed liquid ammonia leaves at the bottom. These condensers are usually made of 2-inch Standard weight pipe, 20 feet long, and 18 or 20 pipes high. However, they can be built of any weight or length of pipe, and any number of pipes high. Each stand of condensers should have a galvanized water trough made in two sections, with adjustable trough supports for leveling.



Atmospheric Condenser With Three Preliminary Pipes

The ammonia condenser illustrated above is of the atmospheric type with a three-pipe preliminary cooler at the lower part of the coil. The hot gas enters at the bottom, where it is partly cooled by the water which has already passed over the main condenser. The partially cooled gas then passes to the top of the coil and meets the coldest condensing surface where the actual process of condensation begins.

Cast Iron Pipe Stands

For Condensers, Brine Coolers, Water Coolers, or Heat Exchangers

Made to order only—Prices on application

A complete stand consists of a base, an intermediate section or sections, and a top section. However, an intermediate section may be used at the top; it is always required with water troughs and trough supports.



Top Section



Intermediate Section

Malleable iron or galvanized sections are made to order; prices on application.

Bases: The 9-inch and 15-inch bases are designed for 2-inch atmospheric and 2-inch double pipe condensers.



Base



Face 2 Inches Wide



Face 6 Inches Wide

Trough Supports

List of Sizes, All for Use with 2-inch Pipe		
Top Sections	4 or 6 pipes high	*4⅜"
Intermediate Sections	4, 6, or 8 pipes high	*3½"
	4 or 6 pipes high	*4⅜"
Bases	9 or 15 inches high	
Trough Supports	2 or 6-inch face	

*Indicates center to center dimension for pipes.

Trough supports: The trough support with a 2-inch wide face is for use on each end of a condenser coil; the support with a 6-inch wide face is for the middle of the coil where two troughs meet.

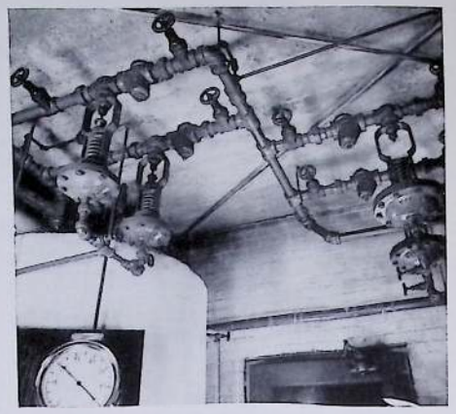
Each trough support has two long bolts, with three hexagon nuts each, for adjusting and leveling the trough.

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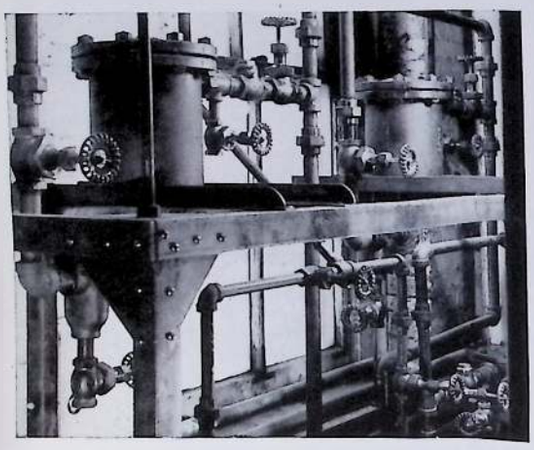
—From Crane—
Products to Fit the Service



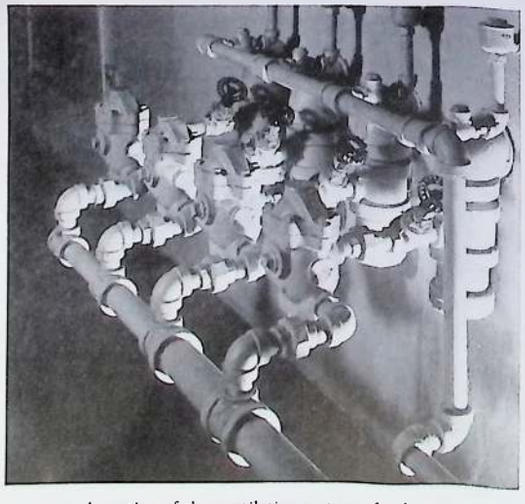
Crane fittings, unions, and valves are important in the service lines of dwellings.



Housing project piping where Crane fittings, unions, and valves are installed.



Piping system in the boiler room of a candy manufacturer



A portion of the ventilating system of a large gymnasium utilizing Crane fittings and unions.



Crane fittings, unions, and valves used in piping for controlling air operated valves in a large refinery.

Solder-Joint Valves, Fittings, and Accessories

Solder-Joint Valves
Gate . . . . . page 420
Globe . . . . . page 421
Angle . . . . . page 421
Swing Check . . . . . page 420

Solder-Joint Fittings
Couplings, Reducers, and Adapters . . . . . page 422
Elbows . . . . . page 423
Tees, Plugs, Caps, and Bushings . . . . . page 424
Return Bends and Unions . . . . . page 424

Accessories
Torches and Soldering Sets . . . . . page 426
Tools and Brushes . . . . . page 427
Soldering Materials . . . . . page 427

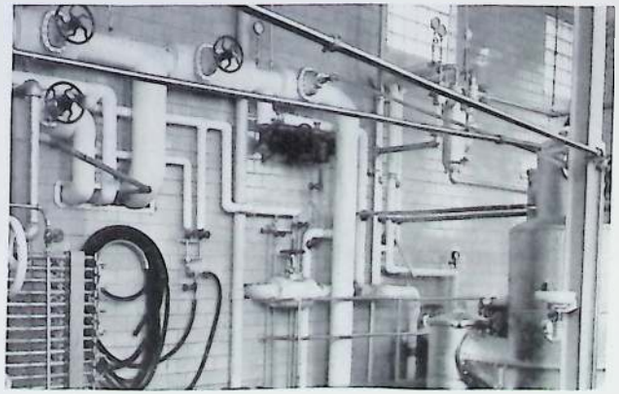
Copper Water Tube
Standard Specifications . . . . . page 428
Linear Expansion Table . . . . . page 425

Making a Solder Joint . . . . . page 425

Square End Sawing Vise for Copper Tube . . . see page 444

The user of copper tubing for plumbing, heating, and industrial installations will appreciate the complete line of solder-joint material offered by Crane. All of the requirements for a modern, dependable installation—valves, fittings, tubing, and accessories—are obtainable from one source—Crane.

The list of Crane Solder-Joint Valves includes globe, angle, gate, and check valves. In addition, a wide selection of Crane screwed end valves, through the use of adaptors, is available for copper tubing piping systems.



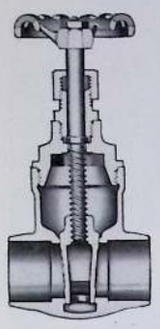
A Crane installation in an evaporator room of a milk drying plant.

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Brass Solder-Joint Gate Valves

Wedge Disc—Non-Rising Stem

WORKING PRESSURES
100 pounds saturated steam
150 pounds water, 200° F.



Cross Section

Service recommendations: Crane No. 1320 Brass Solder-Joint Gate Valves are recommended for general shut-off valve service on low pressure steam lines and on hot and cold water lines.

The valves are well suited for use in plumbing and heating systems, on circulating water lines, on low pressure condensation return lines, and for similar low pressure services.

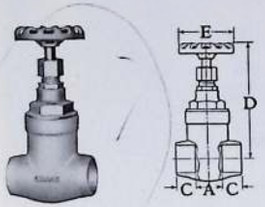
Important—When Solder-Joint Valves and Fittings are installed on steam lines, the solder used to make the joints must have a melting point high enough to withstand the temperature of the steam.

Construction: No. 1320 Gate Valves have a non-rising stem and a one-piece wedge disc. They are sturdily constructed and are amply reinforced at points subject to greatest stress, to withstand piping and operating strains. All parts are made of good quality materials.

Repacking: The valves, when wide open, can be repacked while under pressure.

Larger sizes and higher pressure valves: When larger size or higher pressure valves are wanted, Crane screwed end valves with solder-joint adaptors can be used.

Instruction tag: These valves are furnished with a tag giving special instructions for soldering.



No. 1320, Gate
Wedge Disc, Non-Rising Stem

List Prices and Dimensions

Size	Inches	3/8	1/2	3/4	1	1 1/4	1 1/2	2
No. 1320, Gate	Each	4.30	5.00	5.90	7.00	9.40	12.00	17.00
Dimensions, in Inches A		13/16	13/16	7/8	1 1/16	1 5/16	1 7/16	1 9/16
Dimensions, in Inches C		13/32	17/32	25/32	29/32	31/32	1 3/32	1 11/32
Dimensions, in Inches D		3 1/4	3 3/4	4 3/8	5 1/8	5 3/4	6 3/8	7 3/8
Dimensions, in Inches E		1 1/2	1 3/4	2 1/16	2 9/16	2 3/4	3 1/16	3 5/8

Brass Solder-Joint Swing Check Valves

WORKING PRESSURES
100 pounds saturated steam
150 pounds water, 200° F.

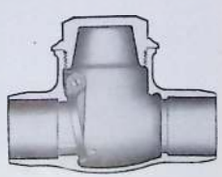
Service recommendations: Crane No. 1303 Brass Solder-Joint Swing Check Valves are recommended for service on steam, hot water, and cold water. They are particularly suited for plumbing and heating systems and for low pressure steam and water lines in industrial and process plants.

Important—When Solder-Joint Valves and Fittings are installed on steam lines, the solder used to make the joints must have a melting point high enough to withstand the temperature of the steam.

Construction: The valves are strong and well proportioned; they will easily withstand normal operating strains. All parts are made of good quality materials.

Larger sizes and higher pressure valves: When larger size valves or valves suitable for higher pressures are wanted, Crane screwed end valves with solder-joint adaptors can be used.

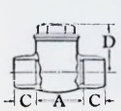
Instruction tag: The valves are furnished with a tag giving special instructions for soldering.



Cross Section



No. 1303
Swing Check



Swing Check

List Prices and Dimensions

Size	Inches	1/2	3/4	1	1 1/4	1 1/2	2
No. 1303, Swing Check	Each	4.30	4.90	6.50	8.00	9.70	14.70
Dimensions, in Inches A		1 3/8	1 11/16	2 1/16	2 7/16	2 7/8	3 1/2
Dimensions, in Inches C		13/16	1	1 1/16	1 1/8	1 3/16	1 3/8
Dimensions, in Inches D		1 9/16	1 13/16	2 3/16	2 9/16	2 13/16	3 1/4

Swing Check Valves may be used either in a horizontal position, or in a vertical position for upward flow.

Brass Solder-Joint Globe and Angle Valves

Composition Disc

WORKING PRESSURES
100 pounds saturated steam
150 pounds water, 200° F.



No. 1310
Globe

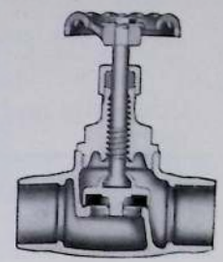


No. 1310½
Globe
With Drain



No. 1311
Angle

No. 1310½ Globe Valves are regularly furnished with a right hand drain unless a left hand drain is specified.



Cross Section
No. 1310, Globe

List Prices

Size	Inches	3/8	1/2	3/4	1	1 1/4	1 1/2	2
No. 1310, Globe	Each	3.20	3.90	5.40	7.40	10.00	13.00	20.00
No. 1310½, Globe with drain	Each		4.30	6.00				
No. 1311, Angle	Each	3.20	3.90	5.40	7.40	10.00	13.00	20.00

For composition discs, see page 133.

Service recommendations: Solder-Joint Globe and Angle Valves are recommended for steam or water lines. They are well suited for plumbing and heating systems, for low pressure steam and water piping in industrial plants, and for similar service.

Important—When valves are installed on steam lines, the solder used to make the joints must have a melting point that is high enough to remain unaffected by the temperature of the steam.

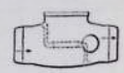
Construction: The valves, although light in weight, are sturdily constructed. They are well proportioned and are amply reinforced to withstand piping and operating strains. All parts are made of good quality materials.

The disc holder is spun onto the end of the stem. The stuffing box is amply deep to prevent leakage around the stem.

Discs: Unless otherwise ordered, these valves are furnished with a No. 12 Composition Disc, suitable for 150 pounds cold water or for hot water, 200° F. maximum temperature.

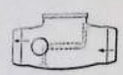
When so ordered, the valves will be furnished with a No. 10 Composition Disc suitable for 100 pounds saturated steam. For description and dimensions of discs, see page 133.

Drain on No. 1310½ Valve: The No. 1310½ Solder-Joint Globe Valve is regularly furnished with a right hand drain; orders must specify "with left hand drain" if left hand is wanted.



Right Hand

The adjacent illustrations indicate the position of a right hand and a left hand drain.

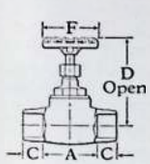


Left Hand

Repacking: These valves, when wide open, can be repacked while under pressure.

Larger sizes and higher pressure valves: When larger size valves or valves suitable for higher pressures are wanted, Crane screwed end valves with solder-joint adaptors are recommended.

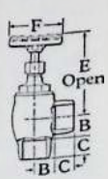
Instruction tag: These valves are furnished with a tag giving special instructions for soldering.



Globe

Dimensions, in Inches

Size	3/8	1/2	3/4	1	1 1/4	1 1/2	2
A	1 1/2	1 3/4	1 15/16	2 3/8	2 3/4	3 3/16	3 7/8
B	9/16	5/8	3/4	7/8	1 1/16	1 1/4	1 9/16
C	7/16	9/16	13/16	15/16	1	1 1/8	1 3/8
D	2 7/8	3 1/2	4	4 1/2	4 7/8	5 1/2	6
E	2 5/8	3 1/8	3 3/4	4 1/4	4 5/8	5 1/4	5 7/8
F	1 1/2	1 3/4	2 1/16	2 9/16	2 3/4	3 1/16	3 5/8



Angle

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Wrought Copper Solder-Joint Fittings

The Crane line of Wrought Copper Solder-Joint Fittings is shown on this and the two pages following. Hints for planning a successful installation are shown on page 425.

Larger sizes; dimensions: Larger sizes than listed are available. List prices of larger sizes, and dimensions for all sizes, will be furnished on application.

Other fittings: Wrought Copper Solder-Joint Fittings for refrigeration, and Cast Brass Fittings, including a complete line for drainage service are also available; prices and information on application.

Tubing: The outside diameter of tubing used with solder-joint fittings is ⅛-inch greater than the nominal size; see page 428.

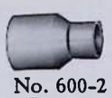
Couplings and Reducers



No. 600 Coupling With Stop
Copper to Copper



No. 601 Coupling Without Stop
Copper to Copper



No. 600-2 Fitting Reducer
Fitting to Copper

List Prices, Each

Nominal Size Inches	No. 600 Coupling with Stop	No. 601 Coupling without Stop	No. 600-2 Fitting Reducer
⅛	.08	.08	—
¼	.09	.09	—
⅜	.09	.09	—
½	.12	.12	—
¾	.18	.18	—
1	.24	.24	—
1¼	.30	.30	—
1½	.38	.38	—
2	.68	.68	—
2½	1.00	1.00	—
¼×⅛	.09	—	.09
⅜×¼ ×⅛	.09	—	.09
½×⅜ ×¼	.12	—	.12
¾×½ ×⅜ ×¼	.18	—	.18
1×¾ ×½ ×⅜	.24	—	.24
1¼×1 ×¾ ×½	.30	—	.30
1½×1¼ ×1 ×¾ ×½	.38	—	.38
2×1½ ×1¼ ×1 ×¾ ×½	.68	—	.68
2½×2 ×1½ ×1¼ ×1	1.00	—	1.00

NPTI = Internal Standard Pipe Thread (Female)
NPTE = External Standard Pipe Thread (Male)

Adapters



No. 603 Female Adapter
Copper to NPTI



No. 603-2 Female Fitting Adapter
Fitting to NPTI



No. 604 Male Adapter
Copper to NPTE



No. 604-2 Male Fitting Adapter
Fitting to NPTE

List Prices, Each

Nominal Size Inches Copper or Fitting to NPT	No. 603 Female Adapter	No. 603-2 Female Fitting Adapter	No. 604 Male Adapter	No. 604-2 Male Fitting Adapter
⅛	.18	.18	.18	.18
¼	.18	.18	.18	.18
⅜	.18	.18	.18	.18
½	.20	.20	.20	.20
¾	.30	.30	.30	.30
1	.55	.55	.55	.55
1¼	.76	.76	.76	.76
1½	1.05	1.05	1.05	1.05
2	1.50	1.50	1.50	1.50
2½	2.60*	2.60*	2.60*	2.60*
¼×⅜	.18	—	.18	—
⅜×1	—	—	.55*	—
×¾	.30	—	.30	—
×½	.20	.20	.20	.20
½×1	—	—	.55	—
×¾	.30	.30	.30	.30
×⅜	.20	.20	.20	.20
×¼	.20	—	—	—
¾×2	—	—	1.50*	—
×1½	—	—	1.05*	—
×1¼	—	—	.76*	—
×1	.55	—	.55	—
×½	.30	.30	.30	.30
1×2	—	—	1.50*	—
×1½	—	—	1.05*	—
×1¼	.76	—	.76	—
×¾	.55	—	.55	—
×½	—	—	.55*	—
1¼×2	—	—	1.50*	—
×1½	1.05	—	1.05	—
×1	.76	—	.76	.76
×¾	—	—	.76*	—
1½×2	1.50	—	1.50	
×1¼	1.05	—	1.05	
×1	1.05*	—	1.05*	
×¾	—	—	1.05*	
2×1½	1.50	—	1.50	
×1¼	—	—	1.50*	
×1	—	—	1.50*	
×¾	—	—	1.50*	

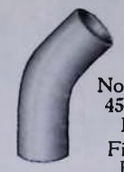
*Asterisk indicates sizes made of cast brass.

Wrought Copper Solder-Joint Fittings

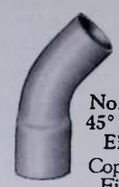
Elbows



No. 606 45° Elbow
Copper to Copper



No. 606-2-2 45° Street Elbow
Fitting to Fitting



No. 606-2 45° Street Elbow
Copper to Fitting



No. 706-3† 45° Elbow
Copper to NPTI



No. 706-4† 45° Elbow
Copper to NPTE



No. 607 90° Elbow
Copper to Copper



No. 607-2-2 90° Street Elbow
Fitting to Fitting



No. 607-2 90° Street Elbow
Copper to Fitting



No. 707-3† 90° Elbow
Copper to NPTI



No. 707-4† 90° Elbow
Copper to NPTE

List Prices, Each

Nominal Size Inches	Copper to Copper: No. 606 45° Elbow	Copper to Copper: No. 607 90° Elbow	Fitting to Fitting: No. 606-2 45° Street Elbow	Fitting to Fitting: No. 607-2 90° Street Elbow
⅛	.15	.15	—	.20
¼	.15	.15	.20	.20
⅜	.15	.15	.20	.20
½	.18	.18	.28	.28
¾	.30	.30	.40	.40
1	.55	.55	.70	.70
1¼	.84	.84	—	.84
1½	1.15	1.15	—	1.15
2	1.65	1.65	—	1.65
2½	3.05	3.05	—	3.05
¼×⅛	—	.15	—	—
⅜×¼	.15	.15	—	—
½×⅜ ×¼	.18	.18	—	—
¾×½ ×⅜	.30	.30	—	—
1×¾ ×½	.55	.55	—	—
1¼×1 ×¾	.84	.84	—	—
×½	—	.84*	—	—
1½×1¼ ×1	—	1.15	—	—
×¾	—	1.15*	—	—
2×1½ ×1¼	—	1.65	—	—
×1	—	1.65*	—	—
2½×2 ×1½ ×1¼ ×1	—	3.05*	—	—

*Asterisk indicates sizes made of cast brass.

Notes: The outside diameter of the tubing is ⅛-inch greater than the nominal size; see page 428.
NPTI = Internal Standard Pipe Thread (Female)
NPTE = External Standard Pipe Thread (Male)

Larger sizes are available; prices, and dimensions of all sizes, on application.

List Prices, Each

Nominal Size Inches	Copper to Fitting: No. 606-2 45° Street Elbow	Copper to Fitting: No. 607-2 90° Street Elbow	Copper to NPT: No. 706-3† 45° Elbow	Copper to NPT: No. 707-3† 90° Elbow	Copper to NPT: No. 706-4† 45° Elbow	Copper to NPT: No. 707-4† 90° Elbow
⅛	.20	.20	—	—	—	.20
¼	.20	.20	—	.20	—	.20
⅜	.20	.20	.20	.20	.20	.20
½	.28	.28	.28	.28	.28	.28
¾	.40	.40	.40	.40	.40	.40
1	.70	.70	.70	.70	.70	.70
1¼	.84	.84	.84	.84	.84	.84
1½	1.15	1.15	1.15	1.15	1.15	1.15
2	1.65	1.65	1.65	1.65	1.65	1.65
2½	—	3.05	—	3.05	—	3.05
¼×½	—	.28	—	—	—	—
⅜×¾	—	—	—	.40	—	—
×½	—	.28	—	.28	—	.28
½×1	—	—	—	.70	—	.70
×¾	—	—	—	.40	—	.40
×⅜	—	.28	—	.28	—	.28
¾×1¼	—	—	—	.84	—	—
×1	—	.70	—	.70	—	.70
×½	—	—	—	.40	—	.40
×⅜	—	—	—	.40	—	—
1×1¼	—	—	—	.84	—	.84
×¾	—	.70	—	.70	—	.70
×½	—	—	—	.70	—	.70
1¼×2	—	—	—	1.65	—	—
×1½	—	—	—	1.15	—	1.15
×1	—	—	—	.84	—	.84
×¾	—	—	—	.84	—	.84
×½	—	—	—	.84	—	.84
1½×2	—	—	—	1.65	—	1.65
×1¼	—	—	—	—	—	1.15
×1	—	—	—	1.15	—	1.15
×¾	—	—	—	1.15	—	—
2×1½	—	—	—	1.65	—	1.65
×1¼	—	—	—	1.65	—	1.65
×1	—	—	—	1.65	—	1.65

The list of reducing sizes above indicates the copper end size first.

†Elbows with NPT ends are made of cast brass.

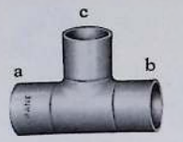
Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 234 of 314
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Wrought Copper Solder-Joint Fittings

Tees

List Prices, Each

Nominal Size Inches	No. 611 Tee
⅛	.23
¼	.23
⅜	.23
½	.27
¾	.49
1	.76
1¼	1.15
1½	1.65
2	2.30
2½	4.85



No 611, Tee
Copper to Copper

For reducing tees, specify the size of openings in the sequence of lower case letters shown on illustration.

Reducing Sizes

Nominal Size Inches a b c	No. 611 Tee
¼× ¼×⅛ × ⅛×¼ × ⅛×⅛	.23
⅜× ⅜×¼ ×⅛	.23
⅜× ¼×⅜ ×¼ ×⅛	.23
⅜× ⅛×⅜ ×¼ ×⅛	.23
¼× ¼×⅜	.23
½× ½×⅜ ×¼	.27
½× ⅜×½ ×⅜ ×¼	.27
½× ¼×½ ×⅜ ×¼	.27
⅜× ⅜×½	.27
¾× ¾×½ ×⅜	.49
¾× ½×¾ ×½ ×⅜	.49
¾× ⅜×¾ ×½ ×⅜	.49
½× ½×¾	.49
1 ×1 ×¾ ×½ ×⅜	.76
1 × ¾×1 ×¾ ×½ ×⅜	.76
1 × ½×1 ×¾ ×½	.76
¾× ¾×1 ½× ½×1	.76
1¼×1¼×1 ×¾ ×½ ×⅜*	1.15
1¼×1 ×1¼ ×1 ×¾ ×½	1.15

Nominal Size Inches a b c	No. 611 Tee
1¼× ¾×1¼ ×1 ×¾	1.15
1¼× ½×1¼* ×1* ×¾*	1.15
1 ×1 ×1¼ ¾× ¾×1¼*	1.15
1½×1½×1¼ ×1 ×¾ ×½	1.65
1½×1¼×1½ ×1¼ ×1 ×¾ ×½*	1.65
1½×1 ×1½ ×1¼ ×1	1.65
1½× ¾×1½ ×1¼*	1.65
1½× ½×1½* 1¼×1¼×1½ 1 ×1 ×1½	1.65
2 ×2 ×1½ ×1¼ ×1 ×¾ ×½	2.30
2 ×1½×2 ×1½ ×1¼ ×1 ×¾ ×½*	2.30
2 ×1¼×2 ×1½ ×1¼ ×1	2.30
2 ×1 ×2* ×1½*	2.30
2 × ¾×2* ×1½*	2.30
2 × ½×2* 1½×1½×2 1¼×1¼×2	2.30

Tees are manufactured under U. S. Patent No. 2,111,695.

Note: The outside diameter of the tubing is ⅛-inch greater than the nominal size; see page 428.

*Asterisk indicates sizes made of cast brass.

Plugs



No. 616
Fitting End Plug

Caps



No. 617
Tube Cap

Unions



No. 633, Union
Copper to Copper

List Prices, Each

Nominal Size Inches	No. 616 Fitting End Plug	No. 617 Tube Cap	No. 633 Union
⅛	...	.08	.76
¼	.09	.09	.76
⅜	.09	.09	.76
½	.12	.12	.91
¾	.18	.18	1.30
1	.24	.24	1.65
1¼	.76	.30	2.30
1½	1.05	.38	3.35
2	1.50	.68	4.20
2½	2.60	1.00	8.35

Bushings



No. 618
Flush Bushing
Fitting to Copper

List Prices, Each

Nominal Size Inches Fitting to Copper	No. 618 Flush Bushing
¼× ⅛	.09
⅜× ¼	.09
½× ⅜	.12
¾× ½	.18
1 × ¾	.24
1¼×1	.30
1½×1¼	.38

Return Bends



No. 638
Return Bend
Copper to Copper

List Prices, Each

Nominal Size Inches	Center to Center Inches	No. 638 Return Bend
⅛	1	.24
¼	1¼	.24
⅜	1½	.30
½	2	.38
¾	2½	.53
	3⅜	.53
1	3	.76
1¼	4	1.20
1½	4½	1.65
2	5½	2.65

Other Solder-Joint Fittings

In addition to the Solder-Joint Fittings shown on this and the preceding two pages, Wrought Copper Solder-Joint Fittings for refrigeration, and Cast Brass Solder-Joint Fittings, including a complete line for drainage service, are available. Prices and data on request.

Larger sizes are available; prices, and dimensions of all sizes, on application.

Wrought Copper Solder-Joint Fittings

Making a Solder Joint



Sectional view of a soldered joint made with a 90° elbow.

Under proper conditions of cleanliness and temperature, solder will make a perfect adhesion between adjoining surfaces of copper and copper alloys. The strength of the joint is equal to, or even greater than, the strength of the tube alone. This is due to the great affinity of tin and copper—the tin of the solder and the copper of the tube and product. Surface tension seals the joint; capillary attraction draws the solder into, through, and all about the joint.

Six simple steps lead to a perfect joint. Both valves and fittings are joined to copper tubing in the same fashion.

Cut the tubing to length, making certain the end is square; use a fine hacksaw blade. Ream and remove all burrs with a file or scraper.

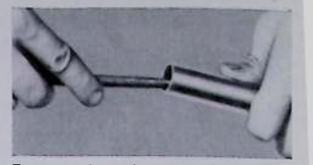
Clean the outside end of the tubing and the cup end of the fitting with steel wool, sand cloth, or a steel wire brush.

Apply flux at the outside end of the tubing and inside the cup end of the product. Apply the flux evenly, but sparingly, until surfaces to be joined are completely covered. Slip the tube into the product and revolve a couple of times to assure even distribution of the flux.

Use solder wire according to the nature of the job, bending over an end as long as the diameter of the fitting—½″ solder for ½″ fittings, etc.

Apply flame at the end of the fitting until the solder melts; than pass the flame toward the center of the fitting until the solder is absorbed and the joint completed.

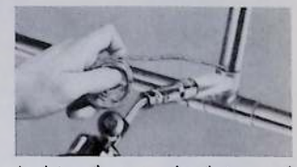
Remove excess solder, while it is still plastic, with a small brush. Leave a fillet around the cup of the fitting as it cools.



Removing burrs from the tube end after it has been cut to the proper length.



Both the tube and cup of the fitting should be cleaned to a bright finish.



Applying flame to the fitting until the solder is completely absorbed.

Solder and Solder Flux Requirements

Nominal Size of Joint Inches	Quantity of Solder Required, in Pounds: For General Use	For Drainage Use
¼	½	—
⅜	½	—
½	¾	—
¾	1	—
1	1½	—
1¼	1¾	1¼
1½	2	1⅜
2	2½	1½
2½	3½	—
3	4½	2¾
3½	5	—
4	6½	4¼

Basis for values: The solder requirements in the table shown above are an estimate based on the weight of solder necessary to prepare 100 joints of the sizes listed.

Solder flux: Two ounces of solder flux are required for each pound of solder.

Solders and fluxes.....page 427

Expansion of Copper Tubing

To plan a solder-joint piping installation successfully, it is necessary, as in any other piping assembly, to make suitable provisions for the expansion of the pipe lines under actual service conditions. Expansion bends can be designed only when the amount of expansion is known.

To find the expansion in inches of any length of copper tubing, proceed as follows:

First, obtain from the adjacent table the expansion at the minimum line temperature and at the maximum line temperature.

Second, subtract the value for the minimum temperature from the value for the maximum temperature to find the expansion per foot through that temperature range.

Third, multiply the expansion per foot by the number of feet of tubing for total expansion.

Temperature Deg. F.	Linear Expansion in Inches: Per foot of Copper Tubing
0	.0000
20	.0025
40	.0045
60	.0065
80	.0087
100	.0110
120	.0135
140	.0157
160	.0177
180	.0200
200	.0225
220	.0252
240	.0274
260	.0295
280	.0317
300	.0342
320	.0370
340	.0395
360	.0415
380	.0440
400	.0464
420	.0489
440	.0515
460	.0537
480	.0564
500	.0588

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Torches and Soldering Sets

Clayton & Lambert Torches



No. 32A Mechanics Standard
For gasoline or kerosene

No. 32A is recommended for all types of industrial use, either indoors or outdoors. It generates a large, powerful, steady blue flame seven inches long which can be reduced to a small flame for light work. The burner has a blunt control needle which prevents the orifice from enlarging, a removable jet block, and a detachable cleaner pin. A full-skirted, heavy windshield protects the generator veins. Regularly furnished for gasoline, the torch will be equipped for use with kerosene, when orders specify.



No. 158A General Purpose
For gasoline only

No. 158A a general purpose torch, can be used indoors or outdoors. A back-flow, superheating vein in the burner generates an intensely hot, well controlled blue flame 6½ inches long. A blunt control needle prevents enlargement of the self-cleaning gas orifice. The orifice is removable; the cleaner pin is detachable. The unit has a windshield, an automatic pump with lock-down plunger, and is bottom filled.



No. 327 Heavy Duty
For gasoline only

No. 327 for heavy duty service generates a powerful blast flame ten inches long or a small flame for ordinary use. The burner has a blunt control needle to prevent orifice enlargement, a removable jet block, and a detachable cleaner pin. A full-skirted, heavy windshield is securely fastened in place. The unit, bottom filled, has an automatic pump with a lock-down plunger.

Turner Torches



No. 150
For gasoline only

No. 150 is a moderately priced torch, highly efficient on both light and heavy jobs. The burner, made of cast bronze, is equipped with a windshield for outdoor use. An improved type valve prevents orifice enlargement. The pressure pump is blow-proof. The tank, made of terne plate steel, is sprayed with a bronze finish.



No. 206A
For gasoline or kerosene

No. 206A is an exceptionally fine torch recommended for general indoor or outdoor use. It features an exclusive type "carburetor control", an automatic cleaning needle, and a replaceable jet block. The torch is equipped with a full-skirted, protective windshield. The tank is made of a high polished brass. The No. 206A is regularly furnished for use with gasoline; when orders so specify, it will be equipped for use with kerosene.

Bernz LP-Gas Torch



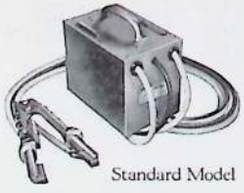
No. LP-700
For liquefied petroleum gas

No. LP-700 is a portable, "cartridge refill" torch using liquefied petroleum gas. The fuel cartridge lasts for many hours and is quickly replaceable when necessary. The torch operates in any position, lights instantly, and heats to approximately 3660° F.

The No. LP-700 Torch features both a pencil-flame burner adjustable for fine, close work and a utility burner for general work requiring a large flame. The flame is protected by a shield.

Gasoline and Kerosene Torches shown above have a one quart capacity.

Ideal Thermo-Grip Soldering Set



Standard Model

Thermo-Grip Soldering Sets, recommended for the sweating and unsweating of copper tube and fittings, are extremely safe. All parts are fully insulated; current is reduced to a harmless low voltage; there is no open flame. Instant heat is provided simply by touching the work with the tool. Each set includes a 115 volt, 50/60 cycle power unit, 12-foot secondary leads, and a plier attachment; furnished without a thumb switch unless specified. A Fork Attachment for soldering in restricted places where straight tools cannot be used and a Pencil Attachment for spot or seam soldering are also available.

Prices on application

Copper Tube Accessories

Ridgid Tubing Cutters



No. 000 . . . . . for ⅛ to 1-inch O. D.
No. 00 . . . . . for ⅜ to 1⅛-inch O. D.
No. 0 . . . . . for ½ to 2⅛-inch O. D.

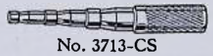
Papco Cut-Off Tool



No. 500

A compact cut-off tool made of aluminum alloy and equipped with a burring attachment; handles copper tubing ⅛ to 1-inch O.D.

Swedge Tool



No. 3713-CS

A hardened steel, chrome-plated precision tool used for swedging ⅜, ½, and ¾-inch copper tubing.

Papco Flaring Tool



No. 400

The No. 400 Flaring Tool features "Form-a-Gage", the exclusive design that means better double flares. Close flares of short tubes are easy, too. The tool quickly selects the right tubing size (⅜ to ⅝-inch) for all hand flaring jobs.

Sawing Vises

Beaver Square-End Sawing Vises facilitate quick, clean, square-end cutting of copper tubing. The vises are illustrated and described on page 444.

Allen Soldering Fluxes



Soldering Oil — Soldering Paste — Soldering Salt

Allen Soldering Paste, safe and easy to use, triples the strength of solder. Available in 2, 4, and 8-ounce, or 1 and 5-pound cans.

Allen Soldering Oil gets into the tiniest crevice and takes the solder along. Excellent for sweat soldering copper joint fittings. Available in 1, 3, and 12-pound bottles.

Allen Soldering Salt, a powdered flux, solders all metals except aluminum. Non-acid; to use, simply mix with water. Available in ½, 1, and 5-pound bottles.

Fluxolder

An Active Solder Paint



A flux and solder combined in paint form. No tinning or cleaning of parts is required.

Fluxolder solders hard-to-reach parts, capillary joints, tubes, etc. It flows with a minimum of heat and produces a perfect joint quickly. Available in ½, 1, and 3-pound cans.



Flux-Stik requires no liquid, paste, or preliminary preparation. Simply rub the stick over the surface and apply the solder. Use on hot or cold metal.

Eagle Bar Solders



Type	Tin-Lead Content	Melt Range Deg. Fahr.
One-Star	60-40%	362-370°
Two-Star	50-50%	362-419°
Three-Star	48-52%	362-424°
Four-Star	45-55%	362-441°
Five-Star	42-58%	362-450°

Eagle Wire Solders



Only new, clean metals are used in Eagle Wire Solder. Available in any alloy. Furnished in 1, 5, 10, 25, and 50-pound spools.

Mill-Rose Clean-Fit Wire Brushes

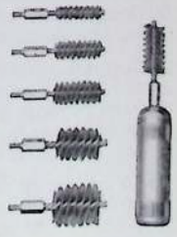


No. 6200 Tube Brush

For quick, easy cleaning of copper tubing products

This handy assortment simplifies cleaning the cup ends of fittings and the ends of copper water tubing. Individual brushes are available for each tubing size from ¼ to 2-inch. The No. 6001 Handle, made of aluminum, fits comfortably into the hand and accommodates any size brush.

The No. 6200 Tube Brushes (individual brushes for ⅜, ½, ¾, and 1-inch tubing sizes) are designed to clean the right amount of surface area necessary for perfect solder-joints.



No. 6000 Brushes and No. 6001 Handle

Prices on application

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Copper Water Tube

Standard Specifications

These seamless copper tubes are especially designed for plumbing purposes, underground water services, etc., but are also suitable for copper coil water heaters, fuel oil lines, gas lines, certain industrial piping, etc. They are furnished in three weights: Types K and L, in hard and soft temper, and Type M, in hard temper only.

Dimensions and Weights

Nominal Size of Tube	Actual Outside Diameter of Tube	Type K Tube		Type L Tube		Type M Tube	
		Wall Thickness	Weight per Foot	Wall Thickness	Weight per Foot	Wall Thickness	Weight per Foot
Inches	Inches	Inches	Pounds	Inches	Pounds	Inches	Pounds
¼	⅜	.035	.145	.030	.126	.025	.106
⅜	½	.049	.269	.035	.198	.025	.144
½	⅝	.049	.344	.040	.285	.028	.203
⅝	¾	.049	.418	.042	.362	—	—
¾	⅞	.065	.641	.045	.455	.032	.328
1	1⅛	.065	.839	.050	.655	.035	.464
1¼	1⅜	.065	1.04	.055	.884	.042	.681
1½	1⅝	.072	1.36	.060	1.14	.049	.940
2	2⅛	.083	2.06	.070	1.75	.058	1.46
2½	2⅝	.095	2.93	.080	2.48	.065	2 03
3	3⅛	.109	4.00	.090	3.33	.072	2.68
3½	3⅝	.120	5.12	.100	4.29	.083	3.58
4	4⅛	..134	6.51	.110	5.38	.095	4.66
5	5⅛	.160	9.67	.125	7.61	.109	6.66
6	6⅛	.192	13.9	.140	10.2	.122	8.92
8	8⅛	.271	25.9	.200	19.3	.170	16.5
10	10⅛	.338	40.3	.250	30.1	.212	25.6
12	12⅛	.405	57.8	.280	40.4	.254	36.7

Service recommendations: Copper water tube is used for many services, such as for steam, water, air, oil, gas, or similar fluids.

Type K Tube is recommended for general plumbing and heating systems, and especially for underground use and where conditions are severe; the tube is also used for gas, oil, and steam.

Type L Tube is recommended for interior use in general plumbing and heating work.

Type M Tube is for use with soldered fittings only, for waste, vent, interior drainage, and other non-pressure applications.

On steam installations, the successful application of copper tubes depends not only upon the weight of the tube but also upon the solder used when making joints. The solder must have a melting point high enough to remain unaffected by the temperature of the steam.

Hard copper tube: Hard copper tube is intended primarily for use in straight lengths. It is recommended for field bending only when proper bending equipment is used.

Soft copper tube: Soft copper tube can be bent without special bending equipment; it is recommended for service where bends must be made in the field, as on concealed replacement work.

Soft copper tube while in transit or when being handled may become flattened or distorted. Before being used, the ends of the tube should be sized to assure a tight soldered joint.

Standard lengths: 20-foot straight lengths for both hard and soft copper tube and 60-foot coiled lengths for soft copper tube are generally considered standard. Other lengths can be furnished.

Tinning: Copper tube can be furnished tinned on the outside, on the inside, or on both the outside and the inside.

American Standard: Type K (hard and soft) and Type L (hard and soft) in sizes ⅜ to 12-inch, and Type M (hard) in sizes 2½ to 12-inch conform to the American Standard for Copper Water Tube, A.S.A. No. H23.1-1947 (A.S.T.M. B88-49).

Prices on application

Pipe Hangers and Supports

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- Standard Ring and Bolt Hangers....page 430
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- Adjustable Clevis and Band Hangers....page 430
- Adjustable Clips....page 431
- Split Pipe Ring Hangers....page 431
- Adjustable Split Swivel Hangers....page 431
- Adjustable Swivel Ring Hangers....page 432
- Adjustable Swivel Pipe Rolls....page 432
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- Spring Cushion Hangers....page 433
- Pre-Engineered Spring Hangers....page 434
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- Welded Steel Brackets....page 441
- Application of Welded Steel Brackets....page 441

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- Floor and Ceiling Plates....page 442

No piping system is better than the means provided for its suspension and support.

The support, suspension, and regulation of motion are important factors to be considered when installing a piping system since the stresses and thrusts occasioned by dead weight and expansive movement may exceed safe working values for the piping materials, the connected equipment, or the building structure.

The purpose of pipe hangers and supports is to carry the weight of the piping safely. Safety requires that supporting equipment, except springs, should be designed to include the weight of the pipe, valves, fittings, fluid transported or that used in testing (whichever is the heavier), and insulation, if used.

Each pipe hanger or support should carry its portion of the load. Hangers, in particular, should be adjustable so that proper pitch and support of the pipe line can be maintained. The basic difference between pipe hangers and pipe supports is that with hangers, the piping load is supported from above; with supports, the piping load is supported from below.

The following pages illustrate many of the various pipe hangers, pipe supports, and accessories furnished by Crane to meet the needs of nearly every piping installation.

For deflection of horizontal pipe lines and spacing of pipe supports, see pages 550 and 551.

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Pipe Hangers



No. 2-C

Standard Ring and Bolt Hangers

The No. 2-C Hangers are made of light weight, good quality soft steel. They can also be furnished galvanized.

The hangers can be used with perforated extension bars, or with malleable iron sockets for use with pipe or rod extensions.

Sizes and Dimensions

Pipe size		Inches	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6
Stock	Size	Inches	¾	¾	⅞	⅞	1	1	1⅛	1⅛	1⅛	1¼	1¼	1¼
	No. of Gauge		16	16	16	16	15	15	12	12	12	12	12	12
Size of bolt		Inches	¼	¼	¼	¼	¼	¼	¼	¼	¼	¼	5/16	5/16

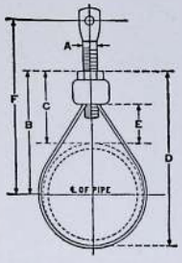
Adjustable Ring Hangers



No. 95-G, Steel
No. 95 CP-G, Copper Plated

For ¾ to 1½-inch copper tubing, use rings one size smaller than for steel pipe.

For extra heavy cast iron soil pipe, use same size rings as for steel pipe.



Dimensions, in Inches

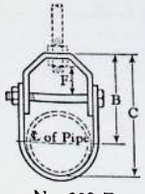
Pipe Size	A	B	C	D	E (Max.)	F (Max.)	Max. Load Lbs.
½	⅜	2½	2 1/16	2⅞	1⅛	4 7/16	75
¾	⅜	2⅝	2 1/16	3⅛	1⅛	4 9/16	80
1	⅜	2 11/16	2 1/16	3⅜	1⅛	4 11/16	85
1¼	⅜	2 15/16	2 1/16	3¾	1⅛	4⅞	95
1½	⅜	3	2⅛	4	1 3/16	5 1/16	105
2	⅜	3¼	2 1/16	4 7/16	1⅛	5 3/16	150
2½	½	3 13/16	2⅜	5¼	1¼	6 1/16	225
3	½	4 3/16	2 7/16	5 15/16	1 5/16	6 7/16	310
3½	½	4 7/16	2 7/16	6 7/16	1 5/16	6 11/16	390
4	⅝	5⅜	3⅛	7⅝	1 11/16	8 3/16	475
5	⅝	5 15/16	3⅛	8 11/16	1 11/16	8¾	685
6	¾	7⅛	3 13/16	10 7/16	2 3/16	10½	950
8	⅞	8 13/16	4½	13⅛	2⅝	12 15/16	1510

These hangers consist of a steel ring supported by a malleable adjusting nut threaded for hanger rod. They may be used directly with an I-Beam Clamp or with a perforated extension bar.

Adjustable Clevis and Band Hangers

These wrought steel Adjustable Clevis and Band Hangers provide for vertical adjustment either before or after the pipe is in place. Hanger rods and supporting nuts may be locked into position after adjustment by use of the upper load nut. Hanger rods and nuts must be ordered separately. The hangers are regularly furnished black; the No. 239-F is available cadmium plated at extra cost.





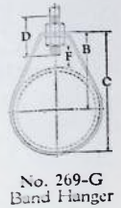
No. 239-F Clevis Hanger

Dimensions, in Inches

Pipe Size	Rod Dia.	No. 239-F B	No. 239-F C	No. 239-F F Max.	No. 269-G B	No. 269-G C	No. 269-G D	No. 269-G F Max.	Max. Load Lbs.
½	⅜	2 15/16	3⅜	1⅛					
¾	⅜	2 15/16	3½	1⅛	2 1/16	2⅝	2½	1	80
1	⅜	3 3/16	3⅞	1 3/16	2 3/16	2⅞	2½	1	85
1¼	⅜	3½	4⅜	1 9/16	2 9/16	3 7/16	2½	1¼	95
1½	⅜	3½	4⅜	1½	2¾	3 11/16	2½	1¼	105
2	⅜	4⅜	5⅝	1 15/16	3	4 3/16	2½	1¼	150
2½	½	4⅜	5⅝	1 3/16	3⅞	5 5/16	3½	1¾	225
3	½	4⅝	6½	1 3/16	4¼	6	3½	1¾	310
3½	½	4⅝	6½	1 3/16	4½	6½	3½	1¾	390
4	⅝	5¼	7½	1 5/16	4⅞	7⅛	3½	1¾	475
5	⅝	6 5/16	9⅛	2	5 11/16	8 7/16	4	2	685
6	¾	6 15/16	10¼	2	6⅜	9 11/16	4½	2	950
8	⅞	9 9/16	13⅞	2⅝	7 9/16	11⅞	4½	2	1510
10	⅞	11⅝	17	3½					
12	⅞	13⅜	19¾	3 7/16					

Prices on application





No. 269-G Band Hanger

Pipe Hangers

Adjustable Clips



Clip Base No. 116-G



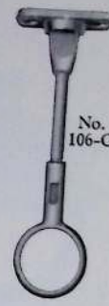
Clip Ring No. 105-G

All of these clips are Underwriters' listed. The No. 106-G is made of malleable iron and consists of the No. 105-G Clip Ring, the No. 116-G Clip Base, and a hanger rod. The No. 106-G Clips allow a 1½-inch adjustment which can be made easily after the pipe is installed. The adjustment is made by raising the pipe until the head of the rod is close to the ceiling and the turning rod.

This Clip is regularly furnished black; galvanized to order.

Dimensions, in Inches

Pipe Size	Square Head Hanger Rod Length	Square Head Hanger Rod Diam.	Ceiling to Center of Pipe Min.	Ceiling to Center of Pipe Max.	Inside Diameter of Ring
¾	6¼	⅜	8	9⅝	1 3/16
1	6¾	⅜	8½	10⅛	1 7/16
1¼	6¾	⅜	8¾	10⅜	1 13/16
1½	7	⅜	9	10⅝	2 1/16
2	7¼	⅜	9½	11⅛	2 9/16



No. 106-G

Split Pipe Ring Hangers



Socket No. 110-G No. 110R-G

Dimensions, in Inches

No. 110-G, Pipe Threaded Pipe Size	A	B	Max. Load Lbs.	No. 110 R-G, Rod Threaded Pipe Size	A	B	Max. Load Lbs.
½-1	⅛	1⅛	150	½-2	⅜	1⅛	150
1¼-3	¼	1 5/16	390	2½-3½	½	1 5/16	390
3½-4	⅜	1 9/16	685	4-5	⅝	1 9/16	685
5-6	½	1⅞	950	6	¾	1 13/16	950
8	¾	2⅛	1510	8	⅞	2 1/16	1510

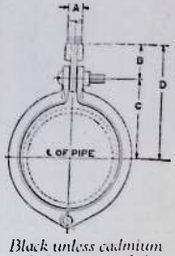


Pipe Ring No. 108-G



Ring and Socket No. 107-G No. 107R-G

Pipe Size	Ring and Socket No. 107-G, Pipe Threaded A	B	C	D	No. 107R-G, Rod Threaded A	B	C	D	Maximum Load Pounds
½	⅛	1⅛	1 5/16	2⅛	⅜	1⅛	1 5/16	2⅛	75
¾	⅛	1⅛	1⅛	2 5/16	⅜	1⅛	1⅛	2 5/16	80
1	⅛	1⅛	1¼	2 7/16	⅜	1⅛	1¼	2 7/16	85
1¼	¼	1 5/16	1 9/16	2 15/16	⅜	1⅛	1 9/16	2¾	95
1½	¼	1 5/16	1 11/16	3 1/16	⅜	1⅛	1 11/16	2⅞	105
2	¼	1 5/16	2 1/16	3 7/16	⅜	1⅛	2 1/16	3¼	150
2½	¼	1 5/16	2¼	3⅝	½	1 5/16	2¼	3⅝	225
3	¼	1 5/16	2¾	4⅛	½	1 5/16	2¾	4⅛	310
3½	⅜	1 9/16	3⅛	4¾	½	1 5/16	3⅛	4½	390
4	⅜	1 9/16	3⅝	5¼	⅝	1 9/16	3⅝	5¼	475
5	½	1⅞	4½	6 7/16	⅝	1 9/16	4½	6⅛	865
6	½	1⅞	5 7/16	7⅜	¾	1 13/16	5 7/16	7 5/16	950
8	¾	2⅛	6⅜	8 9/16	⅞	2 1/16	6⅜	8½	1510



Black unless cadmium plating is specified.

Adjustable Split Swivel Hangers

Dimensions, in Inches

Pipe Size	Ring to Bolt Hole (Centers)	Center of Bolt Hole to Top	Adjustment	Adjuster No.	Pipe Thread	Bolt Thread
½	1	3 3/8	1 5/8	1	⅛	⅜
¾	1⅛	3 3/8	1 5/8	1	⅛	⅜
1	1⅛	3 3/8	1 5/8	1	⅛	⅜
1¼	1 5/8	3 3/8	1 5/8	1	¼	½
1½	1¾	3 3/8	1 5/8	1	¼	½
2	2¼	3 3/8	1 5/8	1	¼	½
2½	2½	3 3/8	1 5/8	1	¼	½
3	3	3 3/8	1 5/8	1	¼	½
3½	3 3/8	4 1/8	2 1/8	2	⅜	⅝
4	3 5/8	4 1/8	2 1/8	2	⅜	⅝
5	4 1/8	4 1/8	2 1/8	2	½	¾
6	4 3/4	4 1/8	2 1/8	2	½	¾
8	7 1/4	5⅝	2⅝	3	½	¾
10	9 1/8	5⅝	2⅝	3	½	⅞

Prices on application

The No. 215-F Adjustable Hanger is made of malleable iron. By its use, the supporting rod or pipe may be cut approximately to size and placed in position; the unit may then be adjusted to the proper position without removing the hanger from the pipe.

The lower portion of the adjuster is cast within the top section, forming an integral swivel which allows the top section to rotate, thus raising or lowering the entire unit to the desired position. The top section is formed in the shape of a hexagon nut to allow the use of a wrench when needed.

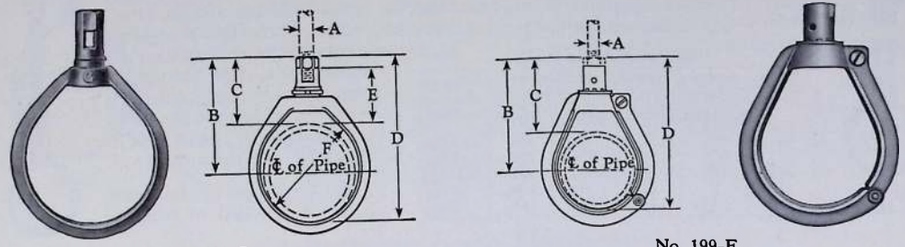
This hanger is regularly furnished black. Galvanized finish can be furnished, when so specified.



No. 215-F

Pipe Hangers

Adjustable Swivel Ring Hangers



No. 101-G
Solid Ring Type

No. 199-F
Split Ring Type

The No. 101-G Solid Ring Type Swivel Ring is made of malleable iron and is Underwriters' listed. The swivel shank allows adjustment by turning the shank nut to left or right. No temporary support of the pipe line is necessary while making adjustments. The swivel shank automatically locks when the pipe is in the desired position.

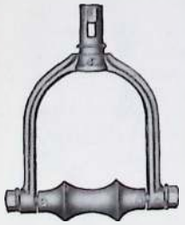
The No. 199-F, made of malleable iron and Underwriters' listed, is suitable for all general piping and sprinkler service. The off-center hinge design provides support for the piping while the ring is open and permits removing the pipe after the hanger is erected. The integral swivel allows vertical adjustment without the use of temporary supports.

Dimensions, in Inches

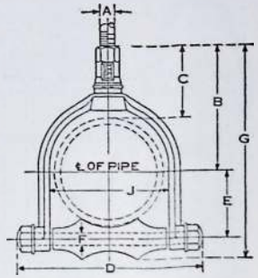
Pipe Size	No. 101-G, Solid Ring Type							No. 199-F, Split Ring Type			
	Max. Load	A	B	C	D	E	F	A	B	C	D
¾	80 lbs.	⅜	2 15/16	2 7/16	3½	2	1 3/16	⅜	2⅜	1 13/16	2⅞
1	85 lbs.	⅜	2¾	2⅛	3 7/16	1 11/16	1 7/16	⅜	2⅝	1 15/16	3¼
1¼	95 lbs.	⅜	3 1/16	2 3/16	3⅞	1¾	1 13/16	⅜	2 13/16	1 15/16	3⅝
1½	105 lbs.	⅜	3 1/16	2⅛	4	1 11/16	2	⅜	2⅞	1 15/16	3⅞
2	150 lbs.	⅜	3 7/16	2¼	4⅝	1 13/16	2 9/16	⅜	3 3/16	2	4⅜
2½	225 lbs.	½	4	2 9/16	5 7/16	2 1/16	3 1/16	½	3⅜	2	4 13/16
3	310 lbs.	½	4⅜	2⅝	6⅛	2⅛	3 11/16	½	3⅞	2⅛	5⅝
3½	390 lbs.	½	4 9/16	2 9/16	6 9/16	2 1/16	4 3/16	½	4 1/16	2⅛	6 1/16
4	475 lbs.	⅝	5 7/16	3 3/16	7 11/16	2 9/16	4¾	⅝	4⅜	2⅛	6⅝
5	685 lbs.	⅝	6	3¼	8 13/16	2⅝	5 13/16	⅝	5⅝	2 13/16	8⅜
6	950 lbs.	¾	7⅛	3 13/16	10 7/16	3 1/16	6⅞	¾	6 3/16	2⅞	9½
8	1510 lbs.	⅞	8 13/16	4½	13⅛	3⅝	8 15/16	⅞	8⅛	3 13/16	12 7/16

These rings, regularly furnished black, will be cadmium plated at extra cost; orders must specify.

Adjustable Swivel Pipe Rolls



No. 174-G
Adjustable Swivel
Pipe Roll



Dimensions, in Inches

Pipe Size	A	B	C	D	E	F	G	J	Max. Load Lbs.
2½	½	4	2 9/16	5½	1 15/16	7/16	6⅝	3¼	225
3	½	4 5/16	2 9/16	6⅛	2¼	7/16	7 5/16	3⅞	310
3½	½	4⅝	2⅝	6⅞	2 9/16	½	8	4⅜	390
4	⅝	5⅜	3⅛	7 7/16	2 13/16	½	9 1/16	4 15/16	475
5	⅝	5 15/16	3⅛	8¾	3 7/16	⅝	10⅜	6	685
6	¾	7 1/16	3¾	10⅞	4	¾	12¼	7⅛	950
8	⅞	8 13/16	4½	13¼	5⅛	⅞	15⅜	9¼	1510
10	⅞	10	4⅝	15½	6⅜	⅞	18 1/16	11¼	2100
12	⅞	11⅛	4¾	17¾	7 7/16	1	20½	13¼	2300

These Adjustable Swivel Pipe Rolls have a malleable iron yoke and a cast iron roll. Vertical adjustment is made by use of the swivel shank which automatically locks, preventing loosening due to vibration.

This type of hanger is primarily designed for use with uncovered pipe but can also be used with covered pipe having Pipe Covering Protection Saddles if the proper size pipe rolls are installed.

Prices on application

Grinnell Constant-Support Hangers

For High Temperature Piping Installations

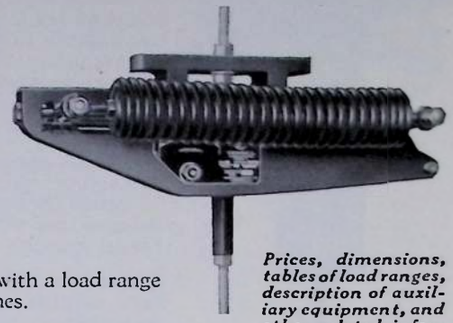
Grinnell Constant-Support Hangers are designed to compensate for the normal variation in the supporting force of helical coil springs. The total supporting force of these highly developed hangers is equal in all positions to the constant weight of the vertically shifting pipe.

The Hangers are recommended for high temperature piping in power plant, oil refinery, and marine installations. The following types are available:

No. 242, Model L: This Constant-Support Hanger is made in six sizes for an over-all load range of 141 to 2110 pounds and a total travel range of 1¼ to 2½ inches.

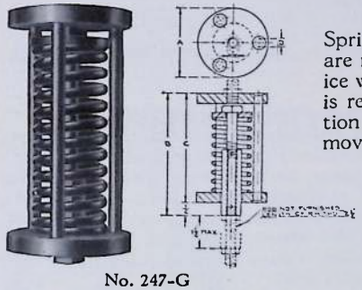
No. 243, Model L: The No. 243 Hanger is made in six sizes with a load range of 210 to 7875 pounds and a total travel range of 2 to 5 inches.

No. 244, Model L: The No. 244 Hanger is made in four sizes with a load range of 1270 to 19,530 pounds and a total travel range of 4 to 10 inches.



Prices, dimensions, tables of load ranges, description of auxiliary equipment, and other related information will be furnished on request.

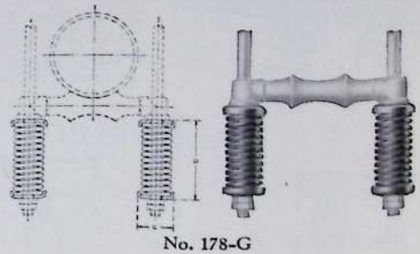
Spring Cushion Hangers



No. 247-G

Spring Cushion Hangers are recommended for service where constant support is required and compensation must be made for movement of the piping.

The use of springs is an efficient means of absorbing vibration.



No. 178-G

(Illustrations show complete assembly of No. 178-G Spring Cushion and a Single Pipe Roll.)

No. 247-G: The No. 247-G Light Duty Spring Hanger is a flexible support with a relatively small variation in supporting force.

It is used on small sized piping where the piping weight is in its range of load carrying capacity.

This hanger is recommended to the plumbing and heating trade for use on steam mains in municipal and commercial buildings and also for small piping in power and industrial plants.

No. 178-G: The No. 178-G Spring Cushion Hanger is usually used with a single pipe roll hanger as illustrated above.

The Spring Cushion consists of a set of two springs and four retainers. Size No. 1 retainer is cored with a 7/16-inch hole suitable for a ⅜-inch hanger rod, Size No. 2 is cored with a 9/16-inch hole for a ½-inch rod, and Size No. 3 is cored with a 15/16-inch hole for a ⅞-inch rod. These holes may be drilled or reamed larger to satisfy the hanger roll rod diameter.

Dimensions, in Inches

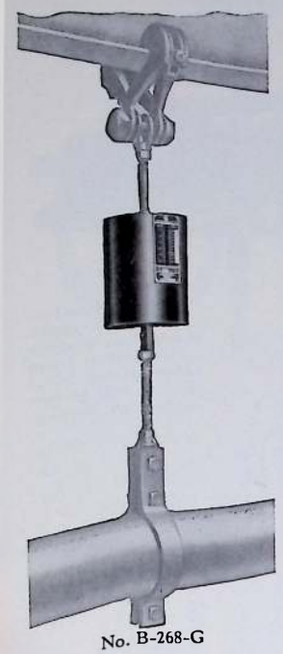
Size No.	No. 247-G						No. 178-G			
	A	B	C	D	*Maximum Deflection	Load Pounds at Maximum Deflection	Rod Size	C	D	†Capacity of Hanger Pounds	Deflection Rate per Spring Pounds per Inch
1	2⅝	4⅝	4⅛	5/16	1¼	47.5	⅜	2 21/32	6⅛	535	214
2	2⅝	5 19/32	5 3/32	5/16	1¼	85.0	⅜	4⅛	6 1/16	1500	600
3	3⅜	5 11/16	5 3/16	⅜	1¼	150.0	½	4⅛	9 1/16	3000	1200
4	3½	7¾	7¼	⅜	1¼	267.5	½				

*At maximum deflection, spring can be compressed an additional ¼-inch before becoming solid.
†Maximum capacity of double spring assembly.

Prices on application

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Grinnell Pre-Engineered Spring Hangers



No. B-268-G

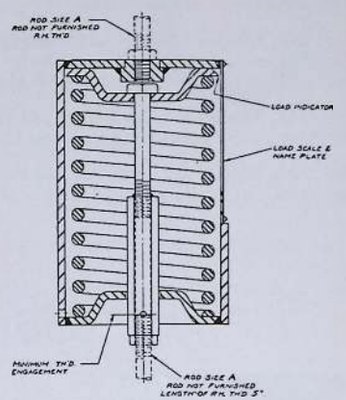
The Grinnell Pre-Engineered Spring Hanger was developed after years of experience in analyzing the problems of flexible pipe suspension systems. Spring design for the expanded line of No. B-268 Spring Hangers has been carefully calculated in all sizes and types to minimize the inherent changes in the supporting force with deflection of the spring. The feature of pre-compression assures operation of the spring within its proper working range, where variation in supporting force is at a minimum. Maximum variation in supporting force per ½-inch deflection of the spring is 10½ per cent of the rated capacity.

The design embodies pre-compressing the spring into the casing, within ½-inch of the working range, thereby reducing the over-all height of the hanger assembly.

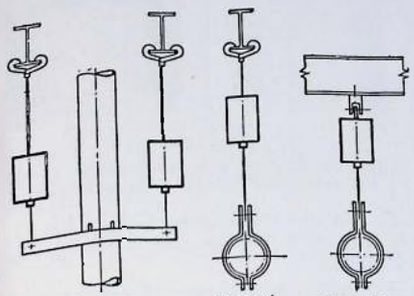
Erection of the hanger system has been simplified by incorporating a scale plate on the side of each hanger.

A unique load coupling eliminates the necessity for a turnbuckle to adjust the hanger load. Shortening or lengthening the rod until the scale pointer indicates the correct load assures proper installation of the equipment.

This Spring Hanger is offered in seven types and makes available a wide choice of carefully engineered spring hangers. It is made in sixteen sizes with load ranges from 74 to 9000 pounds capacity.



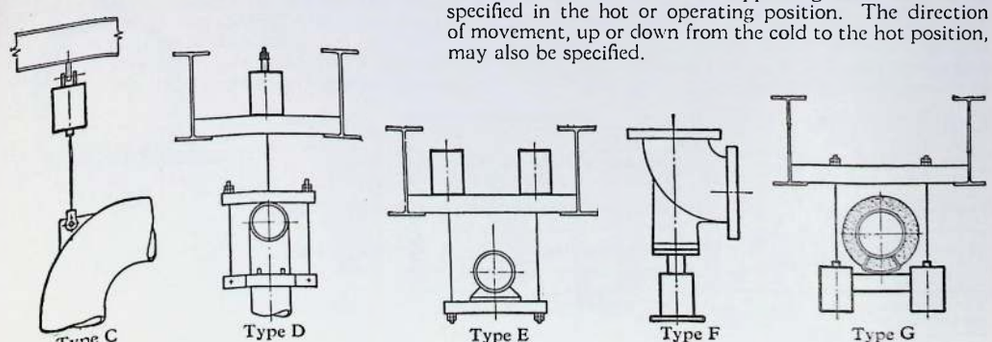
Type A Cross Section



Type A Type A Type B

Specifications: Grinnell Pre-Engineered Spring Hangers are designed to meet the requirements of the American Standard Code for Pressure Piping. Standard weight steel piping is used for the casing and serves to protect the spring from damage as well as weather conditions. The top and bottom spring cap serves as a centering device or guide and prevents the spring from coming in contact with the sides of the casing. All welding is done in strict accordance with the American Standard Code.

When ordering: When ordering, specify catalog number, type, and hanger size. These hangers provide a space for die-stamping the hanger mark number, the operating load per spring unit in pounds, and also for indicating the actual hot and cold position when the necessary data is furnished on the order. The desired supporting force should be specified in the hot or operating position. The direction of movement, up or down from the cold to the hot position, may also be specified.

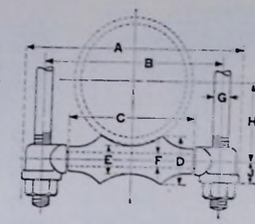


Type C Type D Type E Type F Type G

Prices on application

Single Pipe Rolls and Sockets

The No. 171-G Pipe Roll and Socket assembly is designed for use with uncovered or covered pipe. The single pipe roll takes care of horizontal expansion and contraction. The adjustable socket permits vertical adjustment at the roll. Order hanger rods and nuts separately. Special long rolls and special sockets are available; information on request.





No. 171-G Complete

For Pipe Roll only, specify No. 173-G. For Adjustable Socket only, specify No. 171A-G.

Dimensions, in Inches

Pipe Size	Socket No.	A (Max.)	B	C	D	E	F	G (Min.)	G (Max.)	H	J (Max.)	Max. Load Pounds
1	1	4 1/8	3	1 1/2	1	3/4	3/8	3/8	3/8	1 1/16	9/16	85
1 1/4	1	4 1/2	3 3/8	1 7/8	1 1/16	3/4	3/8	3/8	3/8	1 1/4	9/16	95
1 1/2	1	4 3/4	3 5/8	2 1/8	1 1/8	3/4	3/8	3/8	3/8	1 3/8	9/16	105
2	1	5 1/4	4 1/8	2 5/8	1 3/16	3/4	3/8	3/8	3/8	1 5/8	9/16	150
2 1/2	2	6 1/4	4 7/8	3 1/8	1 3/8	7/8	7/16	1/2	1/2	1 13/16	11/16	225
3	2	6 7/8	5 1/2	3 3/4	1 7/16	7/8	7/16	1/2	1/2	2 1/4	11/16	310
3 1/2	2, 3	7 3/4	6 1/4	4 1/4	1 5/8	1	1/2	1/2	5/8	2 9/16	3/4	390
4	2, 3	8 1/4	6 3/4	4 3/4	1 3/4	1	1/2	1/2	5/8	2 13/16	3/4	475
5	2, 3	9 11/16	8 1/16	5 13/16	2	1 1/8	5/8	1/2	5/8	3 7/16	7/8	685
6	2, 3, 4	11 7/16	9 9/16	6 7/8	2 5/16	1 1/4	3/4	1/2	3/4	4	1	950
8	2, 3, 4, 5	14 1/16	11 15/16	8 7/8	2 13/16	1 1/2	7/8	1/2	7/8	5 1/8	1 3/16	1510
10	2, 3, 4, 5	16 3/16	14 1/16	11	3 3/8	1 3/4	7/8	1/2	7/8	6 3/8	1 3/16	2100
12	3, 4, 5	18 7/16	16 5/16	13	3 7/8	2	1	5/8	7/8	7 7/16	1 1/4	2300
14	5, 6	20 1/8	17 3/4	14 1/4	4 5/8	2 1/2	1 1/8	7/8	1	8 3/8	1 7/16	3075
16	5, 6, 7	22 3/8	19 3/4	16 1/4	5	2 5/8	1 1/4	7/8	1 1/8	9 7/16	1 1/2	3075
18	5, 6, 7	24 1/2	21 7/8	18 1/4	5 7/16	2 3/4	1 1/4	7/8	1 1/8	10 1/2	1 1/2	3875
20	8	27 1/4	24 1/4	20 1/4	6	3	1 3/8	1 1/4	1 1/4	11 5/8	1 5/8	4980
24	6, 7, 8, 9	32 1/8	28 5/8	24 1/4	7 3/16	3 5/8	1 1/2	1	1 1/2	14	2 1/16	4980
30	8, 9, 10	39 7/8	35 1/2	30 1/4	8 15/16	4 1/2	1 7/8	1 1/4	1 7/8	17 7/16	2 7/16	4980

Hanger Couplings and Toggle Bolts



No. 134-G Adjustable Swivel Coupling



No. 136-G Rod Coupling

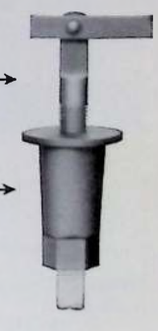
Dimensions, in Inches

Size No.		1	2	3	4	5
No. 134-G	Rod tappings	3/8	1/2	5/8	3/4	7/8
	Length	3 1/16	3 5/8	4 5/8	5 3/16	6 3/8
No. 136-G	Rod tappings	3/8	1/2	5/8	3/4	7/8
	Length	1 15/16	2 1/4	2 1/2	2 13/16	3 1/8

No. 134-G: The No. 134-G has a swivel nut to raise or lower the pipe. It is self-locking.

No. 136-G: The No. 136-G is furnished with right hand threads unless otherwise specified.

Nos. 209-G, 208-G: Nos. 209-G and 208-G are used under tile and cinder concrete construction.



No. 209-G → Toggle Bolt

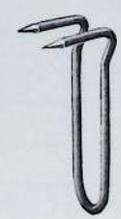
No. 208-G → Hanger Rod Coupling

Pipe Straps



These Galvanized Tin Pipe Straps are furnished for pipe sizes ¼ to 3-inch inclusive.

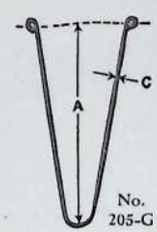
Wire Hooks



These Wire Pipe Hooks have long diamond points and are humped for easy driving. Made in lengths of 4 to 12-inch for pipe sizes ⅜ to 2-inch; copper finish at extra cost.

Prices on application

U-Hooks



No. 205-G

U-Hooks are available in lengths of 6 to 36-inch for pipe sizes ¾ to 8-inch.

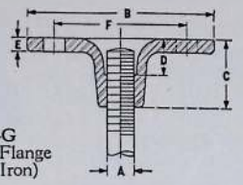
Rod sizes (C) are ⅜, ⅜, 7/16, 9/16, ⅝, and ¾-inch.

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asbestosclaims.law/library/21276/240

Hanger Flanges



No. 153-G
Pipe Hanger Flange
(Malleable Iron)

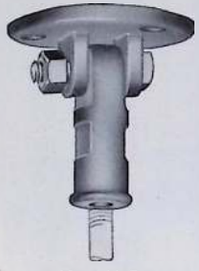


The No. 153-G Hanger Flange size No. 1 has two holes for wood screws; size Nos. 2, 3, 4, and 5 have three holes for coach screws. Underwriters' listed for pipe sizes up to 8-inch, the Flange is used primarily on level ceilings. A 1-inch adjustment is provided where the rod enters the flange.

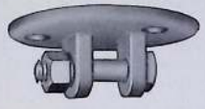
Dimensions, in Inches

Size No.	Pipe Size	A	B	C	D	E	F	Size Screw
1	¾–2	⅜	2⅞	1⅜	⅞	3/16	2	1½ No. 18
2	2½–3½	½	4	1½	15/16	¼	2⅞	⅜×2
3	4–5	⅝	4¾	1⅝	1	5/16	3⅜	½×2
4	6	¾	5¼	1⅞	1 1/16	⅜	3⅝	9/16×2
5	8–12	⅞	6	2⅛	1⅛	7/16	4¼	⅝×2

Adjustable Swinging Hanger Flanges



No. 155-G
Adjustable Swinging
Hanger Flange, Complete

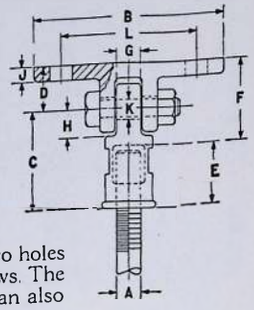


No. 156-G
Flange
With Bolt,
Nut, and
Spring Washer



No. 157-G
Extension
Piece
Rod
Threaded

Made of Malleable Iron
Underwriters' listed
for pipe sizes 8-inch and smaller

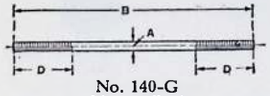


The No. 155-G Hanger Flange, a combination of Nos. 156-G and 157-G, provides a means of hanging pipe where a swing through a 180 radius is desired. Size No. 1 has two holes for wood screws; other sizes have three holes for coach screws. The No. 157-G Extension Piece has a 1-inch adjustment; it can also be used with beam clamps and channel clamps.

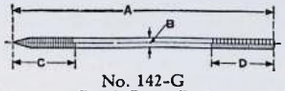
Dimensions, in Inches

Size No.	Pipe Size	A	B	C	D	E	F	G	H	J	K	L	Size Screws	Size Bolt
1	¾–2	⅜	3¼	2⅛	¾	1¼	1⅝	½	9/16	3/16	½	2½	1½ No. 18	⅜×1½
2	2½–3½	½	4	2⅜	15/16	1⅜	1 15/16	⅝	11/16	¼	½	2⅞	⅜×2	⅜×1¾
3	4–5	⅝	4¾	2 9/16	1⅛	1 9/16	2⅛	⅝	11/16	⅜	½	3⅜	½×2	7/16×2
4	6	¾	5¼	2⅞	1 5/16	1¾	2 7/16	⅝	13/16	7/16	½	3⅝	9/16×2	7/16×2⅛
5	8–12	⅞	6	3 1/16	1 7/16	1⅞	2⅝	¾	⅞	½	9/16	4¼	⅝×2	½×2⅜

Hanger Rods



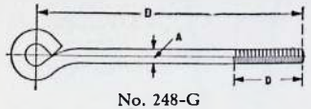
No. 140-G
Hanger Rod
Both Ends Machine Threaded
with Right Hand Threads



No. 142-G
Coach Screw Rod
Machine Threaded
on Opposite End



No. 143-G
Coach Screw Rod
Not Threaded
on Opposite End



No. 248-G
Eye Rod
Machine Threaded

Other rods can be furnished. Information and data on request.

Dimensions, in Inches

Length Inches	No. 142-G and No. 143-G Rod Size B, Inches				No. 140-G and No. 248-G Rod Size A, Inches								
	⅜	½	⅝	¾	⅜	½	⅝	¾	⅞	1	1⅛	1¼	1½
Available in lengths of 8, 10, 12, 14, 18, 24, 30, 36, 42, 48, 54, 60, 66, and 72-inch	Specify length on orders.				Specify length on orders.								
Thread Length C	2	2 7/16	2 9/16	2 9/16									
Thread Length D	2½	2½	2½	3	2½	2½	2½	3	3½	4	4½	5	6

Prices on application

Extension Eye Bolts

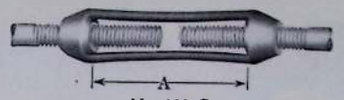


No. 220-G
Eye
Bolt
Forged
Steel

Dimensions, in Inches

Dia. of Eye Bolt	Length	Length of Thread	Dia. of Hole	Thickness of Metal at Eye
⅜	2½	2	13/32	½
	4	2¼	13/32	½
	5½	2¼	13/32	½
½	2¾	2	15/32	⅝
	4¼	2½	15/32	⅝
	5¾	2½	15/32	⅝
⅝	3	2⅛	15/32	⅝
	4½	3¼	15/32	⅝
	6	3¼	15/32	⅝
¾	3	2⅛	15/32	⅝
	4½	3½	15/32	⅝
	6	3¾	15/32	⅝
⅞	3¼	2¼	17/32	¾
	4¾	3¾	17/32	¾
	6¼	4½	17/32	¾

Turnbuckles



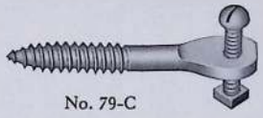
No. 230-G

The No. 230-G Turnbuckle is made of drop forged steel and can be furnished galvanized at additional cost. It is available in the following screw diameters: ⅜, ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼ and 1½-inch. When ordering, specify whether turnbuckles are wanted with or without stub ends.

Standard length Turnbuckles have a 6-inch opening (dimension "A" on illustration). Opening lengths of 9, 12, 18, and 24 inches are also available.

Flattened Lag Screws

With Bolt



No. 79-C

Dimensions, in Inches

Number of Screw	1	2	3
Size	5/16	⅜	½
Length	3½	3½	5

Flattened End Bolts

The No. 96-G End Bolt is forged steel. It is also available heavily copper plated for use with copper pipe and fittings; it is then designated No. 96 CP-G.



No. 96-G

Dimensions, in Inches

Bolt No.	Pipe Size	Bolt Size	Thread Length	Length Center of Hole to End	Size Hole
1	½ to 2	⅜	2	2⅞	9/32
2	2½ to 3½	½	2½	3⅜	11/32
3	4 to 5	⅝	3	4¼	13/32
4	6	¾	3¾	5	13/32
5	8	⅞	4½	6	17/32

Extension Bars

Dimensions, in Inches

Size Number	Width	Thickness	Std. Length Feet	Size Holes	Ctr. to Ctr. of Holes
00	¾	18 ga.	10	9/32	⅝
0	¾	16 ga.	10	9/32	⅝
1	⅞	16 ga.	10	9/32	⅝
2	1	15 ga.	10	9/32	⅝
3	1⅛	12 ga.	10	11/32	¾
4	1¼	12 ga.	10	11/32	¾



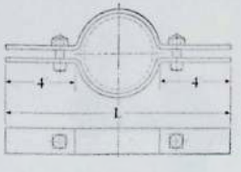
No. 1-C

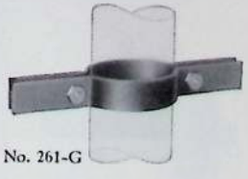
The No. 1-C Perforated Extension Bar is made of soft steel and can be cut with a cold chisel. When specified, lengths of 5 feet can be furnished. The bars will be galvanized at additional cost.

Extension Pipe or Riser Clamps

Dimensions, in Inches

Pipe Size	Length L	Size Stock	Pipe Size	Length L	Size Stock
¾	9⅜	3/16×1¼	5	14½	¼×2
1	9⅝	3/16×1¼	6	15½	¼×2
1¼	10	¼×1¼	8	18½	⅜×2
1½	10⅜	¼×1¼	10	20¾	⅜×2
2	10¾	¼×1¼	12	22¾	½×2
2½	11¼	¼×1¼	14 OD	24	½×2
3	12	¼×1¼	16 OD	26	⅝×2½
3½	13	¼×1½	18 OD	28	⅝×2½
4	13½	¼×1½	20 OD	30	⅝×2½





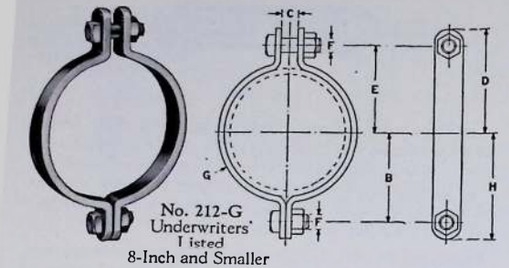
No. 261-G

The No. 261-G Clamp is made of wrought steel and is used as a riser clamp for supporting steel or cast iron pipe risers; also asbestos and other types of pipe covering.

Prices on application

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Wrought Pipe Clamps



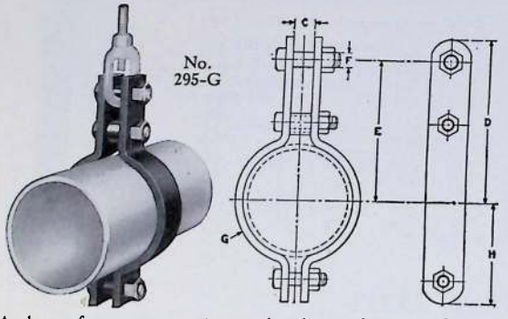
No. 212-G
Underwriters' Listed
8-Inch and Smaller

This clamp is made of wrought steel and is used for hanging power piping and for anchoring pipe on steam and hot water mains. For heavier load ratings the No. 216-G Clamp is available; data on request.

Dimensions, in Inches

Pipe Size	B	C	D	E	F	G	H	Max. Load Pounds 450°F.	Max. Load Pounds 750°F.
1½	1 13/16	½	2½	1 7/8	3/8	¼×1	2 7/16	850	650
2	2 1/8	½	2 3/4	2 1/8	½	¼×1	2 3/4	850	650
2½	2 1/2	5/8	3 1/4	2 5/8	½	¼×1	3 1/8	850	650
3	2 13/16	5/8	3 9/16	2 15/16	½	¼×1	3 7/16	850	650
3½	3 1/8	5/8	3 13/16	3 3/16	½	¼×1	3 3/4	850	650
4	3 7/16	3/4	4 3/8	3 5/8	5/8	¼×1¼	4 3/16	865	660
5	4	3/4	4 15/16	4 3/16	5/8	¼×1¼	4 3/4	865	660
6	4 7/8	7/8	5 7/8	5	3/4	3/8×1½	5 3/4	1550	1200
8	6	1	7	6 1/8	3/4	3/8×1½	6 7/8	1550	1200
10	7 5/16	1	8 9/16	7 7/16	7/8	½×2	8 7/16	2200	1700
12	8 1/4	1	9 9/16	8 7/16	7/8	½×2	9 3/8	2200	1700
14 OD	9	1 1/8	10 5/8	9 1/4	7/8	½×2½	10 3/8	2380	1820
16 OD	10	1 1/8	11 5/8	10 1/4	7/8	½×2½	11 3/8	2380	1820
18 OD	11 1/2	1 1/4	13	11 5/8	1	5/8×2½	12 7/8	2380	1820
20 OD	12 1/2	1 3/8	14 1/8	12 3/4	1 1/8	5/8×2½	13 7/8	3120	2400
24 OD	15	1 5/8	16 7/8	15 1/4	1 1/4	5/8×3	16 5/8	3120	2400

Double Bolt Wrought Pipe Clamps



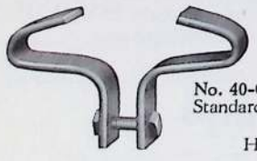
No. 295-G

A clamp for power station and industrial service for use where the top bolt is outside a 4-inch pipe covering; a heavy material is available for above normal loads.

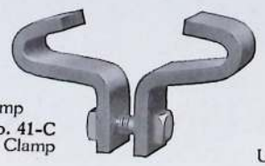
Dimensions, in Inches

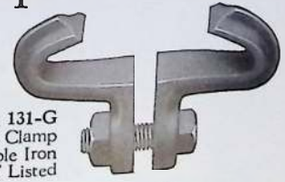
Pipe Size	C	D	E	F	G	H	Max. Load Pounds 750° F.
1½	1 1/16	4 7/8	4 1/8	5/8	¼×1¼	2 3/8	725
2	1 1/16	5 7/8	5 1/8	5/8	¼×1¼	2 11/16	725
2½	1 1/16	6 1/8	5 3/8	5/8	¼×1¼	2 15/16	725
3	1 1/16	6 11/16	5 15/16	5/8	¼×1¼	3½	725
3½	1 1/16	6 15/16	6 3/16	5/8	¼×1¼	3 3/4	1300
4	1 1/16	7 5/8	6½	3/4	3/8×2	4½	1300
5	1 1/16	8 1/8	7	3/4	3/8×2	5	1300
6	1 7/16	9 15/16	8 9/16	1	3/8×2½	6 1/8	1900
8	1 7/16	10 15/16	9 9/16	1	3/8×2½	7 1/8	1900
10	1 7/16	12	10 5/8	1	½×2½	8 1/4	2200
12	1 7/16	13	11 5/8	1	½×2½	9 1/4	2200
14 OD	2	14 5/16	12 11/16	1¼	5/8×3	10 11/16	3200
16 OD	2	15 5/16	13 11/16	1¼	5/8×3	11 11/16	3200
18 OD	2	16 5/16	14 11/16	1¼	5/8×3	12 11/16	3200
20 OD	2	17½	15 7/8	1 3/8	¾×3	14	4200
24 OD	2	19½	17 7/8	1½	¾×3	16	3500

I-Beam and Channel Clamps

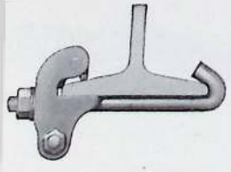


Made of strap steel
No. 40-C
Standard I-Beam Clamp
No. 41-C
Heavy I-Beam Clamp





No. 131-G
I-Beam Clamp
Malleable Iron
Underwriters' Listed



No. 225-G
Universal Side I-Beam Clamp
Malleable Iron
Underwriters' Listed



No. 226-G
Universal Channel Clamp
Malleable Iron
Underwriters' Listed



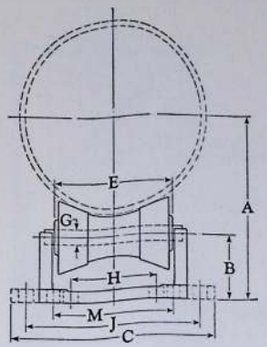
I-Beam Clamps
Forged Steel
No. 228-G
(R. H. Thread)
No. 228L-G
(L. H. Thread)

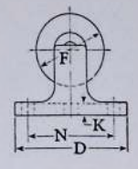


I-Beam Clamps, Forged Steel
No. 292-G (R. H. Thread)
No. 292L-G (L. H. Thread)

Prices on application

Pipe Roll Stands





These Cast Iron Pipe Roll Stands are designed for supporting piping in cases where vertical adjustment is not necessary, but where provision must be made for expansion and contraction of the pipe line.

There are two 1-inch cored holes located on the outside of the stands (at dimension "J") for 2 to 6-inch pipe; the stands for 8-inch pipe and larger have two 1-inch cored holes located inside of the uprights (at dimension "H").



No. 271-G
Pipe Roll Stand, Complete
No. 272-G
Pipe Roll and Rod Only
No. 273-G
Pipe Roll Only

There are four cored holes located at the four corners of the stand to provide additional anchorage. Dimensions "M" and "N" show the location of these holes.

Dimensions, in Inches

Pipe Size	A	B	C Length	D	E	F	G	H	J	K	M	N	Max. Load Pounds
2	3½												
2½	3 7/8	1¾	8⅜	5⅜	2¾	1 7/8	½		6 3/8	9/16	3 7/16	4	390
3	4 1/8												
3½	4 3/8												
4	4 13/16												
5	5 7/16	2 1/16	9⅞	5⅝	3¾	2 1/16	½		7⅞	¾	4 11/16	4¼	950
6	6 1/16												
8	8 11/16	3 7/16	8⅝	6⅝	6	3¼	¾	4		¾	7	5	2100
10	9 13/16												
12	11 3/8	3⅞	10 15/16	7⅞	8	4	⅞	5¾		¾	9 1/16	6	3075
14 OD	12												
16 OD	13 5/8	4¼	12⅜	8⅝	9	4½	1⅛	6¾		⅞	10¼	6½	4980
18 OD	14 5/8												
20 OD	15 5/8												
24 OD	17¾	4⅜	13½	8⅝	10	4 7/16	1⅜	7½		1	11 3/8	6½	7940
30 OD	21⅞	5⅛	17	10¾	12½	5½	1¾	10		1¼	14¼	8	7500

Pipe Roll and Plate



No. 277-G
Pipe Roll and Plate
No. 277 P-G
Base Plate Only

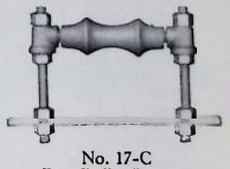
This Cast Iron Pipe Roll and Plate is used to support piping where vertical adjustment is not necessary, but where provision must be made for expansion and contraction. The supports can be raised or lowered by blocking or shimming up the base plate. They use pipe roll No. 273-G.

Pipe Roller Supports

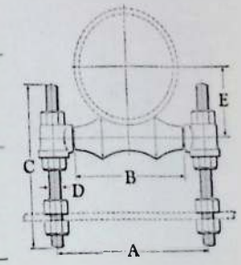
No. 17-C Cast Iron Adjustable Roller is used on welded steel brackets or almost any type of steel construction. It is adjustable while the pipe is in place; the nuts lock the roller in position. All sizes provide a vertical adjustment of 6 inches, and include a roll with sockets, roll rod, two vertical threaded rods, and eight nuts.

Dimensions, in Inches

Pipe Size	A	B	C	D	E
1	3	1½	9½	3/8	1 1/16
1¼	3 3/8	1 7/8	9½	3/8	1¼
1½	3 5/8	2 1/8	9½	3/8	1 3/8
2	4 1/8	2 5/8	9½	3/8	1 5/8
2½	4 7/8	3 1/8	9½	½	1 15/16
3	5½	3 3/4	9½	½	2¼
3½	6¼	4¼	10	5/8	2 9/16
4	6¾	4¾	10	5/8	2 13/16
5	8 1/16	5 13/16	10	5/8	3 7/16
6	9 9/16	6 7/8	11	3/4	4
8	11 15/16	8 7/8	11 3/4	7/8	5 1/8
10	14 1/16	11	11 3/4	7/8	6 3/8
12	16 5/16	13	11 3/4	7/8	7 7/16
14 OD	17 3/4	14 1/4	11 3/4	7/8	8 3/8
16 OD	19 3/4	16 1/4	18	1 1/4	9 7/16
18 OD	21 7/8	18 1/4	18	1 1/4	10 1/2
20 OD	24 1/4	20 1/4	18	1 1/4	11 5/8
24 OD	28 5/8	24 1/4	24	1 1/2	14
30 OD	35 1/2	30 1/4	24	1 7/8	17 7/16



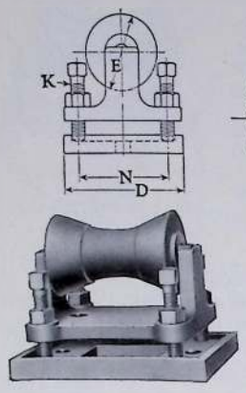
No. 17-C
Pipe Roller Support

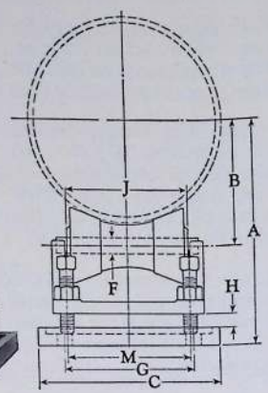


Prices on application

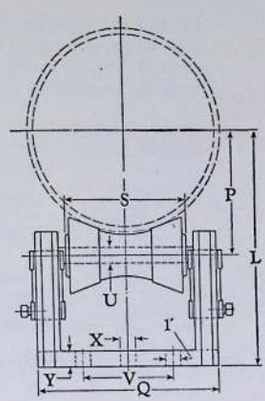
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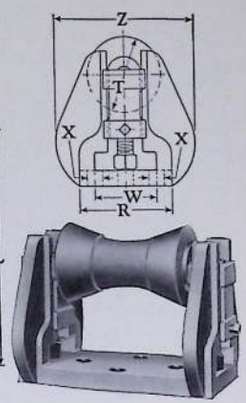
Adjustable Pipe Roll Stands





No. 274-G, Adjustable Pipe Roll Stand with Base Plate
No. 275-G, Adjustable Pipe Roll Stand Only
No. 274 P-G, Base Plate Only





No. 276-G
Adjustable Pipe Roll Stand

No. 274-G: These Cast Iron Stands are designed to support piping where there must be provision for vertical adjustment and lateral movement, as well as for expansion and contraction. Vertical adjustment is obtained by the four adjusting screws. Lateral movement of 1 inch on smaller sizes, and up to 1⅜ inches on larger sizes, is accomplished by sliding the stand on the ends of the adjusting screws.

No. 276-G: These Cast Iron Stands are for supporting piping where vertical adjustment is needed as well as allowance for expansion and contraction. Vertical adjustment is accomplished by turning the two adjustment screws which raise and lower adjusting slides located at either end of the stand. When proper alignment is obtained, the adjusting screws may be locked by tightening the small set screws.

Dimensions, in Inches, for No. 274-G, No. 275-G, and No. 274 P-G

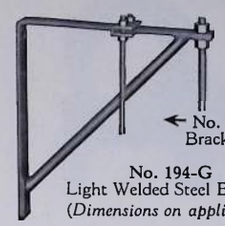
Pipe Size	A Min.	A Max.	B	C	D	E	F	G	H (Max.)	J	K	M	N	Max. Load Pounds
2	5⅛	5⅜	1¾	6⅞	5½	1⅞	½	3⅞	⅞	2¾	⅝	3 7/16	4	390
2½	5⅜	5⅝	2⅛											
3	5¾	6	2⅜											
3½	6	6¼	2⅝											
4	6½	7	2¾	8⅛	5¾	2 1/16	½	5⅛	1⅛	3¾	⅝	4 11/16	4¼	950
5	7	7½	3⅜											
6	7⅝	8⅛	4											
8	10⅜	11⅝	5¼	10⅝	6¾	3¼	¾	7⅜	1¾	6	¾	7	5	2100
10	11½	12¾	6⅜											
12	13	14¼	7½	13	8	4	⅞	9½	1¾	8	⅞	9 1/16	6	3075
14 OD	13⅝	14⅞	8⅛											
16 OD	15¼	16⅝	9⅜	14⅝	8⅝	4½	1⅛	11⅛	1⅞	9	1	10¼	6½	4980
18 OD	16⅜	17¾	10⅜											
20 OD	17⅜	18¾	11⅜											
24 OD	19⅝	21	13⅜	15¾	8⅝	4 7/16	1⅜	12¼	1⅞	10	1	11⅜	6½	6100
30 OD	24	26¾	16¾	19¼	10½	5½	1¾	15¾	3¼	12½	1¼	14¼	8	7500

Dimensions, in Inches, for No. 276-G

Pipe Size	L Min.	L Max.	P	Q	R	S	T	U	V	W	X	Y	Z	Max. Load Pounds
4	7⅛	8⅜	2¾	7	6	3¾	2⅛	½	2½	4	⅞	¾	7⅛	950
5	7¾	9	3⅜											
6	8⅜	9⅝	4											
8	10⅞	12⅜	5¼	9½	6	6	3¼	¾	4½	4	1	⅞	8½	2100
10	12	13½	6⅜											
12	13½	15¼	7½	12	6	8	4	⅞	6	4	1	1	9	3075
14 OD	14⅛	15⅞	8⅛											
16 OD	15½	17⅛	9⅜	13	6½	9	4½	1⅛	7	4½	1	1	9⅛	4980
18 OD	16½	18⅛	10⅜											
20 OD	17½	19⅛	11⅜											
24 OD	19⅝	21½	13⅜	14⅛	6½	10	4½	1⅜	8	4½	1	1	9⅛	6100
30 OD	24¾	27	16¾	17¼	8	12½	5½	1¾	10¼	6	1	1¼	11½	7500

Prices on application

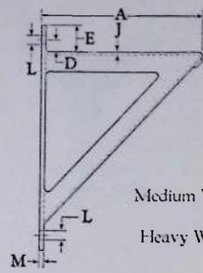
Welded Steel Brackets

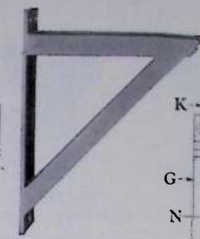


No. 194-G
Light Welded Steel Bracket
(*Dimensions on application*)

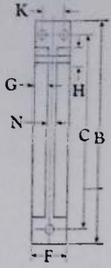
MAXIMUM LOADS
Light Weight Brackets — 750 pounds
Medium Weight Brackets—1500 pounds
Heavy Weight Brackets —3000 pounds

No. 193-G Bracket Clips will support 3½-inch pipe and smaller from any position along the arm of the bracket.





No. 195-G
Medium Welded Steel Bracket
No. 199-G
Heavy Welded Steel Bracket



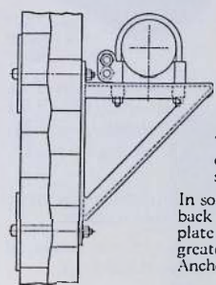
Welded steel brackets in all of the weights shown can be furnished in practically any size or type. The brackets are coated with a protective paint to prevent rusting during shipment.

Dimensions of Medium and Heavy Brackets, in Inches

Figure No.	Bracket No.	A	B	C	D	E	F	G	H	J	K	L	M	N
No. 195-G	0	12	18	15½	1¼	2½	4	1½	1½	3/16	*	13/16	3/8	1
	1	18	24	21½	1¼	2½	4½	1¾	1¾	3/16	*	13/16	3/8	1
	2	24	30	27½	1¼	2½	5	2	2	¼	*	13/16	3/8	1
No. 199-G	0	12	18	15¼	1¼	2¾	4	1½	2	¼	*	13/16	½	1
	1	18	24	21⅜	1⅜	2¾	5	2	2	3/8	2¾	15/16	½	1
	2	24	30	27½	1½	2¾	5	2	2½	5/16	2½	1 1/16	½	1
	3	30	36	33¼	1½	3	5	2	2½	5/16	2½	1 1/16	½	1
	4	36	42	39	1½	3	6	2½	3½	3/8	3½	1 1/16	½	1
	5	42	50	46	1½	3½	6	2½	3½	3/8	3½	1 1/16	½	1

*Medium Weight Brackets and No. 0 Heavy Weight Brackets have only one bolt hole at the top.

Application of Welded Steel Brackets



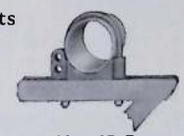
Left: When a bracket is bolted to a wall, back plates must be ordered of such size and thickness to properly distribute the weight over the wall section.

The size and thickness of the plate will be governed by the load to be carried and the construction and condition of the wall.

In some installations, it is advisable to reinforce the back plates with additional steel in the form of a plate or angle to distribute the load over an even greater wall area. This is especially desirable when Anchor Chairs are mounted on a bracket.

The illustrations at the right show various types of pipe supports mounted on welded steel brackets. Pipe supports and welded steel brackets must be ordered separately.

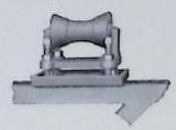
Used with Pipe Rolls and Supports



No. 197-G
Anchor Chair



No. 271-G
Pipe Roll Stand



No. 274-G
Pipe Roll Stand with Base Plate



No. 276-G
Adjustable Pipe Roll Stand

Single Hooks

Dimensions								
Pipe Size, Inches	½	¾	1	1¼	1½	2	2½	3
Center to center of holes, Inches	1 27/32	2⅛	2 7/16	3	3 5/16	3⅞	4 13/16	5½
Size of screws	No. 14			No. 18			⅜-inch	

Application: No. 168-G Single Hooks are used mainly from sides of beams where no adjustment is necessary, and in cases where there is no movement due to expansion and contraction. Single hooks are often used in conjunction with hook plates to carry wall coil.

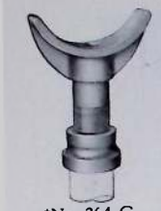


No. 168-G
Single Hook

Prices on application

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Cast Iron Pipe Supports



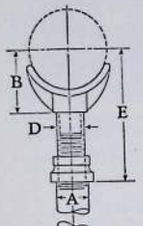
*No. 264-G
Adjustable Pipe

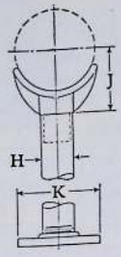


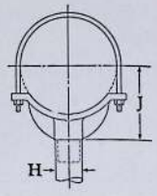
No. 258-G
Pipe Saddle Support



No. 259-G
Pipe Stanchion
Saddle





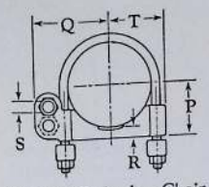


*Retaining spots are welded to the lower end of the nipple after assembly to prevent separation of the nipple and reducer during adjustment.

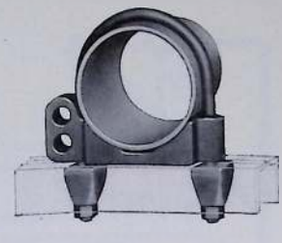
Dimensions, in Inches

Pipe Size	No. 264-G A	B	C	D	E Min.	E Max.	No. 258-G and No. 259-G H	J	K
2½	2½	3½	9	1½	8	13			
3	2½	3¾	9	1½	8¼	13¼			
3½	2½	4	9	1½	8½	13½			
4	3	4¼	9	2½	9¼	14	3	4¼	9
5	3	4⅞	9	2½	10	14¾	3	4⅞	9
6	3	5½	9	2½	10½	15¼	3	5½	9
8	3	6⅞	9	2½	11¾	16½	3	6⅞	9
10	3	8½	9	2½	13½	18¼	3	8½	9
12	3	10	9	2½	15	19¾	3	10	9
14 OD	4	11	11	3	16¼	20¾	4	11	11
16 OD	4	12½	11	3	17¾	22¼	4	12½	11
18 OD	6	14	13½	3½	19½	24	4	14	11
20 OD	6	15½	13½	3½	21	25½	6	15½	13½
24 OD	6	18	13½	4	23¾	28¼	6	18	13½
26 OD							6	19¼	13½
30 OD	6	21½	13½	4	27	31½	6	21½	13½
32 OD	6	22¾	13½	4	28¼	32¾	6	22¾	13½
36 OD	6	24¾	13½	4	30¼	34¾	8	24¾	16

Anchor Chairs



No. 197-G Anchor Chair



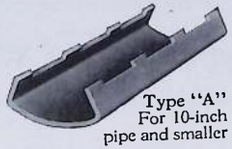
Dimensions, in Inches

Pipe Size	P	Q	R	S	T
4	3	4⅛	¾	⅝	3 3/16
5	3 9/16	5	¾	¾	3⅞
6	4 1/16	5¾	¾	⅞	4 9/16
8	5 5/16	7⅛	1	1	5¾
10	6½	8⅜	1⅛	1⅛	6 13/16
12	7⅝	9½	1¼	1¼	7 13/16
14 OD	8½	10⅛	1½	1¼	8 7/16
16 OD	9⅝	11½	1⅝	1½	9 7/16
18 OD	10⅞	12½	1⅞	1½	10 7/16
20 OD	12	13½	2	1½	11 7/16
24 OD	14	15½	2	1½	13 7/16

These supports consist of a cast iron chair, a round iron yoke, two special cast iron washers, and two hexagonal nuts.

These anchor chairs are well adapted for use with welded steel brackets.

Protection Saddles



Type "A"
For 10-inch
pipe and smaller



Type "B"
For 12-inch
pipe and larger

The No. 186-G, for Standard covering, the No. 186A-G for 2-inch covering, and the No. 187-G for Double Standard covering are available in the ¾, 1, 1¼, 1½, 2, 2½, 3, 3½, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, and 24-inch sizes.

The No. 188-G for Double 1½-inch covering is made in sizes 2, 2½, 3, 3½, 4, 5, 6, 8, and 10-inch.

All saddles are 12 inches long and are made of curved steel plates with the edges turned up.

B & C Floor and Ceiling Plates



No. 1-BC
Made in copper tube sizes ⅜ to 3-inch.



No. 10-BC
Made in standard pipe sizes ¼ to 6-inch.

When ordering, specify the catalog number, the size, and the type of finish desired.



No. 13-BC
Made in standard pipe sizes ¼ to 6-inch.



No. 20-BC
Made in standard pipe sizes ⅜ to 4-inch

These plates, made of pressed steel, are available with a plain or chromium-plated finish. Nos. 1-BC, 10-BC, and 20-BC hold their position on the pipe by means of springs; the No. 13-BC is equipped with a set screw. If the No. 1-BC style is desired with a set screw instead of springs, specify No. 2-BC.

Prices on application

Pipe Tools and Insulating Materials

Pipe and Square-End Sawing Vises.....page 444
Pipe Wrenches and Pipe Tongs.....page 445
Pipe Cutters and Cutter Wheels.....page 446
Pipe End Reamers.....page 447
Pipe Taps.....page 447

Pipe and Bolt Threading Devices.....pages 447 to 450
Pipe Threading Machines.....pages 450 and 451
Power Vise Stand.....page 451
Thread Cutting Oil.....page 452

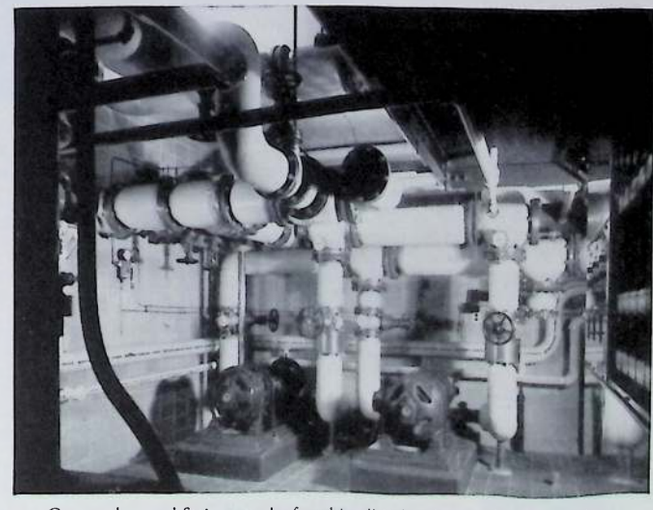
Flange-Jacks.....page 445
Fire Pots.....page 452
Flue Brushes and Scrapers.....page 452
Valve Reseating Equipment.....page 453

Insulating Materials and Cements.....pages 454 and 455
NoDrip Coating and Tape.....page 452
Air Filters.....page 456

In addition to the tools and supplies shown on pages 444 to 456, the following are shown in other sections of this catalog, in order to group them with allied products:

Body Seat Ring Wrenches.....page 137
Thread Lubricant and Compound.....page 464
Machine Bolts.....page 465
Gaskets.....pages 472 to 476, and 416
Sheet Packings.....page 473

For Solder-Joint Accessories, see pages 426 and 427.

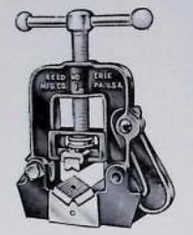


Crane valves and fittings can be found in all industries, on all services, wherever fluids are conveyed in pipe lines. Illustrated is a portion of the basement piping in a large office building—Crane products were used throughout.

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Pipe Vises

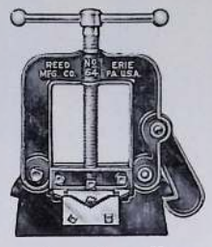
Reed Long Jaw and Extra Heavy Pipe Vises



Long Jaw Vise
For ⅛ to 4½-Inch Pipe

Long Jaw Vises have long bearing alloy tool steel jaws which grip firmly without crushing, marring, or bending the pipe. The lower jaw is reversible; an automatic take-up keeps the vise tight.

Extra Heavy Vises are ruggedly built and have interlocking pipe jaws with heat-treated high carbon steel screws. The base has a flat bottom, without an apron, and can be mounted on any flat surface.

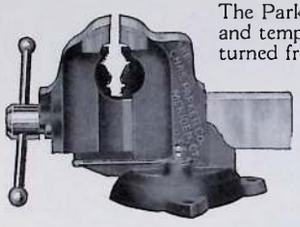


Extra Heavy Vise
For ⅛ to 12-Inch Pipe

Sizes and Capacities

No. of Vise		Long Jaw					Extra Heavy		
		No. 00	No. 0	No. 1	No. 2	No. 3	No. 64	No. 65	No. 66
For Pipe	Inches	⅛ to 1½	⅛ to 2	⅛ to 2½	⅛ to 3½	⅛ to 4½	⅛ to 6	1 to 8	1½ to 12

Parker Combination Pipe Vises



The Parker Combination Pipe Vises have pipe jaws of highest grade steel, milled and tempered in oil. They are furnished with a reversible front jaw which can be turned from end to end when worn, making the vise suitable for general use.

The Parker Vise bolts to a bench, and the split swivel base construction assures ample gripping power. A tension spring holds the handle wherever it is placed.

Sizes and Capacities

Number of Vise		No. 433½	No. 434½	No. 435	No. 436
Size of jaw	Inches	3½	4½	5	6
Maximum pipe size	Inches	2	3	4	6

Williams Drop-Forged Chain Pipe Vises



Vulcan
For ⅛ to 8-Inch Pipe

Vulcan wrought steel chain pipe vises can be used on bench or post. The jaws are tempered for file sharpening.

Vulcan Superior chain vises are made from wrought steel. They are quickly set up. The overhead adjustment feature simplifies operation. Reversible jaws provide long life.

Sizes and Capacities

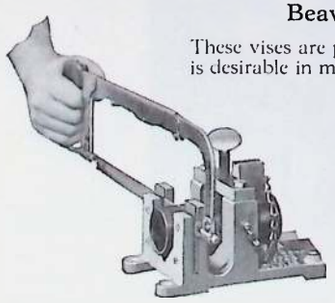
Number of Vise		Vulcan				Vulcan Superior	
		No. 1	No. 2	No. 3	No. 4	No. 11	No. 12
For Pipe	Inches	*⅛ to 2	¼ to 4	¼ to 6	¼ to 8	⅛ to 2½	¼ to 4½

*Will grip pipe fittings not larger in diameter than Standard 2½-inch pipe (2⅞ inches O.D.).



Vulcan Superior
For ⅛ to 4½-Inch Pipe

Beaver Square-End Sawing Vises



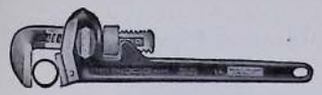
These vises are particularly well suited for copper tubing, on which a square-cut end is desirable in making a good joint. The hacksaw is not furnished with the vise.

No. 2: The No. 2 Square-End Vise is for pipe sizes ⅛ to 2 inches, and is made of aluminum, with renewable hardened steel inserts in the saw guides. It is self-contained, light in weight, and can be used with any kind of a hacksaw. A strip of cotton webbing and a piece of rosin are included for use when cutting polished nickel tubing. The vise is equipped with a long "V" trough for accurate centering of tubing.

No. 4: The No. 4 is similar to the No. 2 except that it is for tube sizes 1½ to 4 inches, and is made of air-furnace malleable iron and uses a different type clamping device.

Prices on application

Pipe Wrenches



Ridgid Straight Pattern



Ridgid End Pattern—Style E



Trimo-Alloy

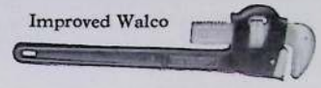
Ridgid pipe wrenches have an all-alloy housing guaranteed never to break or warp. Handles are made of steel. End pattern wrenches are designed particularly for use in close quarters.

Trimo wrenches are made of drop-forged heat-treated alloy steels. All sizes are equipped with a steel handle.

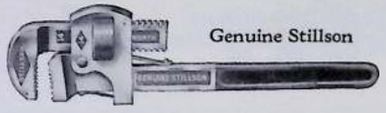
Wrench Sizes and Capacities

Size	Pipe Capacities, in Inches				
	Ridgid		Trimo-Alloy	Genuine Stillson	Improved Walco
Inches	Straight Pattern	End Pattern			
6	¾	¾	⅛-½	⅛-½	⅛-½
8	1	1	⅛-¾	⅛-¾	⅛-¾
10	1½	1½	⅛-1	⅛-1	⅛-1
12	2	2			
14	2	2	¼-1½	¼-1½	¼-1½
18	2½	2½	¼-2	¼-2	¼-2
24	3	3	¼-2½	¼-2½	¼-2½
36	4½	4½	½-3½	¼-3½	¼-4
48	6		1-5	1-5	1-6
60	8				

Improved Walco



Improved Walco wrenches are designed for heavy duty work. All parts are made of forged steel. A new type spring provides reliable ratchet action.



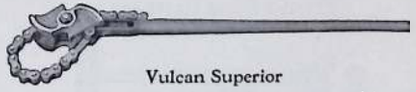
Genuine Stillson

Genuine Stillson Wrenches have a forged steel handle and jaw. They are light in weight and easy to use.

Williams Drop-Forged Chain Pipe Tongs



Vulcan



Vulcan Superior

These Chain Pipe Tongs are furnished with either flat link or cable chain (flat link chain illustrated). Each flat chain is individually tested to two-thirds of the breaking strain listed in the table below.

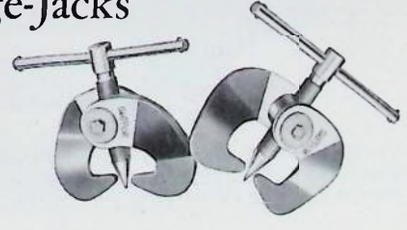
Vulcan Superior Pipe Tongs have reversible jaws. The chain locks easily and positively. A greater number of grips or bites on pipe and fittings is attained by a "V" recess in the jaws.

Sizes, Dimensions, and Capacities

Vulcan No.			10	11	12	13	13½	14	15	16
Vulcan Superior No.			0	1	2	3	3½	4	5	—
For pipe sizes		Inches	⅛ to ¾	⅛ to 1½	¼ to 2½	¾ to 4	1 to 6	1½ to 8	2 to 12	4 to 18
Dimensions, in Inches	Over-all length		13¾	20	27	37	44½	50½	64½	87
	Length of flat chain		9½	13½	17½	22½	32	40½	55½	74½
	Length of cable chain			14½	18	27	33½	42	57	76
Breaking strain	Flat chain	Pounds	3600	6700	9800	12500	14300	15700	21800	40000
	Cable chain	Pounds		6000	9000	12500	14300	15700	21800	40000

Williams Flange-Jacks

Williams Flange-Jacks are exceptionally well suited for flange gasket replacement work. Available in pairs only.



Capacities, in Inches
(Standard Raised Face Flanges)

No.	125-Pound Cast Iron	150-Pound Steel	250-Pound Cast Iron	300-Pound Steel
20	2 to 20	2 to 20	1 to 12	¾ to 12
30	16 to 48	18 to 24	12 to 30	12 to 24

Prices on application

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
ACL Doc 21276 · Page 245 of 314
Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/245

Pipe Cutters and Cutter Wheels

Nye No. 2N Pipe Cutter



For ⅛ to 2-Inch Pipe

The Nye No. 2N is a heavy duty pipe cutter of solid malleable construction. The handle is steel.

Nye Barnes Type Pipe Cutters



The Nye Barnes Type Pipe Cutter is furnished with three, plain edge wheels.

No.		2	4	5	6
For pipe sizes	Inches	⅛—2	2½—4	4—6	6—8

Trimo Pipe Cutters



No.		1	2	3	4
For pipe sizes	Inches	⅛—1¼	⅛—2	1—3	2—4

Ridgid Pipe Cutters

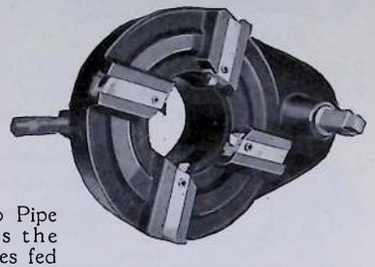


No.		1	2	3	4	6
For pipe sizes	Inches	⅛—1¼	⅛—2	1—3	2—4	4—6

Tubing Cutters

The Crane line of accessories for use with solder-joint valves and fittings includes tubing cutters; refer to page 427 for complete information.

Toledo Automatic Pipe Cutter



No. 40
For 2 to 4-Inch Pipe

The No. 40 Pipe Cutter has the cutter knives fed automatically, cuts rapidly, gives a square-end cut, and can be converted into a power cutter.

Nye Cutter Wheels

Nye cutter wheels fit all standard type pipe cutters. The wheels, of hardened and tempered alloy steel, are made with a smooth edge. When ordering, specify the number and type of cutter.



Make of Cutters Wheels Will Fit

Wheel No.	Type	Cutter Size Number
1 & 2-R	Ridgid	No. 1 or No. 2
	Nye	No. 2N
	Oster	[1]No. 502 Power Machine
3 & 4-R	Ridgid	[1]No. 3 or No. 4
1 & 2-T	Trimo	No. 1 or No. 2
	Nye	Nos. 1T or 2T (Former Nos. 1A, 2A)
	Reed	Nos. 1R or 2R, Roller Block only
	Beaver	No. 102, Model A or B Machine
3-T	Trimo	No. 3
	Nye	No. 3T (Former No. 3A)
	Reed	No. 3R Roller Block only
1-U	Universal	Nye No. 1
2-U	Universal	Nye No. 2
4-U	Universal	Nye No. 4
1-B[2]	Barnes	No. 1, all makes
	Reed	No. 1W, hook end only on No. 1R
2-B[2]	Barnes	No. 2, all makes
	Reed	Nos. 2W, 2F, hook end only on No. 2R
3-B[2]	Barnes	No. 3, all makes
	Reed	No. 3W, hook end only on No. 3R
4-B	Barnes	No. 4, all makes
5-7B	Barnes	Nos. 5, 6, 6½, or 7, all makes
1-S	Saunders	[3]No. 1, all makes
2-S	Saunders	[3]No. 2, all makes
3 & 4-S	Saunders	[3]Nos. 3 or 4, all makes
5-S	Saunders	[3]No. 5, all makes
N10CW	Nye	[3]No. 10 Tube Cutter
N20CW	Nye	[3]Nos. 20 or 30 Tube Cutters

[1]Heavy duty wheels are available, if specified, at extra cost.
[2]When ordering pins for Reed cutters, add "H" to number.
[3]For pins, specify whether for wheel or roller.

Prices on application

Pipe Taps and Reamers

Nye Taper Pipe Taps



For ⅛ to 2-Inch Pipe

Nye Taper Pipe Taps are made of carbon steel for pipe sizes ⅛ to 2 inches.

Nye Ratchet Reamer

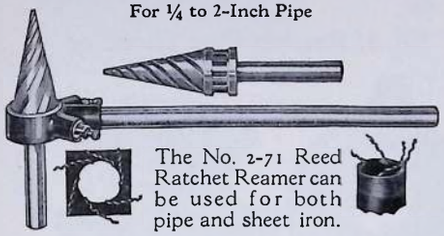
For ¼ to 3-Inch Pipe



This reamer has alloy steel replaceable blades, specially ground for easy reaming.

Reed Self-Feeding Ratchet Reamer

For ¼ to 2-Inch Pipe



The No. 2-71 Reed Ratchet Reamer can be used for both pipe and sheet iron.

Nye Bit Brace Reamers

Spiral Flute

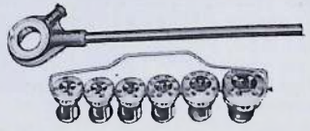
Made with taper shank to fit any standard bit brace.



No.		42	42½	44
For pipe sizes	Inches	⅛ to 1	⅛ to 1¼	¼ to 2

Beaver Threading Devices

Ratchet Pipe and Bolt Threader



No. 3
For ⅛ to 1-Inch Pipe

The No. 3 Threader is furnished with a fully enclosed ratchet. The dies can be inverted for close work.

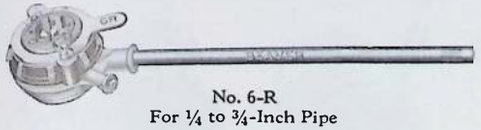
Ratchet Pipe Threader



No. 17
For ⅛ to 2-Inch Pipe

This threader has square removable die segments which can be resharpened. Non-adjustable.

Beaverette Ratchet Threader

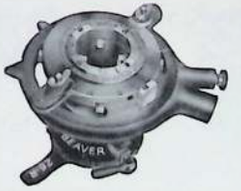


No. 6-R
For ¼ to ¾-Inch Pipe

The No. 6-R Threader consists of two sets of dies (¼, ⅜-inch and ½, ¾-inch) in tool, being moved in and out of working position by a simple cam arrangement. The ⅛-inch die is extra.

This threader is furnished with a smooth working chuck, right or left dies, and will cut standard, oversize, or undersize threads.

Adjustable Ratchet Threader



No. 26-R
For 1 to 2-Inch Pipe

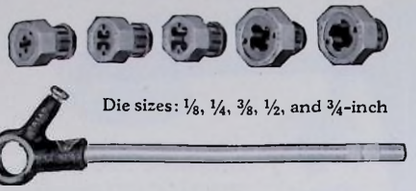
The No. 26-R Threader is fully adjustable and has the ratchet drive ring located in the head, providing straight line pull. The threader is self-contained and well balanced.

Prices on application

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Nye Threading Devices

No. 50 Triad Ratchet Stock



Die sizes: ⅛, ¼, ⅜, ½, and ¾-inch

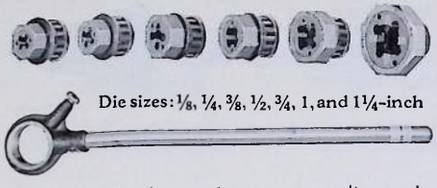
One-piece dies, locked in place by a threaded screw cap, are easy to remove when necessary.

Triplex Solid Die Stock

This stock is a one-piece combination stock with three dies and permanently fixed steel guides. To thread short nipples, the dies can be reversed and a nipple bushing or guide inserted between die and tap plate. Furnished in two combinations: ⅜ to ¾-inch and ½ to 1-inch.



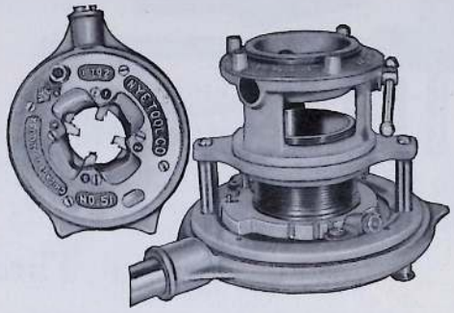
No. 60 Triad Ratchet Stock



Die sizes: ⅛, ¼, ⅜, ½, ¾, 1, and 1¼-inch

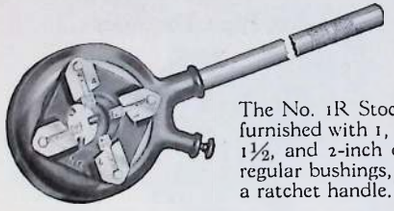
The No. 60 Stock uses the same type dies as the No. 50 above but the die heads are different.

No. 51 Ratchet Pipe Threader



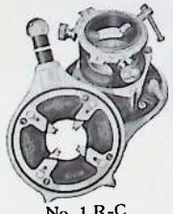
The No. 51 Ratchet Pipe Threader uses a single set of high speed dies to thread 1, 1¼, 1½, and 2-inch pipe. A reversible guide post permits cutting taper or straight pipe threads. The spin back knob feature, (see upper left of smaller illustration) provides a rapid means of screwing the leader nut out to the starting position, at the completion of the threading operation. The unit is self-opening. It will not jam.

No. 1R Ratchet Stock



The No. 1R Stock is furnished with 1, 1¼, 1½, and 2-inch dies, regular bushings, and a ratchet handle.

Ridgid Threading Devices



No. 1 R-C
Poster Threader
For 1, 1¼, 1½, and 2-Inch Pipe



Nos. 65 and 85 Series
Chaser Dies

These Chaser Dies are made of high speed steel.

Chaser Dies (Nos. 1 and 1-R Series) are available for any Ridgid Poster Threaders.



No. 65 R-C
Ratchet Threader
For 1, 1¼, 1½, and 2-Inch Pipe



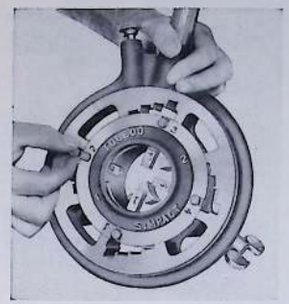
No. 4-P
Ratchet Threader
For 2½ to 4-Inch Pipe

Prices on application

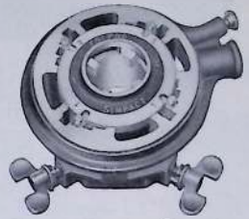
Toledo Threading Devices

Simpact Threader

For 1 to 2-Inch Pipe

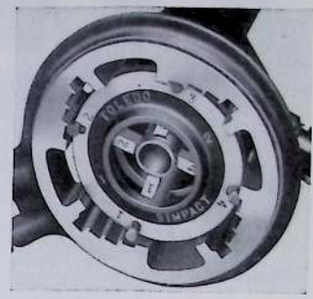


Quick, easy changes. Simply push in the dies—then slip them in the proper steps.



Simpact Ratchet Threader

A compact, all-in-one tool, adjustable for over, under, or standard size threads.

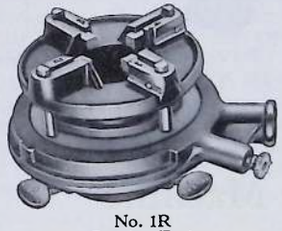


No waste. Oil collects in the pockets; drips on the dies as the tool revolves.

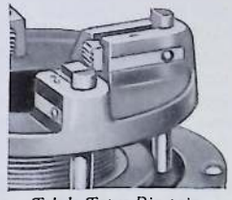
The Simpact Threader is a self-contained tool with one set of fine grade, high speed steel dies, which, through a simple adjustment, threads all four sizes. The dies can be reground when necessary. Three large winghead thumb screws, graduated guide posts, and broad-face chuck jaws simplify centering of pipe.

Adjustable Threaders

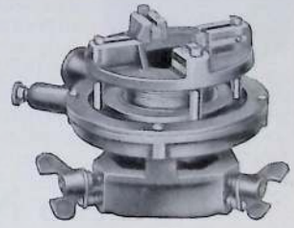
For 1 to 2-Inch Pipe



No. 1R
Ratchet Tool



Toledo Taper-Pin principle assures smooth, perfectly tapered threads.



No. 1 BR
Ratchet Tool

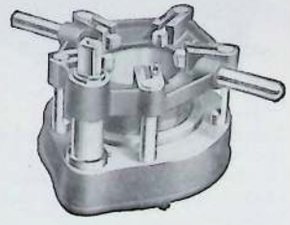
Adjustable Threaders feature the "taper-pin" principle of operation. Adjustments are easy and quick. Dies cut smoothly assuring perfectly tapered threads.

No. 1R, light in weight, uses bushings to center the tool on the pipe. The unit includes separate right hand dies for each size pipe, and one handle.

No. 1BR uses three broad-face chuck jaws and graduated guide posts to center the tool. Separate right hand dies for each size pipe, and one handle, are included.

Geared Adjustable Threaders

For 2½ to 4-Inch Pipe



These Geared Adjustable Threaders are sturdy and strong, yet easily handled by one man, to provide smooth, perfectly tapered threads.

These tools can be converted into power threaders with installation of a Toledo Power Drive.

No. 2 Threader, illustrated at the right, uses bushings to center the pipe and threads 2½ to 4-inch pipe.

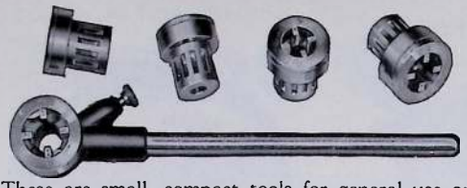
No. 2BR Threader is of the same design as the No. 2 except that it has three broad-face chuck jaws and graduated guide posts in place of bushings. Both the No. 2 and No. 2 BR use a separate set of dies for each size pipe.

Prices on application

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Toledo Threading Devices

Ratchet Threaders



These are small, compact tools for general use or where space is restricted. Quick changes from one size to another are effected simply by pulling out the ratchet pawl, dropping out the head, and setting in another. A separate die head and set of dies are furnished for each pipe size.

No. 00: Capacity, ⅛ to ¾-inch pipe.
No. 11: Capacity, ⅛ to 1¼-inch pipe.
No. 12: Capacity, ⅛ to 2-inch pipe.

Adjustable Die Heads
For Bolts and Pipe

These adjustable die heads may be used in the No. 00 ratchet handle die stock. They have standard bolt threads with an over or under adjustment of 1/64 of an inch.



The die heads have ample chip clearance.

No. 101R: Capacity, ¼ to ⅝-inch bolts.

No. 102R: Capacity, ¾, ⅞, and 1-inch bolts.

Adjustable Bolt Stocks and Dies



Segmental dies move in and out by a turn of the knurled sizing ring, allowing quick setting for deep, shallow, or standard threads. Each die takes a proportional share of the work and may be reground.

No. 101: Available as a single unit consisting of a stock, one size die, and guide, or as a set consisting of seven full-mounted stocks and dies (¼, 5/16, ⅜, 7/16, ½, 9/16, and ⅝-inch) in a metal box.

No. 102: Similar to the No. 101 except it is larger (¾, ⅞, and 1-inch). Can be furnished either full mounted for instant use or with one stock and necessary dies and guides in sizes desired.

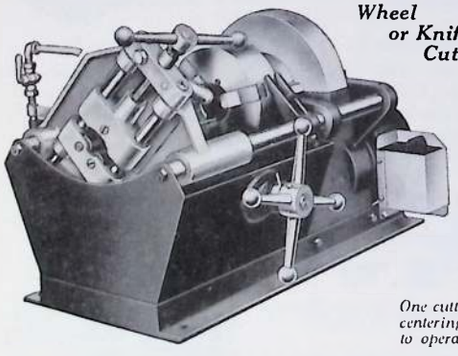
Three-Way Threaders



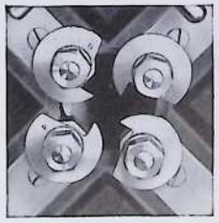
Toledo Three-Way Threaders are small and compact, with dies that can be reground when dull.

No. 30: This threader is used on ⅜ to ¾-inch pipe.
No. 31: This threader is used on ½ to 1-inch pipe.

Toledo No. 999 Power Pipe Machine



Wheel or Knife Cut-Off



Four cutting knives perform simultaneously and smoothly.



Quick-acting, all-steel, hinged type die heads.



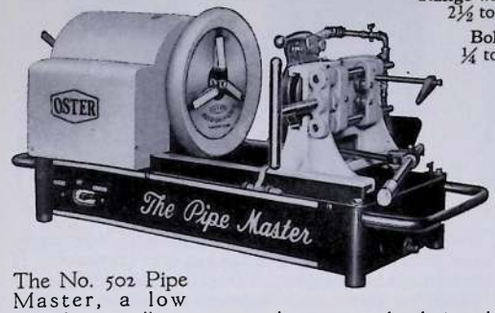
One cutter wheel and two rollers. Self-centering. Fed by one hand wheel. Easy to operate. All parts are replaceable.

Toledo No. 999 Super Model cuts, threads, and reams ½ to 2-inch pipe and will thread ⅜ to 1½-inch bolts. The die heads are the quick-opening, hinged type; mounted vertically on the cutter head, they permit instant change of sizes. The reversible type motor automatically adjusts its speed to the load. All controls are in the forward and reversing switch.

Prices on application

Oster Portable Power Pipe Machines

No. 502 Pipe Master

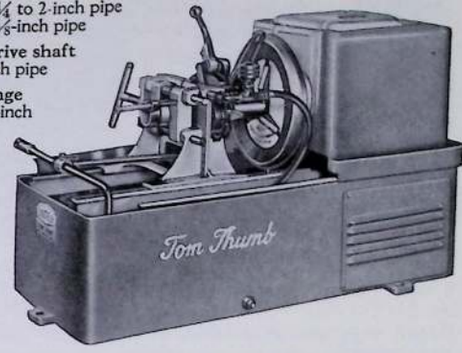


The No. 502 Pipe Master, a low priced, ruggedly constructed, attractively designed portable pipe machine, saves production time and production costs. The Pipe Master reams, threads, and cuts off pipe in one chucking operation. Its quick-opening, adjustable die-head is the stationary type; an opening at the top of the machine permits viewing the thread as it is cut. A new, patented "Auto-Grip" front chuck speeds up operation and eliminates the use of a chuck bar or wrench. The roller type, self-centering cutter, detachable reamer, and Universal centering rear chuck all contribute to maximum efficiency.

Standard equipment also includes: a Universal motor, geared head type, 110 volts, either A.C. single phase or D.C.; four sets of carbon steel dies to cover the standard pipe range; reversing switch; reversible oil pump with relief valve; gauge for thread length; and five gallons of Oster oil.

No. 582 Tom Thumb

Standard range....¼ to 2-inch pipe
Extra range.....⅛-inch pipe
Range with drive shaft 2½ to 8-inch pipe
Bolt range ¼ to 1½-inch



The No. 582 Tom Thumb Portable features a ball-bearing mounted spindle and a worm drive rendering it capable of production speeds suitable for almost any requirement. Types N and W stationary die-heads accommodate pipe sizes up to ¾-inch and 1 to 2-inch respectively. The patented "Auto-Grip" chuck eliminates the use of a chuck bar or wrench. The roller type, self-centering cutter, detachable reamer, and Universal centering rear chuck simplify operation and assure long, dependable service.

Standard equipment also includes: a Universal variable speed motor, 110 volts, either A.C. single phase or D.C.; four sets of carbon steel and high speed steel dies to cover the standard pipe range; reversing switch; reversible oil pump with relief valve; gauge for thread length; and five gallons of Oster oil.

Oster Power Vise Stand

The No. 422 Power Vise Stand with new "Auto-Grip" chuck outmodes old style vise stands. It quickly converts regular die-stocks, cutters, and reamers to more efficient, easy-to-use power tools.

The universal, quick-acting "Auto-Grip" front chuck provides a positive gripping action; no bar or T-wrench is necessary. The chuck is revolved by a reversible power unit mounted and protected from damage within a welded steel case. The universal centering rear chuck instantly lines up all pipe sizes within the range of the machine.

Motor gears are ball-bearing mounted. The spindle gear is hardened steel; the spindle, semi-steel. Two carrying arms, one on each side of the machine, provide easy portability and assure absolute centering of the die-stock during threading operations.

Standard equipment includes: the Universal, geared head, 110 volt motor, either A.C. single phase or D.C.; reversing switch; "Auto-Grip" front chuck; universal centering rear chuck; two carrying arms; two feet for the front legs; universal plate for mounting the pipe vise; and one quart of Oster oil. Legs, vise, and pipe tools, not included, are available at extra cost.

Quickly converts hand tools to power tools.



No. 422
Power Vise Stand
With "Auto-Grip" Chuck

Standard range.....⅛ to 2-inch pipe
Range with drive shaft...2½ to 8-inch pipe

Prices on application

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Clayton & Lambert Coiltrol Fire Pot



No. 44A
Fire Pot

The No. 44 A Fire Pot is easy to start and simple to operate.

The detachable coil unit has a flame control device which allows the powerful flame to be varied in size and volume.

A pot of metal can be rapidly melted, and then, by adjusting the flame control valve, be held at the desired temperature, thus saving gasoline and metal.

The No. 44 A is designed to handle a full 6-inch metal pot; its capacity is one gallon. If the fire pot is to be used to burn kerosene, orders should so specify; a different type burner jet will be furnished.

For torches, see page 426.

Stuart's Thred-Kut Oil



Thred-Kut, a high grade cutting oil, flows freely at low temperatures. Makes dies last longer. Available in 1 gallon cans, 5 gallon pails, or in 15, 30, and 55 gallon drums.

Also available are Stuart's Plumbers' and Extra Winter Strain Lard Oil Compounds.

Mortell NoDrip Coating and Tape



NoDrip Coating
Prevents dripping caused by sweating and condensation. Apply to almost any surface.



NoDrip Tape
Forms a tight fitting, sealed jacket. Quickly stops condensation drip from cold water pipes, valves, or fittings.

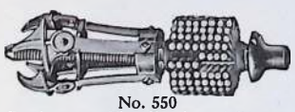
NoDrip Coating, an easy flowing plastic, effectively prevents condensation dripping and corrosion. It eliminates sweating on industrial equipment, blower pipes, air ducts, and cyclones as well as on pipes and tanks. Vermin-proof, moisture-proof, and odorless, it is widely used in industrial plants, warehouses, railroads, etc.

Apply the coating to practically any clean surface, painted or unpainted. No primer is needed unless the coating is used on severely rusted or pitted metal, or on concrete, wood, and other absorbent-like material. In such cases, the primer prevents suction and rapid drying.

Available in 1, 5, and 55 gallon containers.

NoDrip Tape is used on valves, fittings, and small diameter pipe. Quickly stops condensation drip. Prevents rust and corrosion. Simply wrap the tape around the pipes and joints. Available in rolls; one roll covers approximately ten feet of ½-inch pipe.

Pilley Flue Brushes and Scrapers



No. 550
Combination Flue Brush and Scraper

Adjustable claws scrape off hard scale; brush sweeps out remaining deposit. For 2 to 4-inch flues.



No. 585
Flat Steel Wire, Single Spiral Brush

A sturdy type brush that fits all size flues from 1 to 6-inch.



No. 589
Round Steel Wire, Single Spiral Brush

A highly efficient brush. Fits all size flues from 1 to 6-inch.



No. 570
Engineers' Favorite Flue Scraper

Malleable iron claws mounted on spring steel arms. Ajustable scrapers clean 2 to 4-inch flues.

No. 555
Expansion Flue Brush

For hard deposits. Made of flat steel wire for 1½ to 9-inch flues.

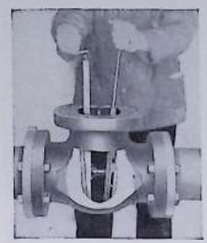
No. 590
Round Steel Wire, Double Spiral Brush

A well built brush designed to fit any size flue, 1 to 6-inch.

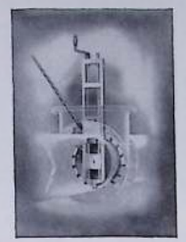
Prices on application

Dexter Valve Reseating Equipment

For Gate Valves



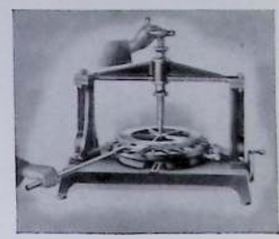
Simple operation of a reseating machine refacing a valve seat.



Phantom view of a reseating machine showing the cutter support.



Phantom view of a gate valve reseating machine showing the cutter.



Gate valve disc being refaced in a Dexter Gate Valve Disc Cutting Machine.

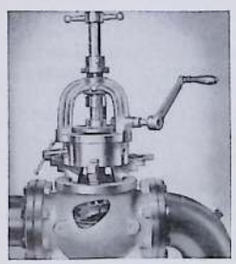
Dexter (Leavitt) valve reseating equipment reseats valves right on the line in a few minutes, ending expensive leakage at extremely low cost. They are easily operated, reliable, efficient, and durable.

Equipment includes cutter supports, disc cutting machines for refacing discs, risers, wrenches, and screw drivers. Rotary cutters are furnished with cutter blades, to meet individual requirements.

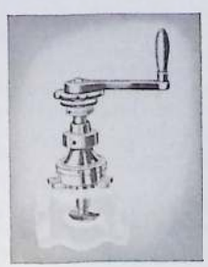
Sets and Capacities

No.		2-3-C	2-4-C	2-6-C	2-8-C	2-10-C	2-12-C	2-14-C	2-16-C
For Valve Sizes	Inches	1½-3	1½-4	1½-6	1½-8	1½-10	1½-12	1½-14	1½-16

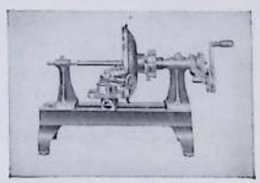
For Globe Valves



No. 12MO
Reseating Machine
In Operating Position



No. 4MO
Reseating Machine
In Operating Position



No. 7LDC
Lathe Disc Cutting Machine

The globe valve reseating equipment includes improved reseating machines, a patented disc cutting machine, a disc holding chuck, an extension spindle, and related equipment.

Cutters have 45°, 55°, and 75° angles. Carbon tool steel cutters are used for low pressure valves, and Universal cutters are used for all valves including high pressure types with seats of toughest metals.

Cutter types and angles are chosen according to individual requirements. Globe equipment can be furnished in variable range capacities.

Reseating machines and lathe disc cutting machines are each made in three sizes suitable for the following valve sizes: ¼ to 4-inch, ¼ to 7-inch, or ¼ to 12-inch.

For Pump Valves



Re-cutting pump valve seats in water chest, using ratchet handle.



No. DPC-7½
Pump Valve
Reseating Equipment

When pumps become defective and inefficient due to worn or badly scored valve seats, they can quickly and inexpensively be restored to full service with Dexter pump valve reseating equipment. Simple, compact, and easy to operate, the equipment keeps suction and discharge valves in all types of pumps working at top efficiency. There is no lengthy interruption in service.

Equipment for pump valve reseating consists of a reseating machine, brackets, ratchet wrench, and pump valve cutters.

No. DPC-7½, shown above, includes an improved No. D60 Pump Machine and a complete set of pump cutters, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, and 7½-inch. Cutter ranges to meet individual requirements are available.

Prices on application

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Johns-Manville Insulating Materials



Asbestocel
For Temperatures Up to 300° F.



85% Magnesia
For Temperatures Up to 600° F.



Wool Felt
For Hot and Cold Water Service Lines up to 225° F.



Zero
To Prevent Cold Water Pipes from Freezing

Pre-Shrunk Asbestocel

Johns-Manville Pre-Shrunk Asbestocel is a cellular type of insulation, made of alternate layers of plain and corrugated asbestos felts. Used on pipe lines carrying low pressure steam and hot water.

This material will not absorb moisture while in stock or during handling and consequently expand. Pre-Shrunk Asbestocel is made of specially-treated, moisture-resistant asbestos paper which prevents "breathing" and thus removes the cause of objectionable shrinkage cracks. It is also fabricated with an improved type of corrugation which affords greater strength and a more uniform appearance.

Pre-Shrunk Asbestocel is made in sections three feet long for pipe sizes of ½ to 12-inch. 3 and 4-ply thicknesses (¼-inch per ply) or thicknesses of 6 or 8 plies to the inch are available. The following finishes are furnished: regular canvas covered, asbestos paper covered high-speed finish, and glazed white high-speed finish.

Zero Pipe Insulation

Zero Pipe Insulation is designed for insulating cold water pipes that are exposed to moderate (ordinary) rather than extremely low temperatures, or where the time that the surrounding atmosphere would be below the freezing point is of short duration.

It is constructed of layers of hair felt surrounded by several layers of wool felt, with a layer of saturated wool felt inside the hair felt to keep the hair from direct contact with the pipe. Hair felt greatly retards the flow of heat from the water in the pipe to the colder surrounding air and is protected by a wool felt jacket and an inner layer of saturated felt.

For outdoor lines, for extremely low temperatures, or for temperatures below the freezing point that are of long duration, Zero Pipe Insulation with a separate jacket is recommended.

Zero Pipe Insulation is furnished in 3-foot lengths, split for ready application, covered with canvas and equipped with metal bands. Made for pipe sizes from ½ to 8-inch, and in one thickness, approximately 1¼ inches.

85% Magnesia

Johns-Manville 85% Magnesia insulation combines the high insulating qualities of basic carbonate of magnesia and asbestos, affording a light weight and efficient insulation. It contains a maximum number of dead-air cells which increases its natural resistance to heat transmission and reduces its weight.

Johns-Manville 85% Magnesia Pipe Insulation is moulded in 3-foot lengths in Standard, 1½-inch, 2-inch, Double Standard, 2½-inch, and 3-inch thicknesses (double layer), to fit standard pipe sizes from ½ to 12-inch.

For smaller pipe, 85% Magnesia Pipe Insulation is furnished in sectional form, packed in crates or cartons with canvas jacket and metal bands. For larger pipe sizes it is supplied in segmental form, without canvas or bands.

Pre-Shrunk Wool Felt

Johns-Manville Pre-Shrunk Wool Felt Pipe Insulation is an effective and economical material for hot water lines and for use on moderately cold water lines where humidity conditions are not severe.

Like Pre-Shrunk Asbestocel, Johns-Manville Pre-Shrunk Wool Felt is made of moisture-resisting felts which prevent the objectionable absorption of moisture in storage, thus minimizing drying shrinkage and pulling apart at the joints after application.

The sheets of wool felt of which this material is composed are indented, which reduces the conductivity of the finished material approximately 25 per cent as compared with ordinary wool felt. It is also up to 20 per cent lighter in weight.

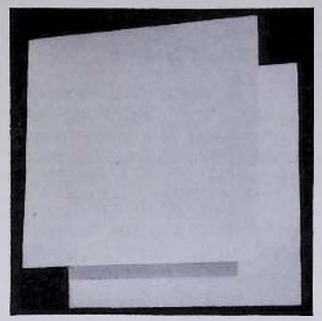
This wool felt has a dual-service felt liner which is waterproof, making it perfectly suited to cold water lines. Since the liner will withstand temperatures as high as 225° F., the material is equally satisfactory for hot water lines.

Available in sections 3 feet long, in thicknesses of ½-inch, ¾-inch, and 1-inch for pipe sizes from ½ to 12-inch. It is available with a canvas finish or with an integral, weather-proof jacket.

Prices and additional information on application

Johns-Manville Insulating Materials

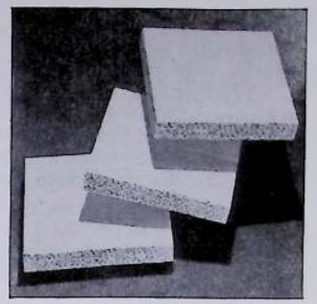
Asbestos Sheet Millboard



Asbestos Sheet Millboard is recommended for general uses requiring sheet or board for protection against fire, heat, acid fumes, etc. It is frequently used as a fireproof lining for floors, partitions, ceilings, elevator shafts, ranges, stoves, grates, etc.

Millboard can be cut with shears to any size desired and fastened with nails or screws. Standard sheet size is 42 x 48 inches; cut pieces can also be furnished. Thicknesses of 1/32 to ½-inch are available.

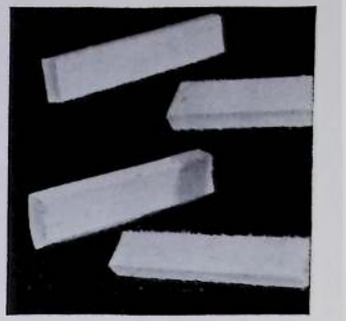
Asbestocel Blocks



An economical insulation for temperatures up to 300° F. Ideal for boilers, warm air ducts, etc.

The blocks are made of built-up asbestos felt layers, alternately plain and corrugated. Available in widths from 6 to 36-inch and in lengths from 36 to 96-inch. Coarse Blocks are furnished in thicknesses of 1 to 8 plies with four plies per inch of thickness. Fine Blocks are furnished in thicknesses of 1 to 16 plies with six or eight plies per inch of thickness.

85% Magnesia Blocks



These blocks are used to insulate flat, curved, or irregular surfaces where temperatures do not exceed 600° F. They are widely used where high insulating value and light weight are needed, and where surfaces are so irregular that an easily cut insulation is required for proper fitting.

Regularly furnished flat or curved in 3 and 6-inch widths, in 18 and 36-inch lengths, and up to 4 inches thick. Flat blocks are available in 9 and 12-inch widths also.

Finishing and Insulating Cements

Johns-Manville cements are unexcelled for insulation of irregular surfaces such as on valves, flanges, pipe fittings, etc., or as a surface finish over block or sheet insulations in order to seal joints and to provide a smooth, durable finish.



Finishing cements include two types: The No. 302 is made of asbestos fiber and suitable binding materials. It produces a hard, durable surface which will not crack, break, or peel off.

The No. 352 is a general utility short-fiber asbestos finishing cement, ideal for finishing insulation on heating boilers and pipe fittings.

Insulating cements also include two types: The 85% Magnesia which features a high insulating value and which, except for its powdered form, is similar to the 85% Magnesia Blocks described above.

The No. 450 is a high grade, mineral wool cement with superior insulating properties. Provides high covering capacity and excellent adhesion to either hot or cold surfaces. It is usually applied in thicknesses equal to block insulation where conditions prevent the use of the latter.

Temperature Limits and Covering Capacities of Cements

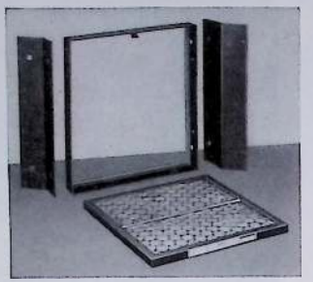
Type of Cement		Max. Temp. Deg. F.	Covering Capacity Applied and Dried 1-inch thick: Sq. Ft. per 100 lbs.	Covering Capacity Applied and Dried 1-inch thick: Sq. Ft. per Bag	Approx. pounds of water to mix 100 pounds cement	Weight per Bag Pounds
Finishing	No. 302	—	25	25	175	100
	No. 352	—	19	9½ or 19	100	50 or 100
Insulating	85% Magnesia	600	58	35	450	60
	No. 450	1500	50	25	250	50

Prices and additional information on application

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Fiberglas Dust-Stop Air Filters

For "V" and Flat Bank Installations



Fiberglas Dust-Stop Filter
With Frame and Angle Uprights



Universal "Unit" Fiberglas Dust-Stop Filter Frames can be combined with front, back, and side angle uprights to form "V" banks



Filter Frames are manufactured to take 2 or 4 inches of filtering media. Filters 1-inch thick, used in series, are recommended.

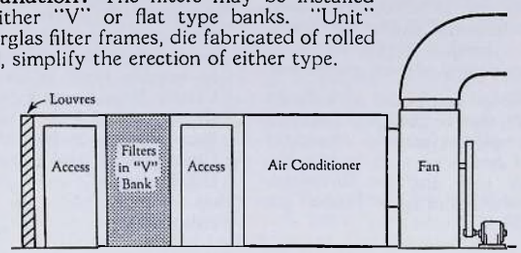
***Fiberglas Dust-Stop Air Filters Assure Efficient, Low-Cost Air Filtration**

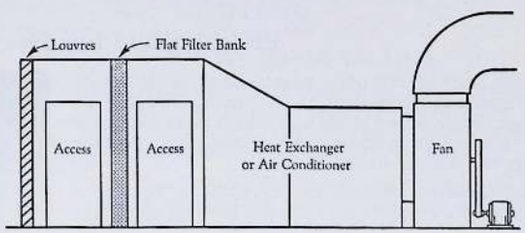
Fiberglas Dust-Stop Air Filters provide an economical means of cleaning the air in unit heating, central heating, ventilating, and air conditioning systems. Designed specifically as a replacement, throw-away type of filter, their use simplifies maintenance problems and insures efficient filtration of air.

The filters will remove dust, dirt, lint, soot, paint spray, etc., from mechanically circulated air in manufacturing and assembly plants, paint shops, laboratories, distilleries, canneries, packing and processing plants, public buildings, theatres, hotels, shops, and institutions.

Construction: Fiberglas Dust-Stop Air Filters are composed of a maze of glass fibers which are coated with a patented, dust catching adhesive. The filters are faced with metallic grilles and bound on the edges with a fiberboard frame.

Installation: The filters may be installed in either "V" or flat type banks. "Unit" Fiberglas filter frames, die fabricated of rolled steel, simplify the erection of either type.





Flat banks occupy less depth within the duct area than "V" banks but they require a larger face area for the same capacity. "V" frames are used where face areas are limited. The angle at which the frames are attached may be adjusted to provide the correct filter area in the space available.

Underwriters' approved: Fiberglas Dust-Stop Air Filters have been awarded an unqualified Class 2 rating by the Underwriters' Laboratories, Inc. This is the highest rating issued an impingement type filter.

Resistance indicators: The resistance of the bank and the pressure drop increase with the amount of dust accumulated in the filter. A Dust-Stop Resistance Indicator (not illustrated) is available to measure the pressure drop. Its use will serve as a guide in determining the proper time to replace filters.

*Fiberglas and Dust-Stop are U.S. Registered Trademarks of the Owens-Corning Fiberglas Corporation.

Prices and additional data on application.

Templates for Drilling, Bolts, Thread Lubricants, Flange Facings, Gaskets, and Galvanizing

Templates for Drilling
Brass and Bronze....page 458
Iron....pages 459 and 460
Steel....pages 461 to 463

Thread Lubricant and Thread Compound....page 464
Thread Lubricant Brushes....page 464
Machine Bolts....page 465
Triplex and Templex Steel Bolt-Studs....pages 466 and 467

Bolting on Companion Flanges....page 457
Wooden Flange Protectors....page 457

Special Facings for Flanges, Valves, and Fittings....pages 468 to 471
Gaskets for Iron, Brass, Bronze, and Steel Flanged Joints...pages 472 to 476
Ring Gaskets for Unions....page 476

Sheet Packing; Cranite and C. C. Rubber....page 473
Galvanizing Steel Flanged Fittings and Flanges....page 476

This section is devoted to a variety of subjects, not wholly related, but having in common the fact that they apply to nearly all Crane products and are referred to frequently. In addition, other sections of this catalog include data on subjects of a somewhat similar nature, but more specialized or technical in character. Among these are found the following:

Normal Engagement Between Male and Female Threads....page 494
Threaded Pipe Joints....page 495
Flange Finishes....pages 510 and 511

Crane Bolting, Engineering Data on....pages 524 and 525
Assembly and Maintenance of Flanged Joints....page 526
Taps and Drains for Flanged Fittings....page 578
Taps and Drains for Flanged Valves....page 579

Pipe and Fabricated Piping....pages 477 to 522
Engineering Data....pages 523 to 580
Gaskets for valves, fittings, and flanges for ammonia....page 416

Bolting on Companion Flanges



Orders for valves, fittings, or other products with companion flanges bolted on should indicate: the catalog number of the flange; if necessary, style of facing on flanges; kind of bolts or bolt studs; and kind of gasket, if gaskets are required. *Unless otherwise ordered, female faced companion flanges will be used when male faced valves and fittings are desired.* The labor involved in bolting on flanges entails an added charge; refer to the Crane Discount Sheet.

Wooden Flange Protectors



Damaged flange faces may make it difficult or impossible to make up tight joints. Wooden protectors are a worthwhile investment, offering ample protection to flange faces while in transit and prior to installation. In addition, in the case of valves, they keep out foreign matter that might otherwise injure the seating surfaces. For complete information on protectors for the ends of valves and fittings, refer to the Crane Discount Sheet.

Templates for Drilling

Brass and Bronze Flanged Valves and Flanges

150-Pound MSS Standard

(Dimensions agree with MSS 150-Pound Corrosion-Resistant Flange Standard, No. SP-42-1951)

This Standard is known as MSS 150-Pound SP Bronze Flange Standard (No. SP-2-1946). It was developed and adopted as "Standard Practice" by the Manufacturers' Standardization Society of the Valve and Fittings Industry.

The flange diameter, bolt circle, and number and diameter of bolts are the same as for the Class 125 Cast Iron and 150-Pound Steel American Standards, but the thickness and facing of the flanges are different.

Size	Dimensions, in Inches						
Inches	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Length of Bolts	Length of Bolt-Studs with 2 Nuts
½	3½	5/16	2⅜	4	½	1¼	1⅞
¾	3⅞	11/32	2¾	4	½	1½	1⅞
1	4¼	⅜	3⅛	4	½	1½	2
1¼	4⅝	13/32	3½	4	½	1½	2
1½	5	7/16	3⅞	4	½	1½	2⅛
2	6	½	4¾	4	⅝	1¾	2½
2½	7	9/16	5½	4	⅝	2	2⅝
3	7½	⅝	6	4	⅝	2	2¾
3½	8½	11/16	7	8	⅝	2¼	2⅞
4	9	11/16	7½	8	⅝	2¼	2⅞
5	10	¾	8½	8	¾	2½	3¼
6	11	13/16	9½	8	¾	2½	3⅜
8	13½	15/16	11¾	8	¾	2¾	3⅝
10	16	1	14¼	12	⅞	3¼	4⅛
12	19	1 1/16	17	12	⅞	3¼	4¼

300-Pound MSS Standard

This Standard is known as MSS 300-Pound SP Bronze Flange Standard (No. SP-2-1946). It was developed and adopted as "Standard Practice" by the Manufacturers' Standardization Society of the Valve and Fittings Industry.

The flange diameter, bolt circle, and number and diameter of bolts are the same as for the Class 250 Cast Iron and 300-Pound Steel American Standards, but the thickness and facing of the flanges are different.

Size	Dimensions, in Inches						
Inches	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Length of Bolts	Length of Bolt-Studs with 2 Nuts
½	3¾	½	2⅝	4	½	1¾	2¼
¾	4⅝	17/32	3¼	4	⅝	2	2½
1	4⅞	19/32	3½	4	⅝	2	2⅝
1¼	5¼	⅝	3⅞	4	⅝	2	2¾
1½	6⅛	11/16	4½	4	¾	2¼	3⅛
2	6½	¾	5	8	⅝	2¼	3
2½	7½	13/16	5⅞	8	¾	2½	3⅜
3	8¼	29/32	6⅝	8	¾	2¾	3½
3½	9	31/32	7¼	8	¾	3	3⅝
4	10	1 1/16	7⅞	8	¾	3	3⅞
5	11	1⅛	9¼	8	¾	3¼	4
6	12½	1 3/16	10⅝	12	¾	3¼	4⅛
8	15	1⅜	13	12	⅞	3¾	4¾

* * * * *

Facing: All 150 and 300-Pound flange faces are plain faced, with two V-shaped concentric grooves between the port and the bolt holes.

Diameter of port: The diameter of the port on 150 and 300-Pound Flanged Valves is the same as the pipe size (nominal).

Bolt holes: Bolt holes are drilled ⅛-inch larger than the diameter of the bolt.

The bolt holes are in multiples of four, so that valves or fittings can be turned to face in any quarter when being installed. They are drilled to straddle the center line unless otherwise ordered.

Spot facing: The bolt holes in Crane brass and bronze flanged valves and flanges are not regularly spot faced.

Gaskets: Full face gaskets should be used. For list prices, dimensions, and description of gaskets, see page 472.

When brass or bronze flanged material is bolted to iron or steel flanges that normally have a raised face, the raised face should be removed to provide a full face bearing for the gasket.

Brass or bronze flanged material should not be bolted to Cranelap flanged pipe joints.

Templates for Drilling

25-Pound and 125-Pound Cast Iron

Dimensions, in Inches

Size	25-Pound Cast Iron							125-Pound Cast Iron						
	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Length of Bolts X	Length of Bolts Y	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Number of Bolts	Diameter of Bolts	Length of Bolts	Length of Bolt-Studs with 2 Nuts
1								4¼	7/16	3⅛	4	½	1¾	
1¼								4⅝	½	3½	4	½	2	
1½								5	9/16	3⅞	4	½	2	
2	6	½	4¾	4	⅝	1¾	2	6	⅝	4¾	4	⅝	2¼	
2½	7	9/16	5½	4	⅝	2	2	7	11/16	5½	4	⅝	2½	
3	7½	⅝	6	4	⅝	2	2¼	7½	¾	6	4	⅝	2½	
3½	8½	11/16	7	8	⅝	2¼	2¼	8½	13/16	7	8	⅝	2¾	
4	9	¾	7½	8	⅝	2¼	2½	9	15/16	7½	8	⅝	3	
5	10	¾	8½	8	⅝	2¼	2½	10	15/16	8½	8	¾	3	
6	11	¾	9½	8	⅝	2¼	2½	11	1	9½	8	¾	3¼	
8	13½	¾	11¾	8	⅝	2¼	2¾	13½	1⅛	11¾	8	¾	3½	
10	16	⅞	14¼	12	⅝	2½	3	16	13/16	14¼	12	⅞	3¾	
12	19	1	17	12	⅝	2¾	3	19	1¼	17	12	⅞	3¾	
14	21	1⅛	18¾	12	¾	3¼	3½	21	1⅜	18¾	12	1	4¼	
16	23½	1⅛	21¼	16	¾	3¼	3½	23½	1 7/16	21¼	16	1	4½	
18	25	1¼	22¾	16	¾	3½	3¾	25	1 9/16	22¾	16	1⅛	4¾	
20	27½	1¼	25	20	¾	3½	4	27½	1 11/16	25	20	1⅛	5	
24	32	1⅜	29½	20	¾	3¾	4¼	32	1⅞	29½	20	1¼	5½	
30	38¾	1½	36	28	⅞	4¼		38¾	2⅛	36	28	1¼	6¼	
36	46	1⅝	42¾	32	⅞	5		46	2⅜	42¾	32	1½	7	
42	53	1¾	49½	36	1	5¼		53	2⅝	49½	36	1½	7½	
48	59½	2	56	44	1	5½		59½	2¾	56	44	1½	7¾	
54	66¼	2¼	62¾	44	1	5¾		66¼	3	62¾	44	1¾		10½
60	73	2¼	69¼	52	1⅛	6		73	3⅛	69¼	52	1¾		10¾
72	86½	2½	82½	60	1⅛	6¼		86½	3½	82½	60	1¾		11½
84	99¾	2¾	95½	64	1¼	7¼		99¾	3⅞	95½	64	2		12¾
96	113¼	3	108½	68	1¼	7¾		113¼	4¼	108½	68	2¼		14

Length of Bolts

X— Valve to valve.

Y— { Valve to screwed companion flange, or
Valve to special 125-pound fitting with 25-pound drilling.

25-Pound Cast Iron: In sizes 4-inch and larger, the 25-Pound templates for drilling conform to the American Tentative Standard for Cast Iron Pipe Flanges and Flanged Fittings for 25 pounds steam working pressure (B16b2-1031). In sizes 3½-inch and smaller, they are Crane Standard, proportioned from the American Tentative Standard.

125-Pound Cast Iron: The 125-Pound templates for drilling conform to the American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 125 (B16.1-1048).

Facing: 25-Pound Flanges and 125-Pound Flanges are plain faced, with a smooth finish.

Diameter of port: The diameter of the port on 25-Pound and 125-Pound Flanged Valves and Fittings is the same as the pipe size (nominal).

Bolt holes: For bolts smaller than 1¾-inch diameter, bolt holes are drilled ⅛-inch larger than the diameter of the bolt.

For bolts 1¾-inch diameter and larger, the bolt holes are drilled ¼-inch larger than the diameter of the bolt.

Drilling templates are in multiples of four, so that valves or fittings may be turned to face in any quarter when being installed.

Bolt holes are drilled to straddle the center line unless otherwise ordered.

Spot facing: Bolt holes are not spot faced except on 125-Pound Cast Iron Flanged Fittings sizes 18 to 24-inch inclusive, unless so ordered. An extra charge is made for spot facing.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Templates for Drilling

250-Pound and 800-Pound Hydraulic Cast Iron

250-Pound Cast Iron: The 250-Pound templates for drilling conform to the American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 250 (B16b-1944).

These templates apply also to 500-Pound W.O.G. Ferrosteel Double Disc Gate Valves.

The flanges have a 1/16-inch raised face. The thickness of flange dimension (dimension "C") includes the 1/16-inch raised face.

In sizes 24-inch and smaller, except for the diameter of the raised face (dimension "D"), these templates are the same as for the 300-Pound Steel American Standard.

800-Pound Hydraulic Cast Iron: The 800-Pound Hydraulic templates for drilling conform to the American Standard for Cast Iron Pipe Flanges and Flanged Fittings for a maximum non-shock hydraulic working pressure of 800 pounds at ordinary air temperatures (B16b1-1931).

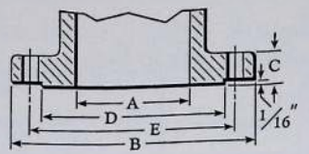
800-Pound W.O.G. Valves are regularly furnished with a 1/4-inch high large male facing on the flanges. The thickness of flange dimension (dimension "C") does not include the 1/4-inch male facing.

Except for flange thickness and length of bolts, these templates are the same as for the 600-Pound Steel American Standard.

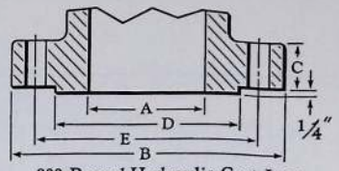
Bolt holes: For bolts smaller than 1 3/4-inch diameter, bolt holes are drilled 1/8-inch larger than the diameter of the bolt. For bolts 1 3/4-inch diameter and larger, bolt holes are drilled 1/4-inch larger than the diameter of the bolt.

Drilling templates are in multiples of four, so that valves or fittings may be turned to face in any quarter when being installed. Bolt holes straddle the center line unless otherwise ordered.

Spot facing: Bolt holes are not spot faced unless so ordered; an extra charge is made.



250-Pound Cast Iron



800-Pound Hydraulic Cast Iron

Dimensions, in Inches

	Size	A For valve or fitting	B	C	D	E	No. of bolts	Dia. of bolts	Length of bolts See Note X	Length of bolt-studs with 2 nuts See Note X
250 Pound Cast Iron	1	1	4 7/8	1 1/16	2 11/16	3 1/2	4	5/8	2 1/2	
	1 1/4	1 1/4	5 1/4	3/4	3 1/16	3 7/8	4	5/8	2 1/2	
	1 1/2	1 1/2	6 1/8	13/16	3 9/16	4 1/2	4	3/4	2 3/4	
	2	2	6 1/2	7/8	4 3/16	5	8	5/8	2 3/4	
	2 1/2	2 1/2	7 1/2	1	4 15/16	5 7/8	8	3/4	3 1/4	
	3	3	8 1/4	1 1/8	5 11/16	6 5/8	8	3/4	3 1/2	
	3 1/2	3 1/2	9	13/16	6 5/16	7 1/4	8	3/4	3 1/2	
	4	4	10	1 1/4	6 15/16	7 7/8	8	3/4	3 3/4	
	5	5	11	1 3/8	8 5/16	9 1/4	8	3/4	4	
	6	6	12 1/2	1 7/16	9 11/16	10 5/8	12	3/4	4	
	8	8	15	1 5/8	11 15/16	13	12	7/8	4 1/2	
	10	10	17 1/2	1 7/8	14 1/16	15 1/4	16	1	5 1/4	
	12	12	20 1/2	2	16 7/16	17 3/4	16	1 1/8	5 1/2	
	14	13 1/4	23	2 1/8	18 15/16	20 1/4	20	1 1/8	6	
	16	15 1/4	25 1/2	2 1/4	21 1/16	22 1/2	20	1 1/4	6 1/4	
	18	17	28	2 3/8	23 5/16	24 3/4	24	1 1/4	6 1/2	
	20	19	30 1/2	2 1/2	25 9/16	27	24	1 1/4	6 3/4	
	24	23	36	2 3/4	30 1/4	32	24	1 1/2	7 3/4	9 1/2
	30	29	43	3	37 3/16	39 1/4	28	1 3/4	8 1/2	10 1/2
	36	34 1/2	50	3 3/8	43 11/16	46	32	2	9 1/2	11 3/4
	42	40 1/4	57	3 11/16	50 7/16	52 3/4	36	2	10 1/4	12 1/2
	48	46	65	4	58 7/16	60 3/4	40	2	10 3/4	13

	Size	A For valve or fitting	B	C	D	E	No. of bolts	Dia. of bolts	Length of Bolts See Note Y	Length of Bolts See Note Z
800 Pound Hydraulic Cast Iron	For sizes smaller than 2-inch, use 600-Pound Steel material.									
	2	2	6 1/2	1 1/4	3 5/8	5	8	5/8	3 3/4	3 1/2
	2 1/2	2 1/2	7 1/2	1 3/8	4 1/8	5 7/8	8	3/4	4 1/4	4
	3	3	8 1/4	1 1/2	5	6 5/8	8	3/4	4 1/2	4 1/4
	3 1/2	3 1/2	9	1 5/8	5 1/2	7 1/4	8	7/8	5	4 3/4
	4	4	10 3/4	1 7/8	6 3/16	8 1/2	8	7/8	5 1/2	5 1/4
	5	5	13	2 1/8	7 5/16	10 1/2	8	1	6	5 3/4
	6	6	14	2 1/4	8 1/2	11 1/2	12	1	6 1/4	6
	8	7 7/8	16 1/2	2 1/2	10 5/8	13 3/4	12	1 1/8	7	6 3/4
	10	9 3/4	20	2 7/8	12 3/4	17	16	1 1/4	7 3/4	7 1/2
	12	11 3/4	22	3	15	19 1/4	20	1 1/4	8	7 3/4
	For sizes larger than 12-inch, use 600-Pound Steel material.									

Length of Bolts or Bolt-Studs

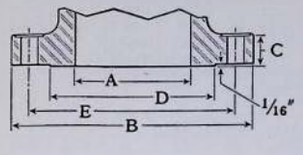
Note X — 1/16" raised face to 1/16" raised face valve, fitting, or companion flange.

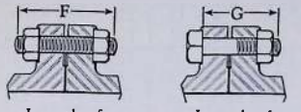
Note Y — 1/4" male to 1/4" male valve, fitting, or companion flange.

Note Z — {1/4" large male to 3/16" large female valve, fitting, or companion flange. / 1/4" tongue to 3/16" groove valve, fitting, or companion flange.

Templates for Drilling

150 and 300-Pound Steel Standards





Length of Bolt-Stud — Length of Machine Bolt

1/16-inch Raised Face Joint

American Standard: The 150 and 300-Pound flange dimensions, drilling templates, and bolt-stud lengths shown in the table at the right conform, respectively, to the American Standard for 150 and 300-Pound Steel Pipe Flanges and Flanged Fittings, B16e-1939.

Facing: Unless otherwise ordered, 150 and 300-Pound Steel Flanged Valves, Fittings, and Companion Flanges are regularly furnished with a 1/16-inch high raised face.

The thickness of flange dimension (dimension "C") includes the 1/16-inch high raised face.

Bolt holes: Bolt holes are drilled 1/8-inch larger than the diameter of the bolt.

Drilling templates are in multiples of four, so that valves or fittings may be turned to face in any quarter when installed. Bolt holes are drilled to straddle the center line unless otherwise ordered.

The bolt holes are spot faced.

Dimensions, in Inches

Class	Size	A For valve or fitting	B	C For companion flange	C For valve or fitting	D	E	No. of bolts or bolt-studs	Dia. of bolts or bolt-studs	F	G
150 Pound Steel	1/2	1/2	3 1/2	7/16		1 3/8	2 3/8	4	1/2	2 1/4	1 3/4
	3/4	3/4	3 7/8	1/2		1 11/16	2 3/4	4	1/2	2 1/4	2
	1	1	4 1/4	9/16	7/16	2	3 1/8	4	1/2	2 1/2	2
	1 1/4	1 1/4	4 5/8	5/8	1/2	2 1/2	3 1/2	4	1/2	2 1/2	2 1/4
	1 1/2	1 1/2	5	11/16	9/16	2 7/8	3 7/8	4	1/2	2 3/4	2 1/4
	2	2	6	3/4	5/8	3 5/8	4 3/4	4	5/8	3 1/4	2 1/2
	2 1/2	2 1/2	7	7/8	11/16	4 1/8	5 1/2	4	5/8	3 1/2	2 3/4
	3	3	7 1/2	15/16	3/4	5	6	4	5/8	3 1/2	3
	3 1/2	3 1/2	8 1/2	15/16	13/16	5 1/2	7	8	5/8	3 1/2	3
	4	4	9	15/16		6 3/16	7 1/2	8	5/8	3 1/2	3
	5	5	10	15/16		7 5/16	8 1/2	8	3/4	3 3/4	3
	6	6	11	1		8 1/2	9 1/2	8	3/4	4	3 1/4
	8	8	13 1/2	1 1/8		10 5/8	11 3/4	8	3/4	4 1/4	3 1/2
	10	10	16	1 3/16		12 3/4	14 1/4	12	7/8	4 3/4	3 3/4
	12	12	19	1 1/4		15	17	12	7/8	4 3/4	3 3/4
	14	13 1/4	21	1 3/8		16 1/4	18 3/4	12	1	5 1/4	4 1/4
	16	15 1/4	23 1/2	1 7/16		18 1/2	21 1/4	16	1	5 1/2	4 1/2
	18	17 1/4	25	1 9/16		21	22 3/4	16	1 1/8	6	4 3/4
	20	19 1/4	27 1/2	1 11/16		23	25	20	1 1/8	6 1/4	5
	24	23 1/4	32	1 7/8		27 1/4	29 1/2	20	1 1/4	7	5 1/2
300 Pound Steel	1/2	1/2	3 3/4	9/16		1 3/8	2 5/8	4	1/2	2 1/2	2
	3/4	3/4	4 5/8	5/8		1 11/16	3 1/4	4	5/8	3	2 1/4
	1	1	4 7/8	11/16		2	3 1/2	4	5/8	3	2 1/2
	1 1/4	1 1/4	5 1/4	3/4		2 1/2	3 7/8	4	5/8	3 1/4	2 1/2
	1 1/2	1 1/2	6 1/8	13/16		2 7/8	4 1/2	4	3/4	3 1/2	2 3/4
	2	2	6 1/2	7/8		3 5/8	5	8	5/8	3 1/2	2 3/4
	2 1/2	2 1/2	7 1/2	1		4 1/8	5 7/8	8	3/4	4	3 1/4
	3	3	8 1/4	1 1/8		5	6 5/8	8	3/4	4 1/4	3 1/2
	3 1/2	3 1/2	9	1 3/16		5 1/2	7 1/4	8	3/4	4 1/4	3 1/2
	4	4	10	1 1/4		6 3/16	7 7/8	8	3/4	4 1/2	3 3/4
	5	5	11	1 3/8		7 5/16	9 1/4	8	3/4	4 3/4	4
	6	6	12 1/2	1 7/16		8 1/2	10 5/8	12	3/4	4 3/4	4
	8	8	15	1 5/8		10 5/8	13	12	7/8	5 1/2	4 1/2
	10	10	17 1/2	1 7/8		12 3/4	15 1/4	16	1	6 1/4	5 1/4
	12	12	20 1/2	2		15	17 3/4	16	1 1/8	6 3/4	5 1/2
	14	13 1/4	23	2 1/8		16 1/4	20 1/4	20	1 1/8	7	6
	16	15 1/4	25 1/2	2 1/4		18 1/2	22 1/2	20	1 1/4	7 1/2	6 1/4
	18	17	28	2 3/8		21	24 3/4	24	1 1/4	7 3/4	6 1/2
	20	19	30 1/2	2 1/2		23	27	24	1 1/4	8 1/4	6 3/4
	24	23	36	2 3/4		27 1/4	32	24	1 1/2	9 1/4	7 3/4

Bolt and bolt-stud lengths: The lengths indicated as dimensions F and G in the above table apply for flanged joints other than Cranelap, made up of combinations of 150-Pound or of 300-Pound valves, fittings, or companion flanges with 1/16-inch high raised faces.

For flanged joints made up of Cranelaps, or for Cranelaps in combination with valves, fittings, or companion flanges having 1/16-inch raised faces, add to dimension F or G the thickness of the lap for each Cranelap used.

150-Pound Class: The bolt-stud lengths established by the American Standard are adequate for all 150-Pound joints, made up of any combination of valves, fittings, or flanges having the regular 1/16-inch raised face.

300-Pound Class: For male to female or tongue to groove flanged joints, add the height of the male or tongue (1/4-inch) to dimension F or G.

When Cranelaps are used in combinations of male to female flanged joints, add the thickness of the lap for each Cranelap. *Caution:* the male Cranelap must have a minimum lap thickness of 1/4-inch.

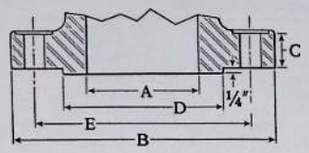
For Cranelaps of tongue to groove flanged joints, add to dimension F or G the thickness of each lap, plus 1/4-inch.

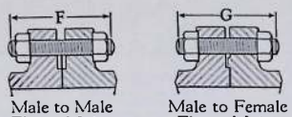
List prices of machine bolts ..... *page 465*
List prices of bolt-studs ..... *pages 466 and 467*
Special facings ..... *pages 468 and 470*
Length of bolt-studs for ring joints .... *page 470*

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Templates for Drilling

400, 600, and 900-Pound Steel Standards





Male to Male Flanged Joint — Male to Female Flanged Joint

Bolt-Stud Length "G" also applies for Tongue to Groove Flanged Joint.

Dimensions, in Inches

Class	Size	A†	B	C	D	E	No. of bolt-studs	Dia. of bolt-studs	F	G
400 Pound Steel	4	4	10	1 3/8	6 3/16	7 7/8	8	7/8	5 1/2	5 1/4
	5	5	11	1 1/2	7 5/16	9 1/4	8	7/8	5 3/4	5 1/2
	6	6	12 1/2	1 5/8	8 1/2	10 5/8	12	7/8	6	5 3/4
	8	8	15	1 7/8	10 5/8	13	12	1	6 3/4	6 1/2
	10	10	17 1/2	2 1/8	12 3/4	15 1/4	16	1 1/8	7 1/2	7 1/4
	12	12	20 1/2	2 1/4	15	17 3/4	16	1 1/4	8	7 3/4
	14	13 1/8	23	2 3/8	16 1/4	20 1/4	20	1 1/4	8 1/4	8
	16	15	25 1/2	2 1/2	18 1/2	22 1/2	20	1 3/8	8 3/4	8 1/2
	18	17	28	2 5/8	21	24 3/4	24	1 3/8	9	8 3/4
	20	18 7/8	30 1/2	2 3/4	23	27	24	1 1/2	9 3/4	9 1/2
	24	22 5/8	36	3	27 1/4	32	24	1 3/4	10 3/4	10 1/2
600 Pound Steel	1/2	1/2	3 3/4	9/16	1 3/8	2 5/8	4	1/2	3	2 3/4
	3/4	3/4	4 5/8	5/8	1 11/16	3 1/4	4	5/8	3 1/2	3 1/4
	1	1	4 7/8	11/16	2	3 1/2	4	5/8	3 1/2	3 1/4
	1 1/4	1 1/4	5 1/4	13/16	2 1/2	3 7/8	4	3/4	3 3/4	3 1/2
	1 1/2	1 1/2	6 1/8	7/8	2 7/8	4 1/2	4	3/4	4 1/4	4
	2	2	6 1/2	1	3 5/8	5	8	5/8	4 1/4	4
	2 1/2	2 1/2	7 1/2	1 1/8	4 1/8	5 7/8	8	3/4	4 3/4	4 1/2
	3	3	8 1/4	1 1/4	5	6 5/8	8	3/4	5	4 3/4
	3 1/2	3 1/2	9	1 3/8	5 1/2	7 1/4	8	7/8	5 1/2	5 1/4
	4	4	10 3/4	1 1/2	6 3/16	8 1/2	8	7/8	5 3/4	5 1/2
	5	5	13	1 3/4	7 5/16	10 1/2	8	1	6 1/2	6 1/4
	6	6	14	1 7/8	8 1/2	11 1/2	12	1	6 3/4	6 1/2
	8	7 7/8	16 1/2	2 3/16	10 5/8	13 3/4	12	1 1/8	7 3/4	7 1/2
	10	9 3/4	20	2 1/2	12 3/4	17	16	1 1/4	8 1/2	8 1/4
	12	11 3/4	22	2 5/8	15	19 1/4	20	1 1/4	8 3/4	8 1/2
	14	12 7/8	23 3/4	2 3/4	16 1/4	20 3/4	20	1 3/8	9 1/4	9
	16	14 3/4	27	3	18 1/2	23 3/4	20	1 1/2	10	9 3/4
	18	16 1/2	29 1/4	3 1/4	21	25 3/4	20	1 5/8	10 3/4	10 1/2
	20	18 1/4	32	3 1/2	23	28 1/2	24	1 5/8	11 1/2	11 1/4
	24	22	37	4	27 1/4	33	24	1 7/8	13	12 3/4
900 Pound Steel	3	2 7/8	9 1/2	1 1/2	5	7 1/2	8	7/8	5 3/4	5 1/2
	4	3 7/8	11 1/2	1 3/4	6 3/16	9 1/4	8	1 1/8	6 3/4	6 1/2
	5	4 3/4	13 3/4	2	7 5/16	11	8	1 1/4	7 1/2	7 1/4
	6	5 3/4	15	2 3/16	8 1/2	12 1/2	12	1 1/8	7 3/4	7 1/2
	8	7 1/2	18 1/2	2 1/2	10 5/8	15 1/2	12	1 3/8	8 3/4	8 1/2
	10	9 3/8	21 1/2	2 3/4	12 3/4	18 1/2	16	1 3/8	9 1/4	9
	12	11 1/8	24	3 1/8	15	21	20	1 3/8	10	9 3/4
	14	12 1/4	25 1/4	3 3/8	16 1/4	22	20	1 1/2	10 3/4	10 1/2
	16	14	27 3/4	3 1/2	18 1/2	24 1/4	20	1 5/8	11 1/4	11
	18	15 3/4	31	4	21	27	20	1 7/8	13	12 3/4
	20	17 1/2	33 3/4	4 1/4	23	29 1/2	20	2	13 3/4	13 1/2
	24	21	41	5 1/2	27 1/4	35 1/2	20	2 1/2	17 1/4	17

†Dimension "A" applies to valves or fittings.

American Standard: The 400, 600, and 900-Pound flange dimensions, drilling templates, and bolt-stud lengths shown in the table at the right conform, respectively, to the American Standard for 400, 600, and 900-Pound Steel Pipe Flanges and Flanged Fittings, B16e-1939.

Facing: Unless otherwise ordered, 400, 600, and 900-Pound Steel Flanged Valves and Fittings are regularly furnished with a 1/4-inch high large male face. Companion Flanges are regularly furnished with 1/4-inch high large male or, if specified, 3/16-inch deep large female facing.

The thickness of flange dimension (dimension "C") does not include the 1/4-inch high large male face.

Bolt holes: Bolt holes are drilled 1/8-inch larger than the diameter of the bolt. Drilling templates are in multiples of four, so that valves or fittings may be turned to face in any quarter when being installed. Bolt holes are drilled to straddle the center line unless otherwise ordered.

Spot facing: The bolt holes are spot faced.

Bolt-stud lengths: The bolt-stud lengths shown in the table at the right apply for flanged joints other than Cranelap, made up of combinations of valves, fittings, or companion flanges with male, female, tongue, or groove faces. Male or tongue faces are 1/4-inch high; female or groove faces are 3/16-inch deep.

For flanged joints made up of Cranelaps or for Cranelaps in combination with valves, fittings, or companion flanges, new bolt-stud lengths must be established in the following manner:

Bolt-Stud Lengths for Cranelap Joints (Based on length "G" for bolt-studs).

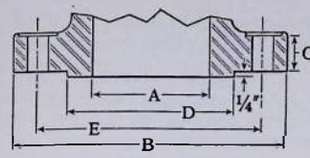
Cranelap to Cranelap	Deduct 1/4-inch and add thickness of both laps
Cranelap to 1/4-inch male	Add thickness of one lap
Cranelap to female	Deduct 1/4-inch and add thickness of one lap*
Cranelap to female Cranelap	Deduct 1/4-inch and add thickness of both laps*
Tongue or groove Cranelaps	Add thickness of each lap

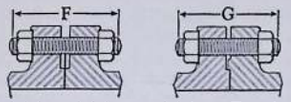
*The Cranelap serving as the male must have a minimum lap thickness of 1/4-inch.

Bolting on companion flanges ..... *page 457*
List prices of bolt-studs ..... *pages 466 and 467*
Special facings ..... *pages 469 to 471*
Length of bolt-studs for ring joints ..... *pages 470 and 471*

Templates for Drilling

1500 and 2500-Pound Steel Standards





Male to Male Flanged Joint — Male to Female Flanged Joint

Bolt-Stud Length "G" also applies for Tongue to Groove Flanged Joint.

Dimensions, in Inches

Class	Size	A†	B	C	D	E	No. of bolt-studs	Dia. of bolt-studs	F	G
1500 Pound Steel	1/2	1/2	4 3/4	7/8	1 3/8	3 1/4	4	3/4	4 1/4	4
	3/4	11/16	5 1/8	1	1 11/16	3 1/2	4	3/4	4 1/2	4 1/4
	1	7/8	5 7/8	1 1/8	2	4	4	7/8	5	4 3/4
	1 1/4	1 1/8	6 1/4	1 1/8	2 1/2	4 3/8	4	7/8	5	4 3/4
	1 1/2	1 3/8	7	1 1/4	2 7/8	4 7/8	4	1	5 1/2	5 1/4
	2	1 7/8	8 1/2	1 1/2	3 5/8	6 1/2	8	7/8	5 3/4	5 1/2
	2 1/2	2 1/4	9 5/8	1 5/8	4 1/8	7 1/2	8	1	6 1/4	6
	3	2 3/4	10 1/2	1 7/8	5	8	8	1 1/8	7	6 3/4
	4	3 5/8	12 1/4	2 1/8	6 3/16	9 1/2	8	1 1/4	7 3/4	7 1/2
	5	4 5/8	14 3/4	2 7/8	7 5/16	11 1/2	8	1 1/2	9 3/4	9 1/2
	6	5 5/8	15 1/2	3 1/4	8 1/2	12 1/2	12	1 3/8	10 1/4	10
	8	7	19	3 5/8	10 5/8	15 1/2	12	1 5/8	11 1/2	11 1/4
	10	8 3/4	23	4 1/4	12 3/4	19	12	1 7/8	13 1/2	13 1/4
	12	10 3/8	26 1/2	4 7/8	15	22 1/2	16	2	15	14 3/4
	14	11 3/8	29 1/2	5 1/4	16 1/4	25	16	2 1/4	16 1/4	16
	16	13	32 1/2	5 3/4	18 1/2	27 3/4	16	2 1/2	17 3/4	17 1/2
	18	14 5/8	36	6 3/8	21	30 1/2	16	2 3/4	19 1/2	19 1/4
	20	16 3/8	38 3/4	7	23	32 3/4	16	3	21 1/2	21 1/4
	24	19 5/8	46	8	27 1/4	39	16	3 1/2	24 1/4	24
2500 Pound Steel	1/2	7/16	5 1/4	1 3/16	1 3/8	3 1/2	4	3/4	4 3/4	4 1/2
	3/4	9/16	5 1/2	1 1/4	1 11/16	3 3/4	4	3/4	5	4 3/4
	1	3/4	6 1/4	1 3/8	2	4 1/4	4	7/8	5 1/2	5 1/4
	1 1/4	1	7 1/4	1 1/2	2 1/2	5 1/8	4	1	6	5 3/4
	1 1/2	1 1/8	8	1 3/4	2 7/8	5 3/4	4	1 1/8	6 3/4	6 1/2
	2	1 1/2	9 1/4	2	3 5/8	6 3/4	8	1	7	6 3/4
	2 1/2	1 7/8	10 1/2	2 1/4	4 1/8	7 3/4	8	1 1/8	7 3/4	7 1/2
	3	2 1/4	12	2 5/8	5	9	8	1 1/4	8 3/4	8 1/2
	4	2 7/8	14	3	6 3/16	10 3/4	8	1 1/2	10	9 3/4
	5	3 5/8	16 1/2	3 5/8	7 5/16	12 3/4	8	1 3/4	12	11 3/4
	6	4 3/8	19	4 1/4	8 1/2	14 1/2	8	2	13 3/4	13 1/2
	8	5 3/4	21 3/4	5	10 5/8	17 1/4	12	2	15 1/4	15
	10	7 1/4	26 1/2	6 1/2	12 3/4	21 1/4	12	2 1/2	19 1/4	19
	12	8 5/8	30	7 1/4	15	24 3/8	12	2 3/4	21 1/4	21

†Dimension "A" applies to valves or fittings.

American Standard: The 1500 and 2500-Pound flange dimensions, drilling templates, and bolt-stud lengths shown in the table at the right conform, respectively, to the American Standard for 1500 and 2500-Pound Steel Pipe Flanges and Flanged Fittings, B16e-1939.

Facing: Unless otherwise ordered, 1500 and 2500-Pound Steel Flanged Valves and Fittings are regularly furnished with 1/4-inch high large male facing. Companion Flanges are regularly furnished with 1/4-inch high large male or, if specified, 3/16-inch deep large female facing.

The thickness of flange dimension (dimension "C") does not include the 1/4-inch high large male face.

Bolt holes: The bolt holes are drilled 1/8-inch larger than the diameter of the bolt.

Drilling templates are in multiples of four, so that valves or fittings may be turned to face in any quarter when installed. Bolt holes are drilled to straddle the center line unless otherwise ordered.

Spot facing: The bolt holes are spot faced.

* * * * *

Bolt-stud lengths: The bolt-stud lengths shown in the above table apply for flanged joints other than Cranelap, made up of combinations of valves, fittings, or companion flanges with male, female, tongue, or groove faces. Male or tongue faces are 1/4-inch high; female or groove faces are 3/16-inch deep.

For flanged joints made up of Cranelaps or for Cranelaps in combination with valves, fittings, or companion flanges, new bolt-stud lengths must be established in the following manner:

Bolt-Stud Lengths for Cranelap Joints (Based on length "G" for bolt-studs).

Cranelap to Cranelap	Deduct 1/4-inch and add thickness of both laps
Cranelap to 1/4-inch male	Add thickness of one lap
Cranelap to female	Deduct 1/4-inch and add thickness of one lap*
Cranelap to female Cranelap	Deduct 1/4-inch and add thickness of both laps*
Tongue or groove Cranelaps	Add thickness of each lap

*The Cranelap serving as the male must have a minimum lap thickness of 1/4-inch.

Bolting on companion flanges ..... *page 457*
List prices of bolt-studs ..... *pages 466 and 467*
Special facings ..... *pages 469 and 471*
Length of bolt-studs for ring joints ..... *page 471*

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Crane Thread Lubricant

For Threaded Pipe Joints, Bolt Threads, and Gasket Coating

For temperatures up to 500° F.



Crane Thread Lubricant is available in a choice of four container sizes, as follows:

Quart can ..2¾ lbs. compound
Pint can.....1¼ lbs. compound
Half-pint can..10 oz. compound
Tube..... 4 oz. compound

Prices on application

Crane Thread Lubricant is used to make better threaded and flanged joints on steam, water, and gas piping. Pipe joints are made tighter; easy "breaking" is assured. The lubricant has been developed to replace ordinary pipe dope or pipe cement.

Recommended use: Unusual lubricating qualities make Crane Thread Lubricant ideal for all threaded metal connections except those on lines carrying liquids such as gasoline, kerosene, naphthas, fuel oil, etc. It is effectively used on Cranite or corrugated metal gaskets in flanged joints.

The lubricant is particularly suited to the requirements of alloys such as stainless steel, Monel, and nickel, as well as copper, brass, iron, and steel. It can be used on chrome or nickel finished fittings without smearing or discoloring the trim. Being non-poisonous, it is safely used on pipe lines handling food products as well as for all domestic and industrial uses.

Crane Thread Lubricant reduces the friction common to making a metal-to-metal joint and prevents the galling or seizing which occurs when a good lubricant is not used.

When threads are clean and properly cut, the use of Crane Thread Lubricant permits pulling them up to a tight joint with greater ease. The lubricant will neither separate nor harden, regardless of age. It spreads easily over threaded surfaces, always providing a high degree of lubrication.

Application: The lubricant is usually applied with a brush. Its consistency is such that application can be made from either the can or tube, whichever is more convenient.

Crane High Temperature Thread Compound

For temperatures up to 1000° F.



Crane High Temperature Thread Compound is regularly furnished in 3¾-pound cans.

Price, per pound.....$1.35

Crane High Temperature Thread Compound is the result of years of development and research to find a compound combining low frictional qualities with particular suitability for high temperature service.

The tendency of metal to seize or gall is more pronounced under high temperatures and high loading. Only a proper compound can avoid these damaging effects.

Threaded pipe joints, made up with Crane High Temperature Thread Compound, after having been in service under temperatures as high as 1000° F., can be taken apart readily and re-used; threads are kept smooth and a pressure tight, metal-to-metal contact is maintained.

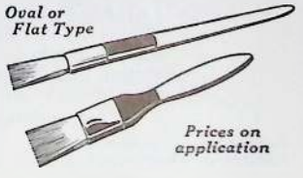
On bolt-studs used in flanged joints for high pressure-temperature installations, the tendency of seizing or galling of the threads is a common failing because of the high bolt loads and increased friction. Crane High Temperature Thread Compound is ideal for use on bolt-studs; it enables the maximum stress to be obtained with a minimum of power applied to the nut. Bolted joints are more easily assembled to tightness under high pressures, and damage of threads incidental to high loading is avoided.

Thread Lubricant Brushes

Thread lubricant can be applied in any convenient way. It is common practice, however, to apply the compound with a brush.

These brushes are specifically made for easy application of thread lubricant to bolts, flanges, gaskets, studs, valves, fittings, etc.

The brushes are well constructed to withstand heavy usage. The bristles are well set in the handle to minimize the usual loss of bristles in hard service. These brushes are available in two types, either oval or flat. Specify the type of brush desired, when ordering.



Machine Bolts

For a variety of services and for temperatures up to a maximum of 500° F., Machine Bolts with square heads and hexagon nuts are the standard practice of the Pipe and Fitting Industry.



Length	List Prices, Per 100							List Prices, Per 100. Quantities of 500 or more of one diameter	
Inches	½" Dia.	⅝" Dia.	¾" Dia.	⅞" Dia.	1" Dia.	1⅛" Dia.	1¼" Dia.	1⅜" Dia.	1½" Dia.
1¼	5.90	9.55							
1½	6.10	9.80	12.65	19.45					
2	6.45	10.30	13.30	20.35	28.20				
2½	6.85	10.80	13.95	21.25	29.35				
3	7.25	11.30	14.60	22.15	30.50			72.80	88.45
3½	7.60	11.80	15.25	23.05	31.65			74.80	90.85
4	7.95	12.30	15.90	23.95	32.80	52.50	63.05	76.80	93.20
4½	8.35	12.80	16.55	24.85	33.95	53.80	64.70	78.80	95.60
5	8.75	13.30	17.20	25.75	35.10	55.10	66.35	80.80	97.95
5½	9.15	13.80	17.85	26.65	36.25	56.40	68.00	82.80	100.35
6	9.55	14.30	18.50	27.55	37.40	57.70	69.65	84.80	102.70
6½	11.25	14.80	19.15	28.45	38.55			86.80	105.10
7	11.70	15.30	19.80	29.35	39.70	60.30	72.95	88.80	107.45
7½	12.15	15.80	20.45	30.25	40.85			90.80	109.85
8	12.60	16.30	21.10	31.15	42.00	62.90	76.25	92.80	112.20
8½	13.05	16.80	21.75	32.05				94.80	114.55
9	13.50	17.30	22.40	32.95	44.30	65.50	79.55	96.80	116.95
9½	13.95	17.80	23.05					98.80	119.35
10	14.40	18.30	23.70	34.75	46.60	68.10	82.85	100.80	121.70
11	15.80	19.30	25.00	36.55	48.90	70.70	86.15	104.80	126.45
12	16.70	20.30	26.30	38.35	51.20	73.30	89.45	108.80	131.20
13	17.60	21.30	27.60	40.15	53.50			112.80	135.95
14	18.50	22.30	28.90	41.95	55.80	78.50	96.05	116.80	140.70
15	19.40	23.30	30.20	43.75	58.10	81.10	99.35	120.80	145.45

For intermediate lengths, use the list price for the next longer length.

List Prices: The list prices shown in the table above cover Machine Bolts having a Regular Unfinished Square Head and equipped with a Heavy Unfinished Hot Pressed Hexagon Nut. Unless otherwise specified on the order, Machine Bolts and Nuts of this description will be regularly furnished.

When so specified, Machine Bolts can be supplied without nuts, with various other type of nuts, or with other types of bolt heads; list prices are based on the prices shown in the table above with appropriate additions or deductions, as specified in the table below.

Deductions from or Additions to the List Prices in the above table, Per 100

			½" Dia.	⅝" Dia.	¾" Dia.	⅞" Dia.	1" Dia.	1⅛" Dia.	1¼" Dia.	1⅜" Dia.	1½" Dia.
Bolts	Regular Unfin. Sq. Head, Without Nuts	Deduct	2.05	3.10	4.10	6.65	9.10	12.75	16.90	20.20	27.85
	Regular Hexagon Head, Unfinished	Add	.65	1.00	1.40	2.20	3.00				
Nuts	Heavy Hexagon, Unfinished, C.P.	Add	.20	.45	.90	1.35	2.00	2.00	4.00		
	Heavy Hexagon, Semi-finished, C.P.	Add	.50	1.00	1.60	2.05	2.90	3.10	5.40		
	Regular Hexagon, Unfinished, C.P.	Deduct	.60	.25	.05						
		Add				.50	.70	1.25	1.20	5.00	6.10
	Regular Square, Unfinished, H.P.	Deduct	1.10	1.20	1.70	2.75	3.80	4.00	5.30	2.80	4.45

Standards: Machine Bolts and Nuts are made from open-hearth steel conforming to the ASTM Specification A-107—47.

The dimensions of bolt heads and nuts conform to the American Standard ASA-B18.2—1941.

Bolt and nut threads conform to the American Standard ASA-B1.1—1935 Standard on Screw Threads, Coarse Thread Series, Class 2 Fit.

Extra List Prices, Per 100
For less than 500 of one diameter

Quantities	1⅜" Dia.	1½" Dia.
400 to 499	2.00	2.25
300 to 399	3.20	3.50
200 to 299	7.20	7.50
100 to 199	19.20	19.60
50 to 99	44.00	44.50
25 to 49	92.00	92.50
10 to 24	240.00	241.00

For engineering data on machine bolts, see pages 524 and 525.

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Crane Triplex and Templex Alloy Steel Bolt-Studs



Bolt-Stud
Threaded Entire Length
With Two Nuts

The list prices apply to Triplex Steel Bolt-Studs equipped with two nuts, each. Prices of Templex Steel Bolt-Studs will be furnished on application.

The lengths shown below do not include the crowned ends.

Each Triplex or Templex Steel Bolt-Stud is equipped with two medium carbon, oil-quenched, semi-finished, heavy, steel hexagon nuts.

Triplex Steel Bolt-Studs: The merits of Crane Triplex Steel are well known. Triplex Steel Bolt-Studs have been used with uniformly satisfactory results in thousands of steel valve and fitting installations, many of which—particularly in oil refineries—have been operating under extreme pressures and temperatures.

Made to rigid manufacturing tolerances of a high quality chrome-molybdenum steel, they provide liberal strength for the bolting of steel flanged joints.

Templex Steel Bolt-Studs: Templex Steel, a Crane development in bolting materials, is superior to Triplex Steel in creep resistance. On temperatures over 850° F., especially where joints are made up for permanent, long-time service, as in steam power plants, Crane Templex Steel will be found ideal.

A specially heat treated chrome-molybdenum-vanadium steel, Templex offers unusual resistance to creep.

Marking: On one end of each bolt-stud is stamped the identification of the material; Crane Triplex is marked with the symbol "T B7", and Crane Templex is marked with the symbol "T B14". These markings are shown in the accompanying illustrations.



Triplex Steel



Templex Steel

Standard lengths: The lengths of bolt-studs are standardized in increments of ¼-inch in accordance with the American Standard, ASA B16e-1939.

When ordering bolt-studs for Cranelap requirements, lengths should be selected as follows:

A. If calculated length is 1/16-inch or more longer than a standardized length, use the next longer standard ¼-inch length.

B. If calculated length is less than 1/16-inch longer than a standardized length, use the next shorter standard ¼-inch length.

Bolt-stud lengths in ⅛-inch increments are made to order only, at a special price; prices on request.

Threads: Crane Alloy Steel Bolt-Studs are threaded their entire length. Threading, including threading on the accompanying nuts, is in accordance with the American Standard for Screw Threads for High Strength Bolting (ASA B1.4), sizes 1-inch and smaller in diameter with the Coarse-Thread Series, and sizes 1⅛-inch and larger in diameter with the 8-Pitch-Thread Series.

Length	List Prices, Each				
Inches	7/16" Dia.	½" Dia.	5/8" Dia.	¾" Dia.	⅞" Dia.
2	.39	.39	.43		
2¼	.40	.40	.44		
2½	.41	.41	.45	.53	
2¾		.42	.46	.55	
3		.43	.47	.57	.72
3¼		.44	.48	.59	.74
3½		.45	.49	.61	.76
3¾			.50	.63	.78
4			.51	.65	.80
4¼			.52	.67	.82
4½			.53	.69	.84
4¾			.54	.71	.86
5			.55	.73	.88
5¼				.75	.90
5½			.57	.77	.92
5¾				.79	.94
6			.59	.81	.96
6¼				.83	.98
6½				.85	1.00
6¾				.87	1.02
7				.89	1.04
7¼				.91	1.06
7½				.93	1.08
7¾				.95	1.10
8				.97	1.12
8¼					1.14
8½					1.16
8¾					1.18
9					1.20
9¼					1.22
9½					1.24

Standards: Crane Triplex and Templex Steel Bolt-Studs and Nuts conform to the American Standard B16e-1939 and to various A.S.T.M. Specifications. Triplex Steel conforms to A.S.T.M. A 193, Grade B7 bolting. Templex Steel conforms to A.S.T.M. A 193, Grade B14 bolting.

The nuts conform to A.S.T.M. Specification A 194, Class 2H; they are made to American Standard "Heavy" Hexagon Nut dimensions, ASA B18.2.

Description of materials . . . page 9

Engineering data on bolting . . . pages 524 to 526

Crane Triplex and Templex Alloy Steel Bolt-Studs

(continued)

The list prices apply to Triplex Steel Bolt-Studs equipped with two nuts, each. Prices of Templex Steel Bolt-Studs will be furnished on application.

The lengths shown below do not include the crowned ends.

Each Triplex or Templex Steel Bolt-Stud is equipped with two medium carbon, oil-quenched, semi-finished, heavy, steel hexagon nuts.



Bolt-Stud
Threaded Entire Length
With Two Nuts

Length	List Prices, Each				
Inches	1" Dia.	1⅛" Dia.	1¼" Dia.	1⅜" Dia.	1½" Dia.
5	1.21				
5¼	1.24				
5½	1.27	1.74			
5¾	1.30	1.78			
6	1.33	1.82			
6¼	1.36	1.86			
6½	1.39	1.90	2.45		
6¾	1.42	1.94	2.50		
7	1.45	1.98	2.55		
7¼	1.48	2.02	2.60		
7½	1.51	2.06	2.65		
7¾	1.54	2.10	2.70		
8	1.57	2.14	2.75	3.31	
8¼	1.60	2.18	2.80	3.39	
8½	1.63	2.22	2.85	3.47	4.35
8¾	1.66	2.26	2.90	3.55	4.45
9	1.69	2.30	2.95	3.63	4.55
9¼	1.72	2.34	3.00	3.71	4.65
9½	1.75	2.38	3.05	3.79	4.75
9¾	1.78	2.42	3.10	3.87	4.85
10	1.81	2.46	3.15	3.95	4.95
10¼	1.84	2.50	3.20	4.03	5.05
10½	1.87	2.54	3.25	4.11	5.15
10¾		2.58	3.30	4.19	5.25
11		2.62	3.35	4.27	5.35
11¼		2.66	3.40	4.35	5.45
11½		2.70	3.45	4.43	5.55
11¾		2.74	3.50	4.51	5.65
12		2.78	3.55	4.59	5.75
12¼			3.60	4.67	5.85
12½			3.65	4.75	5.95
12¾			3.70	4.83	6.05
13			3.75	4.91	6.15
13¼			3.80	4.99	6.25
13½			3.85	5.07	6.35
13¾				5.15	6.45
14				5.23	6.55
14¼				5.31	6.65
14½				5.39	6.75
14¾				5.47	6.85
15				5.55	6.95

Length	List Prices, Each		
Inches	1⅝" Dia.	1¾" Dia.	1⅞" Dia.
9½	6.46		
9¾	6.59		
10	6.72	8.55	
10¼	6.85	8.70	
10½	6.98	8.85	
10¾	7.11	9.00	
11	7.24	9.15	
11¼	7.37	9.30	11.30
11½	7.50	9.45	11.45
11¾	7.63	9.60	11.60
12	7.76	9.75	11.75
12¼	7.89	9.90	11.90
12½	8.02	10.05	12.05
12¾	8.15	10.20	12.20
13	8.28	10.35	12.35
13¼	8.41	10.50	12.50
13½	8.54	10.65	12.65
13¾	8.67	10.80	12.80
14	8.80	10.95	12.95
14¼	8.93	11.10	13.10
14½	9.06	11.25	13.25
14¾		11.40	13.40
15	9.32	11.55	13.55
15¼			13.70
15½	9.58	11.85	13.85
15¾			14.00
16	9.84	12.15	14.15
16¼			14.30
16½		12.30	14.45
16¾			
17			14.75
17¼			
17½			15.05
17¾			
18			15.35
18¼			
18½			
18¾			
19			
19¼			
19½			

Length	List Prices, Each		
Inches	2" Dia.	2¼" Dia.	2½" Dia.
12	14.00		
12¼	14.20		
12½	14.40		
12¾	14.60		
13	14.80		
13¼	15.00		
13½	15.20		
13¾	15.40		
14	15.60		
14¼	15.80		
14½	16.00		
14¾	16.20		
15	16.40	21.40	
15¼	16.60	21.60	
15½	16.80	21.80	
15¾	17.00	22.00	
16	17.20	22.20	
16¼		22.40	
16½	17.60	22.60	27.60
16¾			27.80
17	18.00	23.00	28.00
17¼			28.20
17½	18.40	23.40	28.40
17¾			28.60
18	18.80	23.80	28.80
18¼			29.00
18½	19.20	24.20	29.20
18¾			29.40
19	19.60	24.60	29.60
19¼			29.80
19½		25.00	30.00
19¾			30.20
20		25.40	30.40
20¼			30.60
20½		25.80	30.80
21		26.20	31.20
21¼			31.40
21½			31.60
22			32.00
22½			32.40
23			32.80

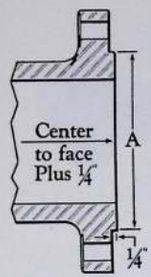
Thread Compound

Crane High Temperature Thread Compound is recommended for use with alloy steel bolt-studs. On bolting subjected to high temperatures, this compound is unsurpassed. Because it reduces friction, maximum stress can be obtained in the bolt-stud with a minimum amount of power applied to the nut. In addition, since it minimizes the tendency of metals to gall or seize, joints can be more readily assembled and taken apart without injuring the bolting. The compound is described in detail on page 404.

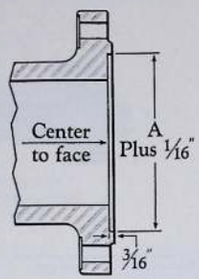
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Male, Female, Tongue, and Groove Flange Facings

For 300-Pound Steel



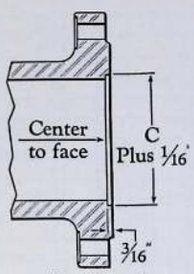
Large Male



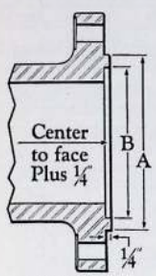
Large Female



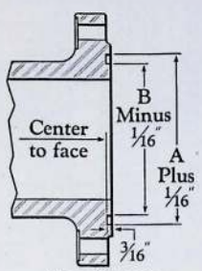
*Small Male



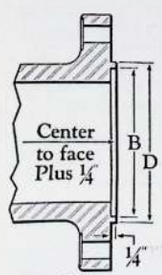
*Small Female



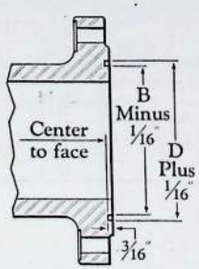
Large Tongue



Large Groove



Small Tongue



Small Groove

Dimensions, in Inches

Class	Size	A	B	C	D
300-Pound Steel	1/2	1 3/8	1	23/32	1 3/8
	3/4	1 11/16	1 5/16	1 5/16	1 11/16
	1	2	1 1/2	1 3/16	1 7/8
	1 1/4	2 1/2	1 7/8	1 1/2	2 1/4
	1 1/2	2 7/8	2 1/8	1 3/4	2 1/2
	2	3 5/8	2 7/8	2 1/4	3 1/4
	2 1/2	4 1/8	3 3/8	2 11/16	3 3/4
	3	5	4 1/4	3 5/16	4 5/8
	3 1/2	5 1/2	4 3/4	3 13/16	5 1/8
	4	6 3/16	5 3/16	4 5/16	5 11/16
	5	7 5/16	6 5/16	5 3/8	6 13/16
	6	8 1/2	7 1/2	6 3/8	8
	8	10 5/8	9 3/8	8 3/8	10
	10	12 3/4	11 1/4	10 1/2	12
	12	15	13 1/2	12 1/2	14 1/4
	14	16 1/4	14 3/4	13 3/4	15 1/2
	16	18 1/2	16 3/4	15 3/4	17 5/8
	18	21	19 1/4	17 3/4	20 1/8
	20	23	21	19 3/4	22
	24	27 1/4	25 1/4	23 3/4	26 1/4

Refer to the Crane Discount Sheet for prices.

The dimensions shown above conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939.

All of the types of facings can be applied to flanged products in the 300-Pound steel class, conforming to the American Steel Flange Standard, B16e-1939.

Center to face: The illustrations show how regular valve or fitting center to face dimensions are affected by these special facings. Notice: the male or tongue facing increases the regular center to face 1/4-inch; the female or groove facing does not alter the regular center to face.

Regular facing and finish: 300-Pound Steel flanged valves, flanged fittings, and flanges are regularly furnished with a 1/16-inch raised face.

1/16-inch raised faces and 1/4-inch male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish. Female, tongue, and groove faces are regularly furnished with a smooth finish.

***Small male and female:** Small male and female facing, when used with steel screwed flanges, makes the joint directly on the end of the pipe. In these cases the pipe must be thick enough to provide a bearing surface of ample width to prevent crushing of the gasket. If a pipe end is to be used as a mating member in a joint, orders should specify the inside diameter of the pipe. In some instances, it may be necessary to lag up the port diameter of valves and fittings to match the I.D. of the pipe, in which case special prices will apply.

Gaskets: Gaskets for male and female and for tongue and groove joints should cover the bottom of the recess with minimum clearances, allowing for the plus or minus tolerance of 0.016 inch (1/61") which is permitted by the American Standard on the inside and outside diameters of facings.

Dimensions of ring joint facing . . . pages 470 and 471
Facings on Cranelap Joints . . . . pages 507 and 508
Templates for drilling . . . . page 461

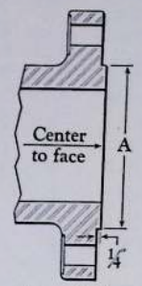
Male, Female, Tongue, and Groove Flange Facings

For 400 to 2500-Pound Steel

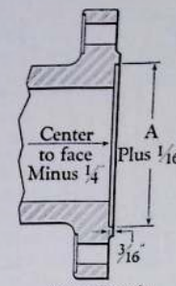
Dimensions, in Inches

Class	Size	A	B	C	D
400, 600, 900, 1500, or 2500-Pound Steel	1/2	1 3/8	1	23/32	1 3/8
	3/4	1 11/16	1 5/16	1 5/16	1 11/16
	1	2	1 1/2	1 3/16	1 7/8
	1 1/4	2 1/2	1 7/8	1 1/2	2 1/4
	1 1/2	2 7/8	2 1/8	1 3/4	2 1/2
	2	3 5/8	2 7/8	2 1/4	3 1/4
	2 1/2	4 1/8	3 3/8	2 11/16	3 3/4
	3	5	4 1/4	3 5/16	4 5/8
	3 1/2	5 1/2	4 3/4	3 13/16	5 1/8
	4	6 3/16	5 3/16	4 5/16	5 11/16
	5	7 5/16	6 5/16	5 3/8	6 13/16
	6	8 1/2	7 1/2	6 3/8	8
	8	10 5/8	9 3/8	8 3/8	10
	10	12 3/4	11 1/4	10 1/2	12
	12	15	13 1/2	12 1/2	14 1/4
	14	16 1/4	14 3/4	13 3/4	15 1/2
	16	18 1/2	16 3/4	15 3/4	17 5/8
	18	21	19 1/4	17 3/4	20 1/8
	20	23	21	19 3/4	22
	24	27 1/4	25 1/4	23 3/4	26 1/4

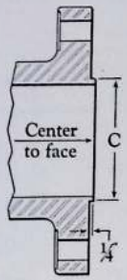
Refer to the Crane Discount Sheet for prices.



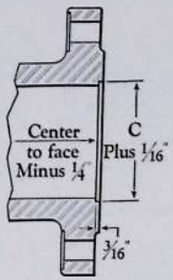
Large Male



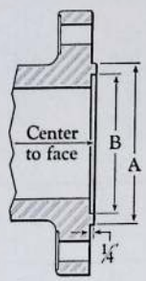
Large Female



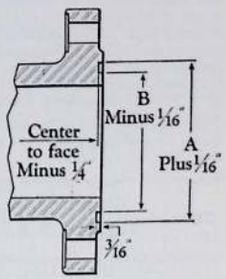
*Small Male



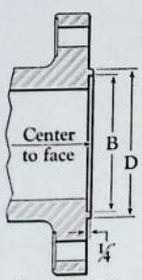
*Small Female



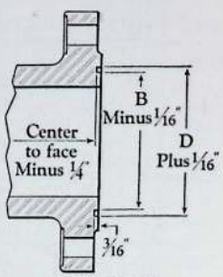
Large Tongue



Large Groove



Small Tongue



Small Groove

The dimensions shown above conform to the American Standard for Steel Pipe Flanges and Flanged Fittings. B16e-1939.

All of the types of facings can be applied to flanged products in the 400, 600, 900, 1500, and 2500-Pound steel classes, conforming to the American Standard, B 16e-1939.

Center to face: The illustrations show how regular valve or fitting center to face dimensions are affected by these special facings. Notice particularly: the male and tongue facings are included in the regular center to face; the female and groove facings require a deduction of 1/4-inch from the regular center to face.

Regular facing and finish: Flanged valves and flanged fittings of the classes indicated are regularly furnished with a 1/4-inch male face. Companion flanges have a 1/4-inch male face or, if specified, a 3/16-inch female face.

The male faces are finished with concentric grooves, approximately 32 grooves per inch, known as a "serrated" finish. Female, tongue, and groove faces regularly have a smooth finish.

***Small male and female:** Small male and female facing, when used with steel screwed flanges, makes the joint directly on the end of the pipe. In these cases the pipe must be thick enough to provide a bearing surface of ample width to prevent crushing of the gasket. If a pipe end is to be used as a mating member in a joint, orders should specify the inside diameter of the pipe. In some instances, it may be necessary to lag up the port diameter of valves and fittings to match the I.D. of the pipe, in which case special prices will apply.

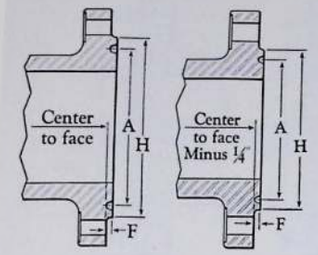
Gaskets: Gaskets for male and female and for tongue and groove joints should cover the bottom of the recess with minimum clearances, allowing for the plus or minus tolerance of 0.016 inch (1/61") which is permitted by the American Standard on the inside and outside diameters of facings.

Dimensions of ring joint facing . . . pages 470 and 471
Facings on Cranelap Joints . . . . . pages 507 and 508
Bolting on companion flanges . . . . . page 457
Templates for drilling . . . . . pages 462 and 463

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Ring Joint Facing and Rings

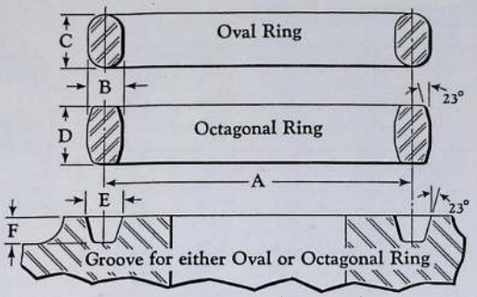
API and American Standard—Dimensions, in Inches



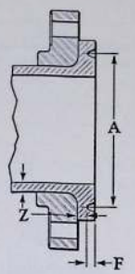
150 and 300-Pound

400, 600, 900, 1500, and 2500-Pound

For Valves, Fittings, and Flanges

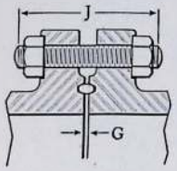


(Oval rings fit grooves having either a flat or round bottom; octagonal rings only fit grooves having a flat bottom.)



("Z" represents pipe thickness.)

Cranelap Joints



"G" is approximate clearance with bolt-studs tight.

Assembled Ring Joint

*Dimension "J" does not apply to Cranelap Joints; see "Bolt-stud lengths" on next page.

†***Caution:*** The 3-inch 300 and 600-Pound Cranelap Ring Joints use Ring No. R 30, having a pitch diameter of 4⅝ inches. When 3-inch 300 or 600-Pound ring joint valves, fittings, or flanges are to be bolted to Cranelap joints, orders must so specify; they will be machined special.

‡See explanation of "center to face" on next page.

Class	Size	Ring Number	A	B	C	D	E	F	G	H	*J	No. of Bolt-Studs	Dia. of Bolt-Studs
150 Pound	1	R 15	1⅞	5/16	9/16	½	11/32	‡¼	5/32	2½	3	4	½
	1¼	R 17	2¼	5/16	9/16	½	11/32	‡¼	5/32	2⅞	3¼	4	½
	1½	R 19	2⁹/16	5/16	9/16	½	11/32	‡¼	5/32	3¼	3¼	4	½
	2	R 22	3¼	5/16	9/16	½	11/32	¼	5/32	4	3¾	4	⅝
	2½	R 25	4	5/16	9/16	½	11/32	¼	5/32	4¾	4	4	⅝
	3	R 29	4½	5/16	9/16	½	11/32	¼	5/32	5¼	4¼	4	⅝
	3½	R 33	5³/16	5/16	9/16	½	11/32	¼	5/32	6¹/16	4¼	8	⅝
	4	R 36	5⅞	5/16	9/16	½	11/32	¼	5/32	6¾	4¼	8	⅝
	5	R 40	6¾	5/16	9/16	½	11/32	¼	5/32	7⅝	4½	8	¾
	6	R 43	7⅝	5/16	9/16	½	11/32	¼	5/32	8⅝	4½	8	¾
	8	R 48	9¾	5/16	9/16	½	11/32	¼	5/32	10¾	4¾	8	¾
	10	R 52	12	5/16	9/16	½	11/32	¼	5/32	13	5¼	12	⅞
	12	R 56	15	5/16	9/16	½	11/32	¼	5/32	16	5½	12	⅞
	14	R 59	15⅝	5/16	9/16	½	11/32	¼	⅛	16¾	6	12	1
	16	R 64	17⅞	5/16	9/16	½	11/32	¼	⅛	19	6	16	1
	18	R 68	20⅜	5/16	9/16	½	11/32	¼	⅛	21½	6½	16	1⅛
	20	R 72	22	5/16	9/16	½	11/32	¼	⅛	23½	7	20	1⅛
	24	R 76	26½	5/16	9/16	½	11/32	¼	⅛	28	7¾	20	1¼

Class	Size	Ring Number	A	B	C	D	E	F	G 300 Lb.	G 400 Lb.	G 600 Lb.	H	*J 300 Lb.	*J 400 Lb.	*J 600 Lb.	No. of Bolt-Studs 300 Lb.	No. of Bolt-Studs 400 Lb.	No. of Bolt-Studs 600 Lb.	Dia. of Bolt-Studs 300 Lb.	Dia. of Bolt-Studs 400 Lb.	Dia. of Bolt-Studs 600 Lb.
†300, 400, and †600 Pound	½	R 11	1¹¹/32	¼	7/16	⅜	9/32	‡7/32	⅛		⅛	2	3		3	4		4	½		½
	¾	R 13	1¹¹/16	5/16	9/16	½	11/32	‡¼	5/32		5/32	2½	3½		3½	4		4	⅝		⅝
	1	R 16	2	5/16	9/16	½	11/32	‡¼	5/32		5/32	2¾	3½		3½	4		4	⅝		⅝
	1¼	R 18	2⅜	5/16	9/16	½	11/32	‡¼	5/32		5/32	3⅛	3¾		3¾	4		4	⅝		⅝
	1½	R 20	2¹¹/16	5/16	9/16	½	11/32	‡¼	5/32		5/32	3⁹/16	4		4¼	4		4	¾		¾
	2	R 23	3¼	7/16	11/16	⅝	15/32	5/16	7/32		3/16	4¼	4¼		4½	8		8	⅝		⅝
	2½	R 26	4	7/16	11/16	⅝	15/32	5/16	7/32		3/16	5	4¾		5	8		8	¾		¾
	†3	†R 31	†4⅞	7/16	11/16	⅝	15/32	5/16	7/32		3/16	5¾	5		5¼	8		8	¾		¾
	3½	R 34	5³/16	7/16	11/16	⅝	15/32	5/16	7/32		3/16	6¼	5¼		5¾	8		8	¾		⅞
	4	R 37	5⅞	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	6⅞	5¼	5¾	6	8	8	8	¾	⅞	⅞
	5	R 41	7⅛	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	8¼	5½	6	6¾	8	8	8	¾	⅞	1
	6	R 45	8⅝	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	9½	5¾	6¼	7	12	12	12	¾	⅞	1
	8	R 49	10⅝	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	11⅞	6¼	7	8	12	12	12	⅞	1	1⅛
	10	R 53	12¾	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	14	7¼	7¾	8¾	16	16	16	1	1⅛	1¼
	12	R 57	15	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	16¼	7½	8½	9	16	16	20	1⅛	1¼	1¼
	14	R 61	16½	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	18	7¾	8¾	9½	20	20	20	1⅛	1¼	1⅜
	16	R 65	18½	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	20	8½	9¼	10¼	20	20	20	1¼	1⅜	1½
	18	R 69	21	7/16	11/16	⅝	15/32	5/16	7/32	7/32	3/16	22⅝	8¾	9½	11	24	24	20	1¼	1⅜	1⅝
	20	R 73	23	½	¾	11/16	17/32	⅜	7/32	7/32	3/16	25	9¼	10¼	11¾	24	24	24	1¼	1½	1⅝
	24	R 77	27¼	⅝	⅞	13/16	21/32	7/16	¼	¼	7/32	29½	10¼	11¼	13½	24	24	24	1½	1¾	1⅞

Dimensions, in Inches (Cont.)

Class	Size	Ring Numbers	A	B	C	D	E	F	G	H	*J	No. of Bolt-Studs	Dia. of Bolt-Studs
900 Pound	3	R 31	4⅞	7/16	11/16	⅝	15/32	5/16	5/32	6⅛	6	8	⅞
	4	R 37	5⅞	7/16	11/16	⅝	15/32	5/16	5/32	7⅛	7	8	1⅛
	5	R 41	7⅛	7/16	11/16	⅝	15/32	5/16	5/32	8½	7¾	8	1¼
	6	R 45	8⅝	7/16	11/16	⅝	15/32	5/16	5/32	9½	8	12	1⅛
	8	R 49	10⅝	7/16	11/16	⅝	15/32	5/16	5/32	12⅛	9	12	1⅜
	10	R 53	12¾	7/16	11/16	⅝	15/32	5/16	5/32	14¼	9½	16	1⅜
	12	R 57	15	7/16	11/16	⅝	15/32	5/16	5/32	16½	10¼	20	1⅜
	14	R 62	16½	⅝	⅞	1³/16	21/32	7/16	5/32	18⅜	11¼	20	1½
	16	R 66	18½	⅝	⅞	1³/16	21/32	7/16	5/32	20⅝	11¾	20	1⅝
	18	R 70	21	¾	1	1⁵/16	25/32	½	3/16	23⅜	13½	20	1⅞
	20	R 74	23	¾	1	1⁵/16	25/32	½	3/16	25½	14½	20	2
	24	R 78	27¼	1	1⁵/16	1¼	1¹/16	⅝	7/32	30⅜	18¼	20	2½
1500 Pound	½	R 12	1⁹/16	5/16	9/16	½	11/32	‡¼	5/32	2⅜	4¼	4	¾
	¾	R 14	1¾	5/16	9/16	½	11/32	‡¼	5/32	2⅝	4½	4	¾
	1	R 16	2	5/16	9/16	½	11/32	‡¼	5/32	2¹³/16	5	4	⅞
	1¼	R 18	2⅜	5/16	9/16	½	11/32	‡¼	5/32	3³/16	5	4	⅞
	1½	R 20	2¹¹/16	5/16	9/16	½	11/32	‡¼	5/32	3⅝	5½	4	1
	2	R 24	3¾	7/16	11/16	⅝	15/32	5/16	⅛	4⅞	6	8	⅞
	2½	R 27	4¼	7/16	11/16	⅝	15/32	5/16	⅛	5⅜	6½	8	1
	3	R 35	5⅜	7/16	11/16	⅝	15/32	5/16	⅛	6⅝	7¼	8	1⅛
	4	R 39	6⅜	7/16	11/16	⅝	15/32	5/16	⅛	7⅝	8	8	1¼
	5	R 44	7⅝	7/16	11/16	⅝	15/32	5/16	⅛	9	10	8	1½
	6	R 46	8⅝	½	¾	11/16	17/32	⅜	⅛	9¾	10¾	12	1⅜
	8	R 50	10⅝	⅝	⅞	1³/16	21/32	7/16	5/32	12½	12	12	1⅝
	10	R 54	12¾	⅝	⅞	1³/16	21/32	7/16	5/32	14⅝	13¾	12	1⅞
	12	R 58	15	⅞	1⅛	1¹/16	29/32	9/16	3/16	17¼	15¾	16	2
	14	R 63	16½	1	1⁵/16	1¼	1¹/16	⅝	7/32	19¼	17¼	16	2¼
	16	R 67	18½	1⅛	1⁷/16	1⅜	1³/16	1¹/16	5/16	21½	19	16	2½
	18	R 71	21	1⅛	1⁷/16	1⅜	1³/16	1¹/16	5/16	24⅛	20¾	16	2¾
	20	R 75	23	1¼	1⁹/16	1½	1⁵/16	1¹/16	⅜	26½	22¾	16	3
	24	R 79	27¼	1⅜	1¾	1⅝	1⁷/16	1³/16	7/16	31¼	26	16	3½
2500 Pound	½	R 13	1¹¹/16	5/16	9/16	½	11/32	‡¼	5/32	2⁹/16	4¾	4	¾
	¾	R 16	2	5/16	9/16	½	11/32	‡¼	5/32	2⅞	5	4	¾
	1	R 18	2⅜	5/16	9/16	½	11/32	‡¼	5/32	3¼	5½	4	⅞
	1¼	R 21	2²⁷/32	7/16	11/16	⅝	15/32	5/16	⅛	4	6¼	4	1
	1½	R 23	3¼	7/16	11/16	⅝	15/32	5/16	⅛	4½	7	4	1⅛
	2	R 26	4	7/16	11/16	⅝	15/32	5/16	⅛	5¼	7¼	8	1
	2½	R 28	4⅜	½	¾	11/16	17/32	⅜	⅛	5⅞	8	8	1⅛
	3	R 32	5	½	¾	11/16	17/32	⅜	⅛	6⅝	9¼	8	1¼
	4	R 38	6³/16	⅝	⅞	1³/16	21/32	7/16	5/32	8	10½	8	1½
	5	R 42	7½	¾	1	1⁵/16	25/32	½	5/32	9½	12½	8	1¾
	6	R 47	9	¾	1	1⁵/16	25/32	½	5/32	11	14¼	8	2
	8	R 51	11	⅞	1⅛	1¹/16	29/32	9/16	3/16	13⅜	16	12	2
	10	R 55	13½	1⅛	1⁷/16	1⅜	1³/16	1¹/16	¼	16¾	20¼	12	2½
	12	R 60	16	1¼	1⁹/16	1½	1⁵/16	1¹/16	5/16	19½	22¼	12	2¾

Rings: See page 472. Type "A" or "B" Rings ¼, 5/16, or 7/16-inch wide are regularly furnished oval shape; ½-inch wide or wider Type "A" or Type "B" Rings are octagonal shape.

Standards: The dimensions of the rings and ring joint grooves conform to American Standard B16.20-1952. The flange facing dimensions conform to the American Standard for Steel Pipe Flanges and Flanged Fittings, B16e-1939 and Addendum B16e4-1940.

Flange facing and ring dimensions also conform to the American Petroleum Institute Standard 6-B, Fourth Edition, May, 1949 (Tentative), except that this Standard does not include ½ and ¾-inch 600-Pound Flanges or 16-inch and larger 1500-Pound Flanges.

Rings for ring joints . . . page 472
Dimensions of Cranelap Joints . . page 508
List prices of bolt-studs . . pages 466 and 467
Templates for drilling and flange dimensions . . pages 461 to 463

The dimensions shown on this and the preceding page apply to ring joint facing and rings for the end flanges of steel valves and flanged fittings, and for steel flanges. The groove (smooth finish) for the ring is cut in a raised face as illustrated on the preceding page.

‡**Center to face:** When ring joint facing is applied to 150 and 300-Pound valves and fittings, the center to the raised face is equal to the regular center to face dimension (which includes the 1/16-inch raised face) plus the depth of the groove on sizes 2-inch and larger, or plus the depth of the groove minus 1/32-inch on smaller sizes.

On higher pressure ring joint valves and fittings, the center to the raised face is equal to the regular center to face dimension minus ¼-inch (the height of the large male), plus the depth of the groove on 400, 600, 900, and 1500-Pound sizes 2-inch and larger and on 2500-Pound sizes 1¼-inch and larger, or plus the depth of the groove minus 1/32-inch on the smaller sizes.

This practice also applies to loose flanges; that is, the raised face which is equal to the depth of the groove is added to the flange thickness (dimension "B" on pages 296 and 297) except that on the smaller sizes the groove cuts 1/32-inch into the flange thickness.

On Cranelap joints with ring joint facing the depth of the groove is added to the minimum thickness of the lap. See pages 505 to 508 for Cranelap joints.

***Bolt-stud lengths:** The length of bolt-studs indicated as dimension "J" in the tables applies for all combinations of ring joint valves, fittings, and flanges other than Cranelap.

For ring joint combinations made up of valves, fittings, or flanges bolted to Cranelaps, add the pipe thickness to dimension "J". For Cranelap to Cranelap ring joints, add twice the pipe thickness to dimension "J".

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Rings for Ring Joints



Oval Ring
Types A and B

Prices on application



Octagonal Ring
Types A and B

Crane Oval and Octagonal Rings, illustrated above, are available in two grades of material suitable for use in 150, 300, 400, 600, 900, 1500, and 2500-Pound ring joints.

The shape of the ring regularly furnished for various sizes and pressure classes of joints is indicated in the table at the right.

Ordering: Orders for rings should specify the Ring Number and whether Type A or Type B is wanted. When the Type is not specified, Type A Rings will regularly be supplied in the shape shown in the table at the right.

Type A Rings are made of Soft Steel (90 Brinell maximum hardness), either oval or octagonal, as shown in the table at the right; they are recommended for use with Carbon Steel, No. 4 Carbon-Molybdenum Steel, or No. 3 Nickel Steel products.

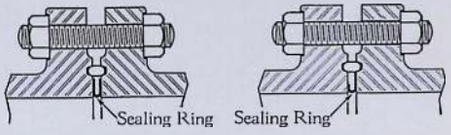
Type B Rings made of 5% Chrome with ½% Molybdenum (130 Brinell maximum hardness), are recommended for corrosive services, as in oil refinery work, and for use with No. 5 Chrome-Molybdenum Steel products. They have the same shape as Type A Rings, being distinguished by a square bead on the outer periphery.

Shape of Ring Regularly Furnished For Various Size Ring Joints

Pressure Class	Oval Rings	Octagonal Rings
150-Pound	All sizes	...
300-Pound	18" and smaller	20 and 24"
400-Pound		
600-Pound		
900-Pound	12" and smaller	14" and larger
1500-Pound	5" and smaller	6" and larger
2500-Pound	2" and smaller	2½" and larger

Dimensions of Rings and Ring Joints . . pages 470 and 471
Flanged joint assembly and maintenance . . . . . page 526

Corrosion Sealing Rings



For unusually corrosive fluids, ***Corrosion Sealing Rings,*** illustrated above, are recommended for protection of rings. Prices on application.

Gaskets

For Brass and Bronze Flanged Joints



Full Face Gaskets are furnished without bolt holes unless otherwise ordered; an extra charge is made for punching bolt holes.

Size of Joint	150-Pound MSS Standard Full Face Gaskets				300-Pound MSS Standard Full Face Gaskets		
	List Prices, Each			Inside and Outside Diameters	List Prices, Each		Inside and Outside Diameters
Inches	1/16-inch Cloth Inserted Rubber	1/16-inch "CC" Rubber	1/16-inch Cranite	Inches	1/16-inch "CC" Rubber	1/16-inch Cranite	Inches
1	.15	.18	.18	1 ×4¼	.39	.22	1 ×4⅞
1¼	.21	.26	.19	1¼×4⅝	.39	.26	1¼×5¼
1½	.21	.26	.22	1½×5	.39	.34	1½×6⅛
2	.27	.35	.31	2 ×6	.46	.38	2 ×6½
2½	.34	.43	.44	2½×7	.56	.53	2½×7½
3	.41	.51	.49	3 ×7½	.69	.61	3 ×8¼
3½	.44	.69	.61	3½×8½			
4	.52	.77	.66	4 ×9			
5	.62	1.05	.72	5 ×10			
6	.69	1.25	.81	6 ×11			
8	.96	1.50	1.20	8 ×13½			
10	1.30	2.05	1.70	10 ×16			

Important: Full face gaskets should always be used for brass or bronze flanged joints. Metallic gaskets are not recommended.

When brass or bronze flanged material is bolted to iron or steel material which normally has a raised face, the raised face should be removed to provide a full face bearing for the gasket. Brass or bronze flanged material should not be bolted to Cranelap flanged pipe joints.

Cranite Gaskets: When installing Cranite Gaskets, they should be coated with Crane Thread Lubricant in order to facilitate making tight joints; see page 464. Cranite Gaskets are satisfactory for use in oil lines where asbestos gaskets are permitted.

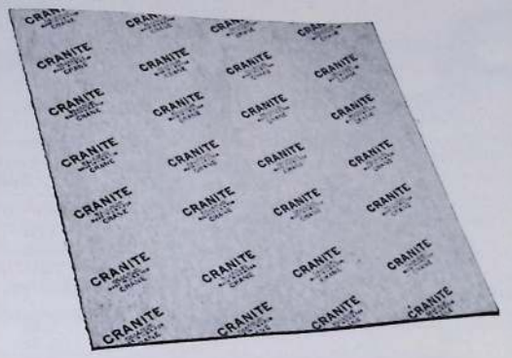
Sheet Packings . . . . page 473
For Gaskets for Iron and Steel Flanged Joints, see pages 474 to 476.

Cranite Sheet Packing

CRANITE——*the highest grade sheet packing obtainable.*

Cranite Packing has been approved by the Underwriters' Laboratories, Inc., for use on hazardous liquids.

The name "CRANITE" is registered in the United States Patent Office.



The list price of Cranite Sheet Packing, for widths and thicknesses regularly furnished, is $1.60 per pound.

The 1/16-inch thickness averages .62 pound to the square foot.

An Asbestos Composition manufactured solely for Crane

Cranite Sheet Packing: Cranite Sheet Packing is made of an asbestos composition, using only selected long fiber asbestos, cross laminated to provide unusual tensile strength. It offers a very uniform and high resistance to compression, is exceptionally strong and rugged, and will not deteriorate with age.

This packing is unhesitatingly recommended for a multitude of services, such as steam, water, oil, dry air, acids, ammonia, alkali, gases, etc., and for temperatures up to 750° F.

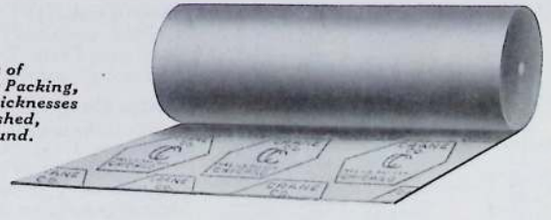
Because of the great number of services for which Cranite Sheet Packing can be used, its unusually high quality, and its ability to withstand deterioration, users will find it economical to purchase the packing in quantities and to carry it in stock.

For best results, gaskets cut from Cranite Sheet Packing should be coated with Crane Thread Lubricant when being installed. See page 464 for Crane Thread Lubricants.

Sizes: Cranite Sheet Packing is regularly furnished 1/16-inch thick in sheets 36 or 48 inches square. Other thicknesses from 1/64 to 1/4-inch, or other sizes up to 120 inches square can be made to order; prices and additional data on request.

"CC" Rubber Sheet Packing

The list price of "CC" Rubber Sheet Packing, for widths and thicknesses regularly furnished, is $1.05 per pound.



Average weights per square yard:
1/16-inch thick . . . 5¼ pounds
3/32-inch thick . . . 8 pounds
⅛-inch thick . . . 10½ pounds

Manufactured Solely for Crane

"CC" Rubber Sheet Packing, manufactured solely for Crane, is especially well adapted for high or low pressure service on saturated steam, hot and cold water, air, gases, etc.

"CC" Rubber Sheet Packing is regularly furnished in rolls 36 inches wide and in thicknesses of 1/16-inch 3/32-inch, or ⅛-inch; each of these rolls weighs approximately 200 pounds.

Other widths, up to 72 inches, are available on special order; prices and data furnished on request.

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Gaskets

For Cast Iron Flanged Joints



Ring Gaskets cover the face of the flange to the inside edge of the bolts, and will always be furnished unless otherwise ordered.



Full Face Gaskets are furnished without bolt holes unless otherwise ordered; an extra charge is made for punching bolt holes.

Flanged Joint		Ring Gaskets						Full Face Gaskets					
		List Prices, Each				Diameter, in Inches		List Prices, Each				Diameter, in Inches	
Pressure Class	Size Inches	1/16-inch Cloth Inserted Rubber	1/16-inch "CC" Rubber	4-ounce Canvas	1/16-inch Cranite	Inside	Outside	1/16-inch Cloth Inserted Rubber	1/16-inch "CC" Rubber	4-ounce Canvas	1/16-inch Cranite	Inside	Outside
For 25-Pound Cast Iron Flanged Joints	10	.63	1.05	.37	....	10	13⅝	1.30	2.05	.81	....	10	16
	12	.86	1.30	.52	....	12	16⅜	1.70	2.55	1.05	....	12	19
	14	1.05	1.60	.62	....	14	18	1.90	2.90	1.20	....	14	21
	16	1.20	2.05	.72	....	16	20½	2.45	3.65	1.45	....	16	23½
	18	1.30	2.35	.77	....	18	22	2.75	4.10	1.65	....	18	25
	20	1.50	2.55	.90	....	20	24¼	2.95	4.50	1.75	....	20	27½
	24	2.10	3.00	1.25	....	24	28¾	3.75	5.40	2.30	....	24	32
	30	3.10	4.50	1.90	....	30	35⅛	5.60	9.10	3.40	....	30	38¾
	36	4.30	7.00	2.60	....	36	41⅞	7.50	13.90	4.55	....	36	46
	42	5.15	8.25	3.10	....	42	48½	....	16.55	5.55	....	42	53
	48	....	9.65	4.10	....	48	55	....	19.25	7.15	....	48	59½
For 125-Pound Cast Iron Flanged Joints	1	.07	.09	.06	.08	1	2⅝	.15	.18	.13	.18	1	4¼
	1¼	.10	.13	.09	.09	1¼	3	.21	.26	.18	.19	1¼	4⅝
	1½	.10	.13	.09	.12	1½	3⅜	.21	.26	.18	.22	1½	5
	2	.10	.18	.09	.14	2	4⅛	.27	.35	.21	.31	2	6
	2½	.13	.22	.10	.17	2½	4⅞	.34	.43	.27	.44	2½	7
	3	.18	.26	.13	.20	3	5⅜	.41	.51	.31	.49	3	7½
	3½	.21	.36	.15	.29	3½	6⅜	.44	.69	.33	.61	3½	8½
	4	.24	.40	.16	.31	4	6⅞	.52	.77	.35	.66	4	9
	5	.28	.51	.19	.36	5	7¾	.62	1.05	.41	.72	5	10
	6	.34	.60	.22	.41	6	8¾	.69	1.25	.44	.81	6	11
	8	.44	.77	.27	.56	8	11	.96	1.50	.59	1.20	8	13½
	10	.62	1.05	.37	.75	10	13⅜	1.30	2.05	.81	1.70	10	16
	12	.86	1.30	.52	1.15	12	16⅛	1.70	2.55	1.05	2.30	12	19
	14	1.05	1.60	.62	1.20	14	17¾	1.90	2.85	1.20	2.60	14	21
	16	1.20	2.05	.72	1.40	16	20¼	2.45	3.65	1.50	3.10	16	23½
	18	1.25	2.35	.77	1.20	18	21⅝	2.75	4.10	1.65	3.20	18	25
	20	1.50	2.55	.90	1.45	20	23⅞	2.95	4.50	1.75	3.50	20	27½
	24	2.05	2.95	1.25	2.50	24	28¼	3.75	5.40	2.30	4.25	24	32
	30	3.10	4.50	1.85	....	30	34¾	5.60	9.10	3.40	....	30	38¾
	36	4.30	6.95	2.60	....	36	41¼	7.50	13.90	4.55	....	36	46
	42	5.15	8.25	3.10	....	42	48	....	16.55	5.55	....	42	53
	48	....	9.65	4.05	....	48	54½	....	19.20	7.15	....	48	59½
For 250-Pound Cast Iron Flanged Joints	1½	....	.18	....	.14	1½	3¾						
	2	....	.20	....	.15	2	4⅜						
	2½	....	.26	....	.19	2½	5⅛						
	3	....	.33	....	.26	3	5⅞						
	3½	....	.36	....	.30	3½	6½						
	4	....	.39	....	.36	4	7⅛						
	5	....	.53	....	.47	5	8½						
	6	....	.64	....	.61	6	9⅞						
	8	....	.92	....	.81	8	12⅛						
	10	....	1.20	....	1.05	10	14¼						
	12	....	1.55	....	1.25	12	16⅝						
	14	....	2.15	....	2.10	13¼	19⅛						
	16	....	2.55	....	2.30	15¼	21¼						
	18	....	2.95	....	2.60	17	23½						
	20	....	3.10	....	3.05	19	25¾						
	24	....	4.10	....	3.95	23	30½						

Canvas Gaskets: Canvas Gaskets are furnished uncoated. They should be coated with Crane Thread Lubricant or with red lead and oil when installed.

Cranite Gaskets: When Cranite Gaskets are installed, they should be coated with Crane Thread Lubricant to facilitate making tight joints. Cranite Gaskets are satisfactory for use in oil lines where asbestos gaskets are permitted.

Other materials: Other commercial sheet packing gaskets are made to order; prices on application.

Thread lubricant ..... *page 464*
Gaskets for brass flanged joints ..... *page 472*
Sheet packings ..... *page 473*

800-Pound Hydraulic Cast Iron Joints: Gaskets for 800-Pound Hydraulic Cast Iron Flanged Joints are the same as for 600-Pound Steel Flanged Joints; use the list prices and dimensions shown on page 475.

Gaskets

For Steel Flanged Joints

Cranite Gaskets: Cranite Gaskets are recommended for steam, water, air, gas, and many other similar services, including oil lines on which asbestos gaskets are permitted. Their use is limited to a maximum of 750° F. When being installed, they should be coated with Crane Thread Lubricant to facilitate the making of tight joints; see page 464.

Corrugated Metallic Gaskets: Corrugated Metallic Gaskets (Copper or Soft Iron) can be furnished when ordered; prices and dimensions on application. They should have a large inside diameter to assure a high unit compressive load; this requirement is mandatory in the case of piping materials used at the higher pressures and temperatures for which they are recommended. The gaskets should be coated with Crane High Temperature Thread Compound when being installed; see page 464.



Ring Gaskets extend to the inside edge of the bolts



Corrugated Metallic Gasket

800-Pound Hydraulic Cast Iron Joints: 800-Pound Hydraulic Cast Iron Flanged Joints use the same gaskets as the 600-Pound Steel; see list prices and dimensions in the table below.

Ring Gaskets—1/16-Inch Thick Cranite

Size of Joint Inches	150-Pound List Price Each	150-Pound I.D. × O.D. Inches	300-Pound List Price Each	300-Pound I.D. × O.D. Inches	400-Pound List Price Each	400-Pound I.D. × O.D. Inches	600-Pound List Price Each	600-Pound I.D. × O.D. Inches	900-Pound List Price Each	900-Pound I.D. × O.D. Inches	1500-Pound List Price Each	1500-Pound I.D. × O.D. Inches
½	.06	½ ×1⅞	.08	½ ×2⅛	....	.....	.08	½ ×2⅛	....	.....	.08	½ ×2½
¾	.07	¾ ×2¼	.08	¾ ×2⅝	....	.....	.08	¾ ×2⅝	....	.....	.09	11/16×2¾
1	.08	1 ×2⅝	.09	1 ×2⅞	....	.....	.09	1 ×2⅞	....	.....	.11	⅞ ×3⅛
1¼	.09	1¼×3	.11	1¼×3¼	....	.....	.11	1¼×3¼	....	.....	.13	1⅛×3½
1½	.12	1½×3⅜	.14	1½×3¾	....	.....	.14	1½×3¾	....	.....	.15	1⅜×3⅞
2	.14	2 ×4⅛	.15	2 ×4⅜	....	.....	.15	2 ×4⅜	....	.....	.27	1⅞×5⅝
2½	.17	2½×4⅞	.19	2½×5⅛	....	.....	.19	2½×5⅛	....	.....	.36	2¼×6½
3	.20	3 ×5⅜	.26	3 ×5⅞	....	.....	.26	3 ×5⅞	.36	2⅞×6⅝	.40	2¾×6⅞
3½	.29	3½×6⅜	.30	3½×6½	....	.....	.29	3½×6⅜	....	.....	....	.....
4	.31	4 ×6⅞	.36	4 ×7⅛	.34	4 ×7	.44	4 ×7⅝	.54	3⅞×8⅛	.58	3⅝×8¼
5	.36	5 ×7¾	.47	5 ×8½	.45	5 ×8⅜	.66	5 ×9½	.72	4¾×9¾	.81	4⅜×10
6	.41	6 ×8¾	.61	6 ×9⅞	.59	6 ×9¾	.69	6 ×10½	1.00	5¾×11⅜	1.00	5⅜×11⅞
8	.56	8 ×11	.81	8 ×12⅛	.78	8 ×12	1.00	7⅞×12⅝	1.40	7½×14⅛	1.40	7 ×13⅞
10	.75	10 ×13⅜	1.05	10 ×14¼	1.00	10 ×14⅛	1.65	9¾×15¾	2.10	9⅜×17⅛	2.15	8¾×17⅛
12	1.15	12 ×16⅛	1.25	12 ×16⅝	1.25	12 ×16½	2.00	11¾×18	2.60	11⅛×19⅝	3.05	10⅜×20½
14	1.35	13¼×17¾	2.10	13¼×19⅛	2.05	13⅛×19	2.25	12⅞×19⅜	2.70	12¼×20½	3.80	11⅜×22¾
16	1.75	15¼×20¼	2.30	15¼×21¼	2.35	15 ×21⅛	2.90	14¾×22¼	3.30	14 ×22⅝	....	.....
18	1.55	17¼×21⅝	2.60	17 ×23½	2.55	17 ×23⅜	3.20	16½×24⅛	3.75	15¾×25⅛	....	.....
20	1.80	19¼×23⅞	3.05	19 ×25¾	3.05	18⅞×25½	3.80	18¼×26⅞	4.40	17½×27½	....	.....
24	2.95	23¼×28¼	3.95	23 ×30½	4.00	22⅝×30¼	4.75	22 ×31⅛	6.40	21 ×33	....	.....

Large Male and Female Gaskets—1/16-Inch Thick Cranite

Size of Joint Inches	300-Pound List Price Each	300-Pound I.D. × O.D. Inches	400-Pound List Price Each	400-Pound I.D. × O.D. Inches	600-Pound List Price Each	600-Pound I.D. × O.D. Inches	900-Pound List Price Each	900-Pound I.D. × O.D. Inches	1500-Pound List Price Each	1500-Pound I.D. × O.D. Inches
½	.04	½ ×1⅞	....	.....	.04	½×1⅜	....	.....	.04	½ ×1⅜
¾	.05	¾ ×111/16	....	.....	.05	¾ ×111/16	....	.....	.05	11/16×111/16
1	.05	1 ×2	....	.....	.05	1 ×2	....	.....	.06	⅞ ×2
1¼	.06	1¼×2½	....	.....	.06	1¼×2½	....	.....	.07	1⅛×2½
1½	.07	1½×2⅞	....	.....	.07	1½×2⅞	.....	.....	.08	1⅜×2⅞
2	.11	2 ×3⅝	....	.....	.11	2 ×3⅝	....	.....	.12	1⅞×3⅝
2½	.12	2½×4⅛	....	.....	.12	2½×4⅛	....	.....	.13	2¼×4⅛
3	.15	3 ×5	....	.....	.15	3 ×5	.15	2⅞×5	.16	2¾×5
3½	.16	3½×5½	....	.....	.16	3½×5½	....	.....	....	.....
4	.24	4 ×6 3/16	.24	4 ×6 3/16	.24	4 ×6 3/16	.25	3⅞×6 3/16	.27	3⅝×6 3/16
5	.29	5 ×7 5/16	.29	5 ×7 5/16	.29	5 ×7 5/16	.31	4¾×7 5/16	.36	4⅜×7 5/16
6	.36	6 ×8½	.36	6 ×8½	.36	6 ×8½	.39	5¾×8½	.44	5⅜×8½
8	.47	8 ×10⅝	.47	8 ×10⅝	.50	7⅞×10⅝	.56	7½×10⅝	.63	7 ×10⅝
10	.61	10 ×12¾	.61	10 ×12¾	.66	9¾×12¾	.72	9⅜×12¾	.88	8¾×12¾
12	.81	12 ×15	.81	12 ×15	.88	11¾×15	1.00	11⅛×15	1.15	10⅜×15
14	.88	13¼×16¼	.91	13⅛×16¼	.97	12⅞×16¼	1.15	12¼×16¼	1.25	11⅜×16¼
16	1.05	15¼×18½	1.15	15 ×18½	1.20	14¾×18½	1.40	14 ×18½	....	.....
18	1.35	17 ×21	1.35	17 ×21	1.55	16½×21	1.95	15¾×21	....	.....
20	1.45	19 ×23	1.50	18⅞×23	1.80	18¼×23	2.20	17½×23	....	.....
24	2.35	23 ×27¼	2.50	22⅝×27¼	2.85	22 ×27¼	3.20	21 ×27¼	....	.....

Sheet packings ..... *page 473* *Large tongue and groove gaskets* ..... *page 476*

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Gaskets for All Large Tongue and Groove Flanged Joints

Cranite Gaskets are not recommended for temperatures higher than 750° F. They are satisfactory for use in oil lines where asbestos gaskets are permitted. Corrugated Metallic Gaskets (Copper or Soft Iron) are available; prices on application.

Coating Cranite Gaskets with Crane Thread Lubricant and Corrugated Metallic Gaskets with Crane High Temperature Thread Compound, before installing, will facilitate making tight joints.

Cranite Gaskets are not recommended for use in small male and female or small tongue and groove joints. Cranite offers uniform and high resistance to compression but the gasket contact area in such joints is so narrow, crushing the gasket is possible.

List Prices and Dimensions of Gaskets

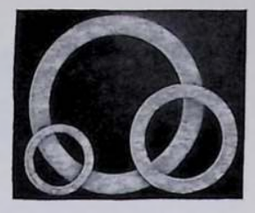
For 800-Pound Hydraulic and 800-Pound W.O.G. Cast Iron, and 300, 400, 600, 900, and 1500-Pound Steel Large Tongue and Groove Flanged Joints

Size of Joint	1/16-inch Cranite		Size of Joint	1/16-inch Cranite	
	List Price	Inside and Outside Diameters		List Price	Inside and Outside Diameters
Inches	Each	Inches	Inches	Each	Inches
1/2	.03	1 ×1 3/8	5	.13	6 5/16×7 5/16
3/4	.03	1 5/16×1 11/16	6	.16	7 1/2 ×8 1/2
1	.03	1 1/2 ×2	8	.25	9 3/8 ×10 5/8
1 1/4	.04	1 7/8 ×2 1/2	10	.36	11 1/4 ×12 3/4
1 1/2	.04	2 1/8 ×2 7/8	12	.42	13 1/2 ×15
2	.05	2 7/8 ×3 5/8	14	.46	14 3/4 ×16 1/4
2 1/2	.06	3 3/8 ×4 1/8	16	.61	16 3/4 ×18 1/2
3	.09	4 1/4 ×5	18	.69	19 1/4 ×21
3 1/2	.10	4 3/4 ×5 1/2	20	.88	21 ×23
4	.12	5 3/16×6 3/16	24	1.05	25 1/4 ×27 1/4

Thread lubricant and compound....page 464
Sheet packings.....page 473

Ring Gaskets For Unions or Union Fittings

When ordering ring gaskets, specify the gasket material and the size and kind of union or union fitting.



For ring gaskets for Tongue and Groove Flange Unions, see page 416.

List Prices and Dimensions of Ring Gaskets

Size of Union or Union Fitting	For 150-Pound Malleable Iron Screwed Unions and Union Fittings *Circulating Boiler Fittings			For 125-Pound Cast Iron Flange Unions	
	Rubber	Cranite	Inside and Outside Diameters	1/16-inch Cloth Inserted Rubber	Inside and Outside Diameters
Inches	Price per 100	Price per 100	Inches	Price Each	Inches
1/4	.56	1.00	1/2 ×29/32	....	....
3/8	.89	1.25	5/8 ×1 3/32	....	....
1/2	1.05	1.50	3/4 ×1 1/4	.11	13/16 ×1 3/8
3/4	1.30	1.80	31/32 ×1 17/32	.12	1 1/16 ×1 7/8
1	1.60	2.25	1 7/32 ×1 13/16	.13	1 5/16 ×2 1/8
1 1/4	1.95	2.70	1 9/16 ×2 5/32	.13	1 11/16×2 5/8
1 1/2	2.40	3.35	1 13/16×2 7/16	.14	1 15/16×2 7/8
2	3.20	4.50	2 5/16 ×3 3/32	.14	2 3/8 ×3 1/2
2 1/2	4.20	5.90	2 3/4 ×3 9/16	.15	2 7/8 ×3 7/8
3	5.40	7.60	3 3/8 ×4 1/4	.17	3 1/2 ×4 5/8
3 1/2	....	....	....	.19	4 ×5 1/4
4	....	....	....	.20	4 1/2 ×5 3/4
5	....	....	....	.30	5 9/16 ×7
6	....	....	....	.35	6 5/8 ×8 1/4
8	....	....	....	.85	8 5/8 ×10 1/2

*Circulating Boiler Fittings (No. 586 and No. 589) use the gaskets shown for the 3/4-inch size.

Galvanized Steel Flanged Fittings and Flanges

Extra List Prices for Galvanizing

Size	150-Pound Cast Steel Fittings and Forged Steel Flanges						300-Pound Cast Steel Fittings and Forged Steel Flanges					
	Elbows	Elbows	Crosses	Flanges			Elbows	Elbows	Crosses	Flanges		
	No. 525 D No. 527 D No. 545 D	No. 550 D No. 551 D	No. 537 D No. 539 D	No. 556 Screwed	No. 554½ No. 556½ No. 558½ No. 568		No. 401 D No. 403 D No. 421 D	No. 425½ D No. 427 D	No. 413 D No. 415 D	No. 291 E Screwed	No. 290 E No. 292 E No. 296 E No. 297 E	
	Reducers No. 547 D No. 548 D	Tees No. 531 D No. 534 D	Laterals No. 541 D No. 543 D	No. 554 Slip-On Welding			Reducers No. 423 D No. 423½ D	Tees No. 407 D No. 412 D	Laterals No. 417 D No. 419 D	No. 294 E Slip-On Welding		
Inches	Extra Each	Extra Each	Extra Each	Extra Each	O.D. In.	Extra Each	Extra Each	Extra Each	Extra Each	Extra Each	O.D. In.	Extra Each
1	3.50	5.20	7.00	.90	4 1/4	1.30	4.40	6.50	8.70	1.20	4 7/8	1.80
1 1/4	3.50	5.20	7.00	.90	4 5/8	1.30	4.40	6.50	8.70	1.20	5 1/4	1.80
1 1/2	3.50	5.20	7.00	.90	5	1.30	4.40	6.50	8.70	1.20	6 1/8	1.80
2	3.50	5.20	7.00	1.00	6	1.50	4.40	6.50	8.70	1.50	6 1/2	2.20
2 1/2	3.60	5.40	7.30	1.10	7	1.60	4.50	6.70	9.00	1.50	7 1/2	2.30
3	4.00	6.00	8.00	1.30	7 1/2	1.80	5.00	7.60	10.00	1.70	8 1/4	2.50
3 1/2	4.70	7.00	9.40	1.50	8 1/2	2.20	6.00	9.00	12.00	2.00	9	3.00
4	5.30	8.00	10.50	1.80	9	2.60	6.50	10.00	13.00	2.40	10	3.60
5	7.00	10.50	14.00	2.00	10	2.90	8.70	13.00	17.50	2.80	11	4.00
6	8.70	13.00	17.50	2.40	11	3.60	11.00	16.50	22.00	3.30	12 1/2	5.00
8	13.00	19.50	26.00	3.60	13 1/2	5.40	16.50	24.50	32.50	5.00	15	7.60
10	21.00	32.00	42.00	5.40	16	8.30	26.00	39.00	52.00	7.60	17 1/2	11.50
12	30.50	45.00	61.00	7.30	19	11.00	37.50	56.50	75.50	10.00	20 1/2	15.00
14	43.50	65.50	87.00	10.00	21	15.00	54.50	81.00	109.00	14.50	23	22.00
16	58.00	87.00	116.00	15.00	23 1/2	23.00	72.50	109.00	145.00	22.00	25 1/2	32.50

Cast Steel Flanged Fittings....pages 267 to 274 *Forged Steel Flanges....pages 291 to 298*

Pipe, Pipe Data, and Thread Information

Tubular Products—Wrought Steel and Wrought Iron
General Notes, Pipe Trade Practice....page 478
Lengths Normally Carried in Stock....page 478

Pipe
Standard Pipe....page 479
Extra Strong Pipe....page 480
Double Extra Strong Pipe....page 481
Reamed and Drifted Pipe....page 481
API Standard Threaded Line Pipe....page 482
Large O.D. Pipe....page 483
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Tubes and Casings
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Pipe Standard and Data
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Commercial Wrought Steel Pipe Data....pages 490 and 491
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Thread Information
American Standard Taper Pipe Threads....page 492
American Standard Straight Pipe Threads....page 493
British Standard Taper Pipe Threads....page 494
Normal Thread Engagement Between Pipe Threads....page 494
Discussion of Threaded Pipe Joints....page 495

Pages 478 to 496 constitute the section devoted to Pipe, Pipe Data, and Thread Information. In addition, this catalog contains useful engineering data on pipe and lists of sizes and weights of copper tubing; see the pages referred to below:

Calculating Working Pressure, Stress, or Wall Thickness of Pipe....pages 543 to 545
Thermal Expansion and Modulus of Elasticity of Pipe....page 549
Deflection of Horizontal Pipe Lines....page 551
Calculation of Pipe Bends....pages 546 and 547
Length of Pipe in Bends....page 548
Expansion in Pipe Lines....page 349
Expansion of Copper Tubing....page 425
Types K, L, and M Copper Tube for Solder-Joints....page 428

Threads for Railing Fittings....page 192 *Fabricated Piping....pages 497 to 522*

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Wrought Steel and Genuine Wrought Iron
Tubular Products

Butt-Welded, Lap-Welded, and Seamless Pipe
Casing, Boiler Tubes, and Tubing

General Notes

Pipe Trade Practice

All weights for steel are figured on the basis of one cubic inch of steel weighing .2833 pound. All weights for wrought iron pipe are figured on the basis of one cubic inch of iron weighing .2777 pound.

All material will be cut to length when so ordered, with extreme variation not exceeding one-eighth of an inch over or under, unless otherwise arranged.

All threads, unless otherwise indicated, are in accordance with American (Briggs') Standard.

The outside diameter of any size of pipe is the same for all weights. Variations in weight and wall thickness affect only the inside diameter.

Pipe 12-inch and smaller is known by its nominal inside diameter; pipe 14-inch and larger is known by its outside diameter. Boiler Tubes and Tubing are known by their outside diameters.

When ordering pipe 12-inch and smaller, designate the weight desired—that is, Standard, Extra Strong, or Double Extra Strong. When ordering pipe having an outside diameter of 14-inch or larger, designate the wall thickness desired.

On orders calling for commercial sizes of pipe which are finished with threads and couplings, in sizes ⅛-inch to 12-inch, inclusive, and where orders specify quantity in lineal feet, it is understood that random lengths fitted with threads both ends and coupling one end will be shipped; and the measurement is charged from end to end; that is, over-all including the coupling.

If cut lengths of any sizes are ordered, instructions must appear on the face of the order whether plain ends, beveled ends, threads only, or threads and couplings are required. The pipe is then cut to the length specified for plain end and threads only, but if cut lengths with threads and couplings are specified the practice is the same with the exception that the couplings are charged separately, whether they are shipped loose or screwed on the pipe.

All data given on the following pages, 479 to 483, inclusive, apply to Wrought Steel Tubular Products. Because of difference in basic weight of steel and wrought iron, inside diameter and thickness dimensions of genuine wrought iron pipe will vary slightly from steel dimensions; that is, smaller inside diameters with correspondingly heavier wall thicknesses. Weights per foot are the same as weights shown for steel pipe.

Pipe Normally Carried in Stock

A distinguishing feature of Crane policy has always been to maintain widely distributed and adequate stocks of all staple lines for the convenience of customers. These include not only valves, fittings, flanges, and accessories, but also large stocks of the various classes of pipe.

Stocks of pipe are carried by each Crane branch in sufficient sizes, classes, and quantities to meet all normal local requirements. Prompt shipment can be made of random lengths or of cut pipe, plain end or threaded. Butt-welded pipe in sizes ⅛ to 3-inch inclusive, both Standard and Extra Strong weights, is normally stocked in 21-foot uniform lengths.

At the Chicago Works, in addition to large stocks of regular pipe, double random lengths of seamless pipe are regularly carried in stock. Averaging 38 feet to 43 feet in length, depending on the size, they are stocked in sizes 4-inch to 24-inch inclusive, both in Standard and Extra Strong weights.

In addition to regular pipe sizes, many wall thicknesses corresponding to ASA Schedule Numbers are stocked. This diversity of sizes, together with the many sizes and grades of seamless alloy pipe and tubing regularly stocked, make it possible for Crane to give prompt service on all pipe requirements.

Standard Pipe

Black and Galvanized

Dimensions, Weights, and Test Pressures

Nominal Size	List Prices	Diameters		Wall Thickness	Nominal Weight Pounds per Foot		Number of Threads per Inch	Test Pressure Pounds per Square Inch		
		Outside	Inside		Plain End	Threads and Couplings		Butt-Weld	Grade A Seamless	Grade B Seamless
Inches	Per Foot Base	Inches	Inches	Inches						
⅛	.05½	.405	.269	.068	.24	.24	27	700		
¼	.06	.540	.364	.088	.42	.42	18	700		
⅜	.06	.675	.493	.091	.57	.57	18	700		
½	.08½	.840	.622	.109	.85	.85	14	700		
¾	.11½	1.050	.824	.113	1.13	1.13	14	700		
1	.17	1.315	1.049	.133	1.68	1.68	11½	700		
1¼	.23	1.660	1.380	.140	2.27	2.28	11½	800		
1½	.27½	1.900	1.610	.145	2.72	2.73	11½	800		
2	.37	2.375	2.067	.154	3.65	3.68	11½	800	1000	1100
2½	.58½	2.875	2.469	.203	5.79	5.82	8	800	1000	1100
3	.76½	3.500	3.068	.216	7.58	7.62	8	800	1000	1100
3½	.92	4.000	3.548	.226	9.11	9.20	8		1200	1300
4	1.09	4.500	4.026	.237	10.79	10.89	8		1200	1300
5	1.48	5.563	5.047	.258	14.62	14.81	8		1200	1300
6	1.92	6.625	6.065	.280	18.97	19.18	8		1200	1300
†8	2.50	8.625	8.071	.277	24.70		8		1200	1300
	2.88		7.981	.322	28.55				1200	1300
†10	3.20	10.750	10.192	.279	31.20		8		1000	1200
	3.50		10.136	.307	34.24				1000	1200
	4.12		10.020	.365	40.48				1000	1200
†12	4.50	12.750	12.090	.330	43.77		8		1000	1200
	5.07		12.000	.375	49.56				1000	1200

Standard Steel Pipe with threads and couplings in sizes larger than 6-inch is designated as Line Pipe; see page 482.

List prices: List prices shown for ⅛ to 6-inch sizes apply to plain end, threaded only, or threaded and coupled pipe.

List prices shown for 8, 10, and 12-inch sizes apply to plain end or threaded only pipe; for prices of threaded and coupled pipe in sizes 8 to 12-inch, see page 482.

Unless otherwise ordered: Unless otherwise ordered, Standard Pipe is furnished with threads and couplings and in random lengths.

On sizes 3-inch and smaller, butt-weld pipe will be furnished unless otherwise specified.

Cut lengths: For cut lengths, an extra charge will be made above random lengths.

Galvanized: For galvanized pipe, an extra charge will be made above Black.

Threads: The taper of threads is ¾-inch per foot, measured on the diameter for all sizes.

Weights: The permissible variation in weight is 5 per cent above and 5 per cent below. The weight per foot of pipe with threads and couplings is based on a length of 20 feet, including the coupling.

†8, 10, and 12-inch sizes: On sizes made in more than one weight, specify the weight desired.

General notes . . . page 478

Standard Bundling Schedule . . . page 480

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Extra Strong Pipe

Black and Galvanized

Dimensions, Weights, and Test Pressures

Nominal Size	List Prices	Diameters		Wall Thickness	Nominal Weight per Foot Plain End	Test Pressure Pounds per Square Inch		
		Outside	Inside			Butt-Weld	Grade A Seamless	Grade B Seamless
Inches	Per Foot Base	Inches	Inches	Inches	Pounds			
⅛	.12	.405	.215	.095	.31	850		
¼	.07½	.540	.302	.119	.54	850		
⅜	.07½	.675	.423	.126	.74	850		
½	.11	.840	.546	.147	1.09	850		
¾	.15	1.050	.742	.154	1.47	850		
1	.22	1.315	.957	.179	2.17	850		
1¼	.30	1.660	1.278	.191	3.00	1100		
1½	.36½	1.900	1.500	.200	3.63	1100		
2	.50½	2.375	1.939	.218	5.02	1100	1500	1600
2½	.77	2.875	2.323	.276	7.66	1100	1500	1600
3	1.03	3.500	2.900	.300	10.25	1100	1500	1600
3½	1.25	4.000	3.364	.318	12.51		1700	1800
4	1.50	4.500	3.826	.337	14.98		1700	1800
5	2.08	5.563	4.813	.375	20.78		1700	1800
6	2.86	6.625	5.761	.432	28.57		1700	1800
8	4.34	8.625	7.625	.500	43.39		1700	2400
10	5.48	10.750	9.750	.500	54.74		1600	1900
12	6.55	12.750	11.750	.500	65.42		1600	1900

Unless otherwise ordered: Unless otherwise ordered, Extra Strong Pipe is furnished with plain ends and in random lengths.

On sizes 3-inch and smaller, butt-weld pipe will be furnished unless otherwise specified.

Random lengths: Random lengths of Extra Strong Pipe are considered to be 12 feet to 22 feet, we to have the privilege, however, of supplying not exceeding 5 per cent of total order in lengths 6 feet to 12 feet.

Cut lengths: For cut lengths, an extra charge will be made above random lengths.

Threads, couplings: For pipe fitted with threads only or with threads and couplings, an extra charge will be made above plain ends.

Galvanized: For galvanized pipe, an extra charge will be made above Black.

Weights: The permissible variation in weight is 5 per cent above and 5 per cent below.

Standard Bundling Schedule

Based on 21-Foot Uniform Lengths

Number of Pieces, Number of Feet, and Weight of Pipe, per Bundle	Size	Standard Pipe			Extra Strong Pipe		
		Number of Pieces	Average per Bundle		Number of Pieces	Average per Bundle	
			Number of Feet	Weight		Number of Feet	Weight
	Inches	Per Bundle		Pounds	Per Bundle		Pounds
	⅛	30	630	151	30	630	195
	¼	24	504	212	24	504	272
	⅜	18	378	215	18	378	280
	½	12	252	214	12	252	275
	¾	7	147	166	7	147	216
	1	5	105	176	5	105	228
	1¼	3	63	144	3	63	189
	1½	3	63	172	3	63	229

Order sizes ⅛ to 1½-inch by the bundle. Order sizes 2 to 3-inch by lengths, using 21 feet as average length, and larger sizes by lengths, using 20 feet as average length.

General notes . . . page 478

Double Extra Strong Pipe

Black and Galvanized

Dimensions, Weights, and Test Pressures

Nominal Size	List Prices	Diameters		Wall Thickness	Nominal Weight per Foot Plain End	Test Pressure Pounds per Square Inch	
		Outside	Inside			Grade A Seamless	Grade B Seamless
Inches	Per Foot Base	Inches	Inches	Inches	Pounds		
½	*	.840	.252	.294	1.714	1000	1000
¾	*	1.050	.434	.308	2.441	1000	1000
1	*	1.315	.599	.358	3.659	1000	1000
1¼	*	1.660	.896	.382	5.214	1000	1000
1½	*	1.900	1.100	.400	6.408	1000	1000
2	.91	2.375	1.503	.436	9.03	1800	1900
2½	1.37	2.875	1.771	.552	13.70	1800	1900
3	1.86	3.500	2.300	.600	18.58	1800	1900
4	2.76	4.500	3.152	.674	27.54	2000	2100
5	3.86	5.563	4.063	.750	38.55	2000	2100
6	5.32	6.625	4.897	.864	53.16	2000	2100
8	7.25	8.625	6.875	.875	72.42	2800	2800

*Sizes ½ to 1½-inch are available only as seamless pressure tubing; prices on application.

Unless otherwise ordered: Unless otherwise ordered, Double Extra Strong Pipe is furnished with plain ends and in random lengths.

Random lengths: Random lengths of Double Extra Strong Pipe are considered to be 12 feet to 22 feet, we to have the privilege, however, of supplying not exceeding 5 per cent of total order in lengths 6 feet to 12 feet.

Cut lengths: For cut lengths, an extra charge will be made above the price listed for random lengths.

Threads, couplings: For pipe fitted with threads only or with threads and couplings, an extra charge will be made above plain ends.

Galvanized: For galvanized pipe, an extra charge will be made above Black.

Weights: The permissible variation in weight is 10 per cent above and 10 per cent below.

Reamed and Drifted Pipe

Dimensions, Weights, and Test Pressures

Nominal Size	List Prices	Diameters		Wall Thickness	Nominal Weight Pounds per Foot		Number of Threads per Inch	Test Pressure Pounds per Square Inch	
		Outside	Inside		Plain End	Threads and Couplings		Butt-Weld	Grade A Seamless
Inches	Per Foot Base	Inches	Inches	Inches					
1	.17	1.315	1.049	.133	1.68	1.70	11½	700	
1¼	.23	1.660	1.380	.140	2.27	2.30	11½	800	
1½	.27½	1.900	1.610	.145	2.72	2.75	11½	800	
†2	.37	2.375	2.067	.154	3.65	3.75	11½	800	1000
	.40		2.041	.167	3.94	4.00			1000
2½	.58½	2.875	2.469	.203	5.79	5.90	8	800	1000
3	.76½	3.500	3.068	.216	7.58	7.70	8	800	1000
3½	.92	4.000	3.548	.226	9.11	9.25	8		1200
4	1.09	4.500	4.026	.237	10.79	11.00	8		1200
5	1.48	5.563	5.047	.258	14.62	15.00	8		1200
6	1.92	6.625	6.065	.280	18.97	19.45	8		1200
8	2.88	8.625	7.981	.322	28.55	29.35	8		1200
10	4.12	10.750	10.020	.365	40.48	41.85	8		1000
12	5.07	12.750	12.000	.375	49.56	51.15	8		1000

Unless otherwise ordered: Unless otherwise ordered, Reamed and Drifted Pipe is furnished with threads and couplings and in random lengths, 16 feet to 22 feet.

Threads: The taper of threads is ¾-inch per foot, measured on the diameter for all sizes.

Weights: The permissible variation in weight is 5 per cent above and 5 per cent below.

The weight per foot of pipe with threads and couplings is based on a length of 20 feet, including the coupling, but shipping lengths of small sizes will usually average less than 20 feet.

†2-inch size: The 2-inch size is made in two weights; weight desired must be specified.

General notes . . . page 478

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API Standard Threaded Line Pipe

Dimensions, Weights, and Test Pressures

Nominal Size Inches	List Prices Per Foot Base	Diameters Outside Inches	Diameters Inside Inches	Wall Thickness Inches	Nominal Weight Pounds per Foot Plain End	Nominal Weight Pounds per Foot Threads and Couplings	Number of Threads per Inch	Test Pressure Pounds per Square Inch Butt-Weld	Test Pressure Pounds per Square Inch Grade A Seamless	Test Pressure Pounds per Square Inch Grade B Seamless
1/8	.06	.405	.269	.068	.24	.25	27	700	1000	1000
1/4	.06½	.540	.364	.088	.42	.43	18	700	1000	1000
3/8	.06½	.675	.493	.091	.57	.57	18	700	1000	1000
1/2	.09	.840	.622	.109	.85	.86	14	700	1000	1000
3/4	.12	1.050	.824	.113	1.13	1.14	14	700	1000	1000
1	.17½	1.315	1.049	.133	1.68	1.70	11½	700	1000	1000
1¼	.23½	1.660	1.380	.140	2.27	2.30	11½	800	2500	2500
1½	.28	1.900	1.610	.145	2.72	2.75	11½	800	2300	2500
2	.37½	2.375	2.067	.154	3.65	3.75	11½	800	1000	1100
2½	.59	2.875	2.469	.203	5.79	5.90	8	800	1000	1100
3	.77	3.500	3.068	.216	7.58	7.70	8	800	1000	1100
3½	.93	4.000	3.548	.226	9.11	9.25	8		1200	1300
4	1.10	4.500	4.026	.237	10.79	11.00	8		1200	1300
5	1.50	5.563	5.047	.258	14.62	15.00	8		1200	1300
6	1.94	6.625	6.065	.280	18.97	19.45	8		1200	1300
†8	2.54	8.625	8.071	.277	24.70	25.55	8		1200	1300
	2.92		7.981	.322	28.55	29.35			1200	1300
†10	3.25	10.750	10.192	.279	31.20	32.75	8		1000	1200
	3.55		10.136	.307	34.24	35.75			1000	1200
	4.17		10.020	.365	40.48	41.85			1000	1200
†12	4.55	12.750	12.090	.330	43.77	45.45	8		1000	1200
	5.12		12.000	.375	49.56	51.15			1000	1200

Unless otherwise ordered: Unless otherwise ordered, API Line Pipe is furnished with threads and couplings and in random lengths.

Cut lengths: For cut lengths, an extra charge will be made above random lengths.

Galvanized: For galvanized pipe, an extra charge will be made above Black.

Threads: The taper of threads is ¾-inch per foot, measured on the diameter for all sizes.

Weights: The permissible variation in weight for any length of pipe is 10 per cent above and 3½ per cent below, but the carload weight shall not be more than 1¾ per cent under the calculated weight.

The weight per foot of pipe with threads and couplings is based on a length of 20 feet, including the coupling.

†8, 10, and 12-inch sizes: On sizes made in more than one weight, weight desired must be specified.

Boiler Tubes

Dimensions and Manufacturing Weights

Outside Diameter Inches	Wall Thickness, Minimum B.W.G.	Wall Thickness, Minimum Inches	Manufacturing Weights Pounds per Foot	Outside Diameter Inches	Wall Thickness, Minimum B.W.G.	Wall Thickness, Minimum Inches	Manufacturing Weights Pounds per Foot
1	13	.095	1.037	3¼	11	.120	4.555
1¼	13	.095	1.328	3½	11	.120	4.921
1½	13	.095	1.619		10	.134	5.469
1¾	13	.095	1.910		9	.148	6.012
2	13	.095	2.201	4	10	.134	6.286
	11	.120	2.726		9	.148	6.915
2¼	13	.095	2.492	4½	10	.134	7.103
2½	12	.109	3.171		9	.148	7.817
2¾	12	.109	3.504	5	9	.148	8.720
3	12	.109	3.838	6	7	.180	12.750
	10	.134	4.652	*Prices on application*			

Under the permissible variations allowed in the A.S.T.M. Standard Specification A-83 and the A.S.M.E. Boiler Code, the tubing furnished on an order cannot be lighter in weight than that of the gauge thickness specified.

Since manufacturing to exact specifications is impossible, the variations are represented by heavier wall thicknesses and overweight. Prices are based on manufacturing weights.

Dimensions and weights for boiler tube sizes not listed will be furnished on application.

General notes . . . page 478

Large O.D. Plain End Pipe

Dimensions, Weights, and Test Pressures

Outside Diameter Inches	Wall Thickness Inches	List Prices Per Foot Base	Nominal Weight Plain End Pounds per Foot	Test Pressure Pounds per Square Inch Grade A Seamless	Test Pressure Pounds per Square Inch Grade B Seamless
14	1/4	3.67	36.71	650	750
	5/16	4.56	45.68	800	950
	3/8	5.45	54.57	950	1100
	7/16	6.33	63.37	1100	1300
	1/2	7.20	72.09	1300	1500
16	1/4	4.20	42.05	550	650
	5/16	5.23	52.36	700	800
	3/8	6.25	62.58	850	1000
	7/16	7.27	72.72	1000	1100
	1/2	8.27	82.77	1100	1300
18	1/4	4.73	47.39	500	600
	5/16	5.90	59.03	600	750
	3/8	7.05	70.59	750	900
	7/16	8.20	82.06	900	1000
	1/2	9.34	93.45	1000	1200
20	1/4	5.27	52.73	450	500
	5/16	6.57	65.71	550	650
	3/8	7.86	78.60	700	800
	7/16	9.14	91.41	800	900
	1/2	10.41	104.13	900	1000
24	5/16	7.90	79.06	450	550
	3/8	9.46	94.62	550	650
	7/16	11.01	110.10	650	750
	1/2	12.54	125.49	750	850
26	5/16	Prices on request	85.73	450	500
	3/8		102.63	500	600
	7/16		119.44	600	700
	1/2		136.17	700	800

Prices and data on larger sizes or heavier walls will be furnished on application.

Unless otherwise ordered: Unless otherwise ordered, Large O.D. Pipe is furnished with plain ends and in random lengths.

Cut lengths: For cut lengths, an extra charge will be made above random lengths.

Weights: The permissible variation in weight is 10 per cent above and 10 per cent below.

Water Well Casing

Dimensions, Weights, and Test Pressures

Outside Diameter Inches	List Prices Per Foot Base	Diameter Outside Inches	Diameter Inside Inches	Wall Thickness Inches	Nominal Weight Pounds per Foot Plain End	Nominal Weight Pounds per Foot Threads and Couplings	Number of Threads per Inch	Test Pressure Pounds per Square Inch Grade A Seamless
3½	.46	3.500	3.250	.125	4.51	4.60	14	1100
4	.56½	4.000	3.732	.134	5.53	5.65	14	1000
4½	.68½	4.500	4.216	.142	6.61	6.75	14	950
5½	.90	5.500	5.192	.154	8.79	9.00	14	850
6	1.05	6.000	5.672	.164	10.22	10.50	14	850
6⅝	1.30	6.625	6.255	.185	12.72	13.00	11½	850
8⅝	1.75	8.625	8.249	.188	16.94	17.50	11½	650

Unless otherwise ordered: Unless otherwise ordered, Water Well Casing is furnished with threads and couplings, and in random lengths.

Cut lengths: For cut lengths, an extra charge will be made above random lengths.

Galvanized: For galvanized casing, an extra charge will be made above Black.

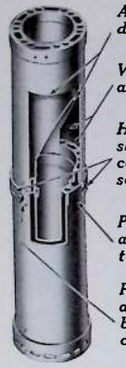
Threads: The taper of threads is ⅜-inch per foot, measured on the diameter for all sizes. The thickness of walls makes it impracticable to cut threads of coarser pitch than shown in the table.

Weights: The permissible variation in weight is 5 per cent above and 5 per cent below. The weight per foot of casing with threads and couplings is based on a length of 20 feet, including the coupling.

General notes . . . page 478

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Metalbestos Gas Vent



Two sections fitted together. Note the built-in air space between the double walls.



New double wall telescopic extension eliminates cutting, speeds installation, and provides a neat finish.

Safer Venting
Top Efficiency
Easier Installation
Underwriters' Approved

The pipe-within-a-pipe construction of the Metalbestos Gas Vent (illustrated at the left) provides quick-heating inner pipe for a strong draft and air-insulated outer pipe for maximum safety.

The use of Metalbestos units eliminates condensation and keeps the surrounding walls cool. It is fully approved by the Underwriters' Laboratories, Inc.

Low cost installation is assured through the use of exclusive type Metalbestos couplings. The couplings join pipe sections together quickly and easily without crimping, cementing, or banding. Special adjustable lengths and elbows permit exact installation without costly cutting and fitting.

Durably constructed Metalbestos is made entirely of aluminum and is highly resistant to corrosion. It will not crack, shatter, or break.



Adjustable 45° Elbow
Swivels to any angle from zero to 45 degrees. Allows for slight changes of direction and simplifies fitting of vent pipe into available space.



Coupling
Special die-formed couplings are permanently attached to each Metalbestos section. They insure perfect alignment of the vent pipe and form a completely gas-tight joint for both inner and outer pipes.

Metalbestos Wall Vent

Metalbestos Wall Vent employs a rectangular design with the same double wall construction found in round Metalbestos.

Specially designed for wall heater venting, this vent will fit inside a standard 2 by 4-inch wall. It is approved by the Underwriters' Laboratories, Inc., for use within ⅜-inch of combustible material.



Prices and additional information furnished on application.

Red Brass and Copper Pipe

Standard Pipe Sizes—Dimensions and Weights

Nominal Size (Iron Pipe Size)	Regular				
	Diameters		Wall Thickness	Weight, Pounds Per Linear Foot	
	Outside	Inside		Red Brass	Copper
Inches	Inches	Inches	Inches		
⅛	.405	.281	.062	.253	.259
¼	.540	.375	.082	.447	.457
⅜	.675	.494	.090	.627	.641
½	.840	.625	.107	.934	.955
¾	1.050	.822	.114	1.27	1.30
1	1.315	1.062	.126	1.78	1.82
1¼	1.660	1.368	.146	2.63	2.69
1½	1.900	1.600	.150	3.13	3.20
2	2.375	2.062	.156	4.12	4.22
2½	2.875	2.500	.187	5.99	6.12
3	3.500	3.062	.219	8.56	8.75
3½	4.000	3.500	.250	11.2	11.4
4	4.500	4.000	.250	12.7	12.9
5	5.563	5.063	.250	15.8	16.2
6	6.625	6.125	.250	19.0	19.4
8	8.625	8.000	.312	30.9	31.6
10	10.750	10.019	.365	45.2	46.2
12	12.750	12.000	.375	55.3	56.5

Ordering: Unless otherwise ordered, red brass or copper pipe is furnished with plain ends.

When brass pipe is ordered, regular weight red brass pipe will be furnished unless another type is specified.

Lengths: Commercial length regularly available is 12 feet.

Weights: Actual weights of red brass and copper pipe will vary slightly from the theoretical weights shown in the accompanying table.

Gauge tubing: Seamless brass or copper tubing in nominal or outside diameters, sizes ⅛ to 10-inch, can be supplied in any gauge. Prices are furnished on application.

Extra strong pipe: Red brass and copper pipe, made to the extra strong thicknesses and regular outside diameter up to 10-inch nominal pipe size can be furnished on special order, when so specified. Complete information will be furnished on application.

For Types K, L, and M Copper Tube for Solder-Joint Valves and Fittings, see page 428.

Prices on application

Ric-wil Insulated Piping Systems

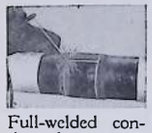
For Steam, Hot Water, Oil, or Refrigerated Process Liquids

Pre-Fabricated Piping



Hel-Cor Insulated Pipe Units

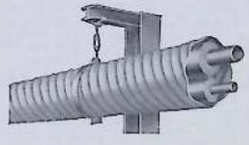
For underground lines. Single or multiple pipe combinations, insulated as required. Housing for pipe and insulation is 16-gauge spirally-corrugated ingot iron conduit, hot-dip zinc galvanized. Outside is coated with asphalt and wrapped with asbestos felt; inside is coated with phenolic resin, baked-on. 21-foot length with required accessories and joint materials is standard.



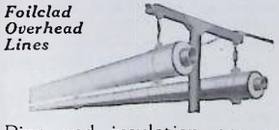
Full-welded conduit closure may be used for field joints. Air tested for tightness.



Type "B" Mechanical Coupler for tight joint without welding; rubber gaskets are used. Can be air tested.



Hel-Cor Overhead Lines employ the same basic system as above except the conduit is neither coated nor wrapped. Simple joint closure consists of a split metal connector band held tight with wedge clamps.



Foilclad Overhead Lines

Pipe and insulation are protected by a double coat of high temperature asphalt. A wrapping of asbestos felt and a final spiral wrapping of copper or aluminum foil provide added protection. 21-foot length is standard with accessories as required.



Cast Iron Insulated Pipe Units, for underground systems have a heavy, corrosion-resistant, cast iron protective housing. Standard units are 18½-feet long with all accessories furnished. Joint connections are shown below.



Mechanical Joint: Gland is drawn tight against a rubber gasket with cast iron bolts and nuts.

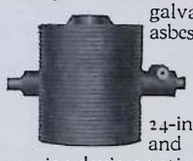


Solid Sleeve Joint: Like above except both ends of conduit are plain with separate connector sleeve.



Flanged Joint: The bolts draw the flanges up tight against the asbestos gasket.

Prefabricated Manholes are made to job requirements of 10-gauge corrugated Armco ingot iron, galvanized and asbestos bonded; outside is coated with asphalt.



24-inch manway and cover; expansion devices optional. Standard unit is 6 feet in diameter and height; other sizes available.

Utilidor-Type Conduit is used for all types of utility service (steam, return, trap discharge, hot water, fire or sewer lines, communication cable, electrical ducts, etc.).



Insulated as required, with walk or crawl through space. Made of Armco corrugated ingot iron, galvanized and asbestos-bonded; outside is asphalt coated. 21-foot length in 30 to 84-inch diameters is standard.

Sectional Conduits



Standard Tile Conduit

For ordinary ground loads. Salt-glazed vitrified tile conduit and base drain foundation in 2-foot lengths. Conduit is scored for splitting and resealing. Loc-lip joint provides a positive seal. Single or multiple pipe systems, with insulation as required.



Super-Tile Conduit

For use under highways and heavy ground loads. Similar to "Standard" except reinforced walls are double-thick. Base drain is extra heavy tile.



Cast Iron Conduit

For protection of insulated piping under or near railroad tracks. Heavy ribbed cast iron withstands vibration and load impacts. 4-foot sections with extra heavy tile base drain.



Universal Tile Conduit

For swamp areas or unstable ground conditions. Consists of a tile arch, trapezoidal blocks, and a continuous concrete foundation laid on the job. Internal drainage. Arch may be Standard Tile, Super-Tile, or Cast Iron.

Use durable, corrosion-resistant Ricwilite Phenolic Resin Coatings to prolong life of piping and equipment. Prices and additional data concerning coatings and other products shown above furnished on request.

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American Standard for Wrought-Steel and Wrought-Iron Pipe

ASA B36.10-1950

Introductory Notes

1 Scope. These standards shall be known as the "American Standard for Wrought-Steel and Wrought-Iron Pipe". The word *pipe* is used as distinguished from *tubing*, restricting the term *pipe* and therefore the scope of these standards, to apply to tubular products of dimensions and materials commonly used for pipe lines and connections.

2 Size. The size of all pipe in these standards is identified by the *nominal pipe size*. For 14 inches and larger, *nominal pipe size* corresponds with the outside diameter of the pipe.

3 Materials. The dimensional standards for pipe described herein are based on products such as are covered by the ASTM and API specifications outlined in Table 1.

4 Wall Thickness. The nominal wall thicknesses are given in Tables 2 and 4 for steel pipe, and in Table 6 for wrought-iron pipe.

5 Weights. The nominal weights of steel pipe are listed in Tables 3 and 5, and correspond with the respective wall thicknesses given in Tables 2 and 4. The nominal weights of wrought-iron pipe are listed in Table 7, and correspond with the respective wall thicknesses given in Table 6.

6 Permissible Variations. Unless otherwise provided by the specification, the actual wall thickness at any point shall not be more than 12.5 per cent under the nominal wall thickness shown in the tables. Permissible variations for other dimensions are indicated in each specification.

7 Screw Threads. Unless otherwise specified, the screw threads of threaded pipe shall conform to American Standard for Pipe Threads (taper threads) (ASA B2).

8 Schedule Wall Pipe. The schedule numbers under Tables 2 and 3 indicate for subjoined wall thickness, for the pressure/stress ratios designated, pipe of approximately uniform strength to resist internal pressure.

When the selection of wall thickness depends primarily upon capacity to resist internal pressure under given conditions, the designer shall compute the exact value of wall thickness suitable for conditions for which the pipe is required as prescribed in detail in the ASME Boiler Code, American Standard Code for Pressure Piping (ASA B31.1), etc., whichever governs the construction. A thickness will be selected from the schedules of nominal thickness contained herein to suit the value computed to fulfill the conditions for which the pipe is desired.

9 Standard Wall, Extra Strong Wall, and Double Extra Strong Wall Pipe. The wall thicknesses shown under Table 4 are those which have been traditional in commercial lists for *standard*, *extra strong*, and *double extra strong* pipe. Up to 10-inch, inclusive, standard wall and Schedule 40 pipe are the same dimensionally. The same is true of extra strong wall and Schedule 80 up to 8-inch inclusive. Double extra strong wall has no corresponding schedule number. Above these limiting sizes to and including 24-inch, wall thicknesses are uniformly ⅜-inch for standard wall and ½-inch for extra strong wall.

10 Wrought-Iron Pipe. The wall thicknesses for wrought-iron pipe shown in Table 6, and the weights per foot in Table 7 are those which have always been customary for this commodity. The weights in Table 7, being basically those for all wrought ferrous pipe, correspond with those for welded and seamless steel pipe in Table 5, but because of the difference in weight per cubic foot of the two materials the wall thicknesses for wrought-iron pipe in Table 6 are slightly greater than those for wrought-steel pipe in Table 4.

Table 1
Specifications for Pipe with ASA Designations and Titles of Standard Specifications

ASA Designation	ASTM or API Designation	Title
B36.1	ASTM A53	Welded and Seamless Steel Pipe
B36.2	ASTM A72	Welded Wrought-Iron Pipe
B36.3	ASTM A106	Seamless Carbon-Steel Pipe for High-Temperature Service
B36.4	ASTM A134	Electric-Fusion-Welded Steel Pipe, Sizes 30″ and Over
B36.5	ASTM A135	Electric-Resistance-Welded Steel Pipe
B36.9	ASTM A139	Electric-Fusion-Welded Steel Pipe, Sizes 4″ to but not including 30″
B36.11	ASTM A155	Electric-Fusion-Welded Steel Pipe for High-Temperature and High-Pressure Service
G8.7	ASTM A120	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses
—	API 5L	Line Pipe
—	API 5LX	High-Test Line Pipe
—	ASTM A158	Seamless Alloy-Steel Pipe for High-Temperature Service
—	ASTM A206	Seamless Carbon-Molybdenum Alloy-Steel Pipe for High-Temperature Service
B36.16	ASTM A211	Spiral-Welded Steel or Iron Pipe
—	ASTM A253	Welded Alloyed Open-Hearth Iron Pipe
—	ASTM A280	Seamless Chromium-Molybdenum Alloy-Steel Pipe for Service at High Temperatures
—	ASTM A312	Seamless Steel and Welded Austenitic Stainless Steel Pipe
—	ASTM A315	Seamless 1 Per Cent Chromium, 0.5 Per Cent Molybdenum Alloy-Steel Pipe for Service at High Temperatures

Table 2
Dimensions of Welded and Seamless Steel Pipe
(Listed by Schedule Numbers)

Nominal Pipe Size	Outside Diam.	Nominal Wall Thickness									
		Sched 10	Sched 20	Sched 30	Sched 40	Sched 60	Sched 80	Sched 100	Sched 120	Sched 140	Sched 160
⅛	0.405	.....	.....	.....	0.068	.....	0.095	.....	.....	.....	.....
¼	0.540	.....	.....	.....	0.088	.....	0.119	.....	.....	.....	.....
⅜	0.675	.....	.....	.....	0.091	.....	0.126	.....	.....	.....	.....
½	0.840	.....	.....	.....	0.109	.....	0.147	.....	.....	.....	0.187
¾	1.050	.....	.....	.....	0.113	.....	0.154	.....	.....	.....	0.218
1	1.315	.....	.....	.....	0.133	.....	0.179	.....	.....	.....	0.250
1¼	1.660	.....	.....	.....	0.140	.....	0.191	.....	.....	.....	0.250
1½	1.900	.....	.....	.....	0.145	.....	0.200	.....	.....	.....	0.281
2	2.375	.....	.....	.....	0.154	.....	0.218	.....	.....	.....	0.343
2½	2.875	.....	.....	.....	0.203	.....	0.276	.....	.....	.....	0.375
3	3.500	.....	.....	.....	0.216	.....	0.300	.....	.....	.....	0.438
3½	4.000	.....	.....	.....	0.226	.....	0.318	.....	.....	.....	.....
4	4.500	.....	.....	.....	0.237	.....	0.337	.....	0.438	.....	0.531
5	5.563	.....	.....	.....	0.258	.....	0.375	.....	0.500	.....	0.625
6	6.625	.....	.....	.....	0.280	.....	0.432	.....	0.562	.....	0.718
8	8.625	.....	0.250	0.277	0.322	0.406	0.500	0.593	0.718	0.812	0.906
10	10.750	.....	0.250	0.307	0.365	0.500	0.593	0.718	0.843	1.000	1.125
12	12.750	.....	0.250	0.330	0.406	0.562	0.687	0.843	1.000	1.125	1.312
14	14.000	0.250	0.312	0.375	0.438	0.593	0.750	0.937	1.093	1.250	1.406
16	16.000	0.250	0.312	0.375	0.500	0.656	0.843	1.031	1.218	1.438	1.593
18	18.000	0.250	0.312	0.438	0.562	0.750	0.937	1.156	1.375	1.562	1.781
20	20.000	0.250	0.375	0.500	0.593	0.812	1.031	1.281	1.500	1.750	1.968
24	24.000	0.250	0.375	0.562	0.687	0.968	1.218	1.531	1.812	2.062	2.343
30	30.000	0.312	0.500	0.625	.....	.....	.....	.....	.....	.....	.....

All dimensions are given in inches.

The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thicknesses, see appropriate material specifications.

Thicknesses shown in bold face type for Schedule 40 are identical with thicknesses shown in bold face type for *Standard Wall* pipe in Table 4. Those in bold face type in Schedules 60 and 80 are identical with thicknesses in bold face type for *Extra Strong Wall* pipe in Table 4.

Some of the larger, heavier wall sections are beyond the capabilities of seamless mill production and must be obtained from turned-and-bored billets or other sources.

Table 3
Nominal Weights of Welded and Seamless Steel Pipe[1]
(Listed by Schedule Numbers)

Nominal Pipe Size (Inches)	Sched 10 Plain Ends	Sched 20 Plain Ends	Schedule 30		Schedule 40		Sched 60 Plain Ends	Sched 80 Plain Ends	Sched 100 Plain Ends	Sched 120 Plain Ends	Sched 140 Plain Ends	Sched 160 Plain Ends
			Plain Ends	Threads[2] and Couplings	Plain Ends	Threads[2] and Couplings						
⅛	.....	.....	.....	.....	0.24	0.24	.....	0.31	.....	.....	.....	.....
¼	.....	.....	.....	.....	0.42	0.42	.....	0.54	.....	.....	.....	.....
⅜	.....	.....	.....	.....	0.57	0.57	.....	0.74	.....	.....	.....	.....
½	.....	.....	.....	.....	0.85	0.85	.....	1.09	.....	.....	.....	1.30
¾	.....	.....	.....	.....	1.13	1.13	.....	1.47	.....	.....	.....	1.94
1	.....	.....	.....	.....	1.68	1.68	.....	2.17	.....	.....	.....	2.84
1¼	.....	.....	.....	.....	2.27	2.28	.....	3.00	.....	.....	.....	3.76
1½	.....	.....	.....	.....	2.72	2.73	.....	3.63	.....	.....	.....	4.86
2	.....	.....	.....	.....	3.65	3.68	.....	5.02	.....	.....	.....	7.44
2½	.....	.....	.....	.....	5.79	5.82	.....	7.66	.....	.....	.....	10.01
3	.....	.....	.....	.....	7.58	7.62	.....	10.25	.....	.....	.....	14.32
3½	.....	.....	.....	.....	9.11	9.20	.....	12.51	.....	.....	.....	.....
4	.....	.....	.....	.....	10.79	10.89	.....	14.98	.....	19.01	.....	22.51
5	.....	.....	.....	.....	14.62	14.81	.....	20.78	.....	27.04	.....	32.96
6	.....	.....	.....	.....	18.97	19.18	.....	28.57	.....	36.39	.....	45.30
8	.....	22.36	24.70	25.55	28.55	29.35	35.64	43.39	50.87	60.63	67.76	74.69
10	.....	28.04	34.24	35.75	40.48	41.85	54.74	64.33	76.93	89.20	104.13	115.65
12	.....	33.38	43.77	45.45	53.53	.....	73.16	88.51	107.20	125.49	139.68	160.27
14	36.71	45.68	54.57	.....	63.37	.....	84.91	106.13	130.73	150.67	170.22	189.12
16	42.05	52.36	62.58	.....	82.77	.....	107.50	136.46	164.83	192.29	223.50	245.11
18	47.39	59.03	82.06	.....	104.75	.....	138.17	170.75	207.96	244.14	274.23	308.51
20	52.73	78.60	104.13	.....	122.91	.....	166.40	208.87	256.10	296.37	341.10	379.01
24	63.41	94.62	140.80	.....	171.17	.....	238.11	296.36	367.40	429.39	483.13	541.94
30	98.93	157.53	196.08	.....	.....	.....	.....	.....	.....	.....	.....	.....

[1] Weights are given in pounds per linear foot and are for pipe with plain ends except for sizes which are commercially available with threads and couplings for which both weights are listed. Weights are calculated on the basis of 1 cu. in. of steel = 0.2833 pounds.

Weights shown in bold face type for Schedule 40 are identical with weights shown in bold face type for *Standard Wall* pipe in Table 5. Those shown in bold face type in Schedules 60 and 80 are identical with weights shown in bold face type for *Extra Strong Wall* pipe in Table 5.

[2] The weights of line pipe with couplings are slightly greater than shown in Schedules 30 and 40 and may be found in API Specification 5-L.

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Table 4
Dimensions of Welded and Seamless Steel Pipe
(Listed as Standard Wall, Extra Strong Wall, and Double Extra Strong Wall)

Nominal Pipe Size	Outside Diam.	Nominal Wall Thickness		
		Standard Wall	Extra Strong Wall	Double Extra Strong Wall
⅛	0.405	0.068	0.095	.....
¼	0.540	0.088	0.119	.....
⅜	0.675	0.091	0.126	.....
½	0.840	0.109	0.147	0.294
¾	1.050	0.113	0.154	0.308
1	1.315	0.133	0.179	0.358
1¼	1.660	0.140	0.191	0.382
1½	1.900	0.145	0.200	0.400
2	2.375	0.154	0.218	0.436
2½	2.875	0.203	0.276	0.552
3	3.500	0.216	0.300	0.600
3½	4.000	0.226	0.318	.....
4	4.500	0.237	0.337	0.674
5	5.563	0.258	0.375	0.750
6	6.625	0.280	0.432	0.864
8	8.625	0.322	0.500	0.875
10	10.750	0.365	0.500	.....
12	12.750	0.375	0.500	.....
14	14.000	0.375	0.500	.....
16	16.000	0.375	0.500	.....
18	18.000	0.375	0.500	.....
20	20.000	0.375	0.500	.....
24	24.000	0.375	0.500	.....

All dimensions are given in inches.

The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thicknesses, see appropriate material specifications.

Thicknesses shown in bold face type for *Standard Wall* are identical with corresponding thicknesses shown in bold face type for Schedule 40 in Table 2. Those shown in bold face type for *Extra Strong Wall* are identical with corresponding thicknesses shown in bold face type in Schedules 60 and 80 in Table 2.

Double Extra Strong Wall has no corresponding schedule numbers. (See Introductory Notes, Paragraph 9). Dimensions are identical with *Double Extra Strong Pipe* shown as an Appendix to B36.10-1939.

Table 5
Nominal Weights of Welded and Seamless Steel Pipe[1]
(Listed as Standard Wall, Extra Strong Wall, and Double Extra Strong Wall)

Nominal Pipe Size, Inches	Standard Wall		Extra Strong Wall	Double Extra Strong Wall
	Plain Ends	Threads and Couplings	Plain Ends	Plain Ends
⅛	0.24	0.24	0.31	.....
¼	0.42	0.42	0.54	.....
⅜	0.57	0.57	0.74	.....
½	0.85	0.85	1.09	1.71
¾	1.13	1.13	1.47	2.44
1	1.68	1.68	2.17	3.66
1¼	2.27	2.28	3.00	5.21
1½	2.72	2.73	3.63	6.41
2	3.65	3.68	5.02	9.03
2½	5.79	5.82	7.66	13.70
3	7.58	7.62	10.25	18.58
3½	9.11	9.20	12.51	.....
4	10.79	10.89	14.98	27.54
5	14.62	14.81	20.78	38.55
6	18.97	19.18	28.57	53.16
8	28.55	29.35	43.39	72.42
10	40.48	41.85	54.74	.....
12	49.56	51.15	65.42	.....
14	54.57	.....	72.09	.....
16	62.58	.....	82.77	.....
18	70.59	.....	93.45	.....
20	78.60	.....	104.13	.....
24	94.62	.....	125.49	.....

[1]Weights are given in pounds per linear foot and are for pipe with plain ends except for sizes which are commercially available with threads and couplings for which both weights are listed.

Weights are calculated on the basis of 1 cu. in. of steel = 0.2833 pounds.

Weights shown in bold face type for *Standard Wall* are identical with weights shown in bold face type for Schedule 40 in Table 3. Those shown in bold face type for *Extra Strong Wall* are identical with weights shown in bold face type for Schedules 60 and 80 in Table 3.

All weights in Table 5 are identical with those in Table 7 for Wrought-Iron Pipe.

Table 6
Dimensions of Welded Wrought-Iron Pipe
(Listed as Standard Wall, Extra Strong Wall, and Double Extra Strong Wall)

Nominal Pipe Size	Outside Diam.	Nominal Wall Thickness		
		Standard Wall	Extra Strong Wall	Double Extra Strong Wall
⅛	0.405	0.069	0.099	.....
¼	0.540	0.090	0.122	.....
⅜	0.675	0.093	0.129	.....
½	0.840	0.111	0.151	0.307
¾	1.050	0.115	0.157	0.318
1	1.315	0.136	0.183	0.369
1¼	1.660	0.143	0.195	0.393
1½	1.900	0.148	0.204	0.411
2	2.375	0.158	0.223	0.447
2½	2.875	0.208	0.282	0.567
3	3.500	0.221	0.306	0.615
3½	4.000	0.231	0.325	.....
4	4.500	0.242	0.344	0.690
5	5.563	0.263	0.383	0.768
6	6.625	0.286	0.441	0.884
8	8.625	0.329	0.510	0.895
10	10.750	0.372	0.510	.....
12	12.750	0.383	0.510	.....
14	14.000	0.383	0.510	.....
16	16.000	0.383	0.510	.....
18	18.000	0.383	0.510	.....
20	20.000	0.383	0.510	.....
24	24.000	0.383	0.510	.....

All dimensions are given in inches.

The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thicknesses, see appropriate material specifications.

Thicknesses of all of the sizes shown are slightly greater than those of corresponding sizes for steel pipe shown in Tables 2 and 4 to compensate for the difference in weights per cubic foot of wrought-steel and wrought-iron. See Introductory Notes, Paragraph 10.

Table 7
Nominal Weights of Welded Wrought-Iron Pipe[1]
(Listed as Standard Wall, Extra Strong Wall, and Double Extra Strong Wall)

Nominal Pipe Size, Inches	Standard Wall		Extra Strong Wall	Double Extra Strong Wall
	Plain Ends	Threads and Couplings	Plain Ends	Plain Ends
⅛	0.24	0.24	0.31	.....
¼	0.42	0.42	0.54	.....
⅜	0.57	0.57	0.74	.....
½	0.85	0.85	1.09	1.71
¾	1.13	1.13	1.47	2.44
1	1.68	1.68	2.17	3.66
1¼	2.27	2.28	3.00	5.21
1½	2.72	2.73	3.63	6.41
2	3.65	3.68	5.02	9.03
2½	5.79	5.82	7.66	13.70
3	7.58	7.62	10.25	18.58
3½	9.11	9.20	12.51	.....
4	10.79	10.89	14.98	27.54
5	14.62	14.81	20.78	38.55
6	18.97	19.18	28.57	53.16
8	28.55	29.35	43.39	72.42
10	40.48	41.85	54.74	.....
12	49.56	51.15	65.42	.....
14	54.57	.....	72.09	.....
16	62.58	.....	82.77	.....
18	70.59	.....	93.45	.....
20	78.60	.....	104.13	.....
24	94.62	.....	125.49	.....

[1]Weights are given in pounds per linear foot and are for pipe with plain ends except for sizes which are commercially available with threads and couplings for which both weights are given.

Weights shown in bold face type for *Standard Wall* are identical with weights shown in bold face type in Table 3. Those shown in bold face type for *Extra Strong Wall* are identical with weights shown in bold face type for Schedules 60 and 80 in Table 3. All weights in Table 7 are identical with those shown in Table 5 for Wrought-Steel Pipe.

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Commercial Wrought Steel Pipe Data

Note 1: The letters "s", "x", and "xx" in the column of Schedule Numbers indicate Standard, Extra Strong, and Double Extra Strong Pipe, respectively.

Note 2: The values shown in square feet for the Transverse Internal Area also represent the volume in cubic feet per foot of pipe length.

Nominal Pipe Size (Inches)	Outside Diameter (D) (Inches)	Schedule No. *See Note 1*	Wall Thickness (t) (Inches)	Inside Diameter (d) (Inches)	Area of Metal (a) (Square Inches)	Transverse Internal Area: Square Inches	Transverse Internal Area: *See Note 2* Square Feet	Moment of Inertia (I) Inches to 4th Power	Weight of Pipe Pounds per foot	Weight of Water Pounds per foot of pipe	External Surface Sq. Ft. per foot of pipe	Section Modulus $(2\frac{I}{D})$
1/8	0.405	40s	.068	.269	.0720	.0568	.00040	.00106	.244	.025	.106	.00523
		80x	.095	.215	.0925	.0364	.00025	.00122	.314	.016	.106	.00602
1/4	0.540	40s	.088	.364	.1250	.1041	.00072	.00331	.424	.045	.141	.01227
		80x	.119	.302	.1574	.0716	.00050	.00377	.535	.031	.141	.01395
3/8	0.675	40s	.091	.493	.1670	.1910	.00133	.00729	.567	.083	.178	.02160
		80x	.126	.423	.2173	.1405	.00098	.00862	.738	.061	.178	.02554
1/2	0.840	40s	.109	.622	.2503	.3040	.00211	.01709	.850	.132	.220	.04069
		80x	.147	.546	.3200	.2340	.00163	.02008	1.087	.102	.220	.04780
		160	.187	.466	.3836	.1706	.00118	.02212	1.300	.074	.220	.05267
		...xx	.294	.252	.5043	.050	.00035	.0242	1.714	.022	.220	.05762
3/4	1.050	40s	.113	.824	.3326	.5330	.00371	.03704	1.130	.231	.275	.07055
		80x	.154	.742	.4335	.4330	.00300	.04479	1.473	.188	.275	.08531
		160	.218	.614	.5698	.2961	.00206	.05269	1.940	.128	.275	.10036
		...xx	.308	.434	.7180	.148	.00103	.05792	2.440	.064	.275	.11032
1	1.315	40s	.133	1.049	.4939	.8640	.00600	.08734	1.678	.375	.344	.1328
		80x	.179	.957	.6388	.7190	.00499	.1056	2.171	.312	.344	.1606
		160	.250	.815	.8365	.5217	.00362	.1251	2.840	.230	.344	.1903
		...xx	.358	.599	1.0760	.282	.00196	.1405	3.659	.122	.344	.2136
1 1/4	1.660	40s	.140	1.380	.6685	1.495	.01040	.1947	2.272	.649	.435	.2346
		80x	.191	1.278	.8815	1.283	.00891	.2418	2.996	.555	.435	.2913
		160	.250	1.160	1.1070	1.057	.00734	.2839	3.764	.458	.435	.3421
		...xx	.382	.896	1.534	.630	.00438	.3411	5.214	.273	.435	.4110
1 1/2	1.900	40s	.145	1.610	.7995	2.036	.01414	.3099	2.717	.882	.497	.3262
		80x	.200	1.500	1.068	1.767	.01225	.3912	3.631	.765	.497	.4118
		160	.281	1.338	1.429	1.406	.00976	.4824	4.862	.608	.497	.5078
		...xx	.400	1.100	1.885	.950	.00660	.5678	6.408	.42	.497	.5977
2	2.375	40s	.154	2.067	1.075	3.355	.02330	.6657	3.652	1.45	.622	.5606
		80x	.218	1.939	1.477	2.953	.02050	.8679	5.022	1.28	.622	.7309
		160	.343	1.689	2.190	2.241	.01556	1.162	7.440	.97	.622	.979
		...xx	.436	1.503	2.656	1.774	.01232	1.311	9.029	.77	.622	1.104
2 1/2	2.875	40s	.203	2.469	1.704	4.788	.03322	1.530	5.79	2.07	.753	1.064
		80x	.276	2.323	2.254	4.238	.02942	1.924	7.66	1.87	.753	1.339
		160	.375	2.125	2.945	3.546	.02463	2.353	10.01	1.54	.753	1.638
		...xx	.552	1.771	4.028	2.464	.01710	2.871	13.70	1.07	.753	1.997
3	3.500	40s	.216	3.068	2.228	7.393	.05130	3.017	7.58	3.20	.916	1.724
		80x	.300	2.900	3.016	6.605	.04587	3.894	10.25	2.86	.916	2.225
		160	.437	2.626	4.205	5.416	.03761	5.032	14.32	2.35	.916	2.876
		...xx	.600	2.300	5.466	4.155	.02885	5.993	18.58	1.80	.916	3.424
3 1/2	4.000	40s	.226	3.548	2.680	9.886	.06870	4.788	9.11	4.29	1.047	2.394
		80x	.318	3.364	3.678	8.888	.06170	6.280	12.51	3.84	1.047	3.140
4	4.500	40s	.237	4.026	3.174	12.73	.08840	7.233	10.79	5.50	1.178	3.214
		80x	.337	3.826	4.407	11.50	.07986	9.610	14.98	4.98	1.178	4.271
		120	.437	3.626	5.578	10.33	.0717	11.65	19.00	4.47	1.178	5.178
		160	.531	3.438	6.621	9.28	.0645	13.27	22.51	4.02	1.178	5.898
		...xx	.674	3.152	8.101	7.80	.0542	15.28	27.54	3.38	1.178	6.791
5	5.563	40s	.258	5.047	4.300	20.01	.1390	15.16	14.62	8.67	1.456	5.451
		80x	.375	4.813	6.112	18.19	.1263	20.67	20.78	7.88	1.456	7.431
		120	.500	4.563	7.953	16.35	.1136	25.73	27.10	7.09	1.456	9.250
		160	.625	4.313	9.696	14.61	.1015	30.03	32.96	6.33	1.456	10.796
		...xx	.750	4.063	11.340	12.97	.0901	33.63	38.55	5.61	1.456	12.090
6	6.625	40s	.280	6.065	5.581	28.89	.2006	28.14	18.97	12.51	1.734	8.50
		80x	.432	5.761	8.405	26.07	.1810	40.49	28.57	11.29	1.734	12.22
		120	.562	5.501	10.70	23.77	.1650	49.61	36.40	10.30	1.734	14.98
		160	.718	5.189	13.32	21.15	.1469	58.97	45.30	9.16	1.734	17.81
		...xx	.864	4.897	15.64	18.84	.1308	66.33	53.16	8.16	1.734	20.02
8	8.625	20	.250	8.125	6.57	51.85	.3601	57.72	22.36	22.47	2.258	13.39
		30	.277	8.071	7.26	51.16	.3553	63.35	24.70	22.17	2.258	14.69
		40s	.322	7.981	8.40	50.03	.3474	72.49	28.55	21.70	2.258	16.81
		60	.406	7.813	10.48	47.94	.3329	88.73	35.64	20.77	2.258	20.58
		80x	.500	7.625	12.76	45.66	.3171	105.7	43.39	19.78	2.258	24.51
		100	.593	7.439	14.96	43.46	.3018	121.3	50.87	18.83	2.258	28.14
		120	.718	7.189	17.84	40.59	.2819	140.5	60.63	17.59	2.258	32.58
		140	.812	7.001	19.93	38.50	.2673	153.7	67.76	16.68	2.258	35.65
		...xx	.875	6.875	21.30	37.12	.2578	162.0	72.42	16.10	2.258	37.56
		160	.906	6.813	21.97	36.46	.2532	165.9	74.69	15.80	2.258	38.48

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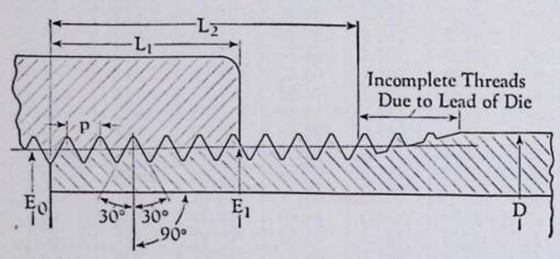
Commercial Wrought Steel Pipe Data (*continued*)

Nominal Pipe Size (Inches)	Outside Diameter (D) (Inches)	Schedule No. *See Note 1*	Wall Thickness (t) (Inches)	Inside Diameter (d) (Inches)	Area of Metal (a) (Square Inches)	Transverse Internal Area: Square Inches	Transverse Internal Area: *See Note 2* Square Feet	Moment of Inertia (I) Inches to 4th Power	Weight of Pipe Pounds per foot	Weight of Water Pounds per foot of pipe	External Surface Sq. Ft. per foot of pipe	Section Modulus $(2\frac{I}{D})$
10	10.750	20	.250	10.250	8.24	82.52	.5731	113.7	28.04	35.76	2.814	21.15
		30	.307	10.136	10.07	80.69	.5603	137.4	34.24	34.96	2.814	25.57
		40s	.365	10.020	11.90	78.86	.5475	160.7	40.48	34.20	2.814	29.90
		60x	.500	9.750	16.10	74.66	.5185	212.0	54.74	32.35	2.814	39.43
		80	.593	9.564	18.92	71.84	.4989	244.8	64.33	31.13	2.814	45.54
		100	.718	9.314	22.63	68.13	.4732	286.1	76.93	29.53	2.814	53.22
		120	.843	9.064	26.24	64.53	.4481	324.2	89.20	27.96	2.814	60.32
		140	1.000	8.750	30.63	60.13	.4176	367.8	104.13	26.06	2.814	68.43
		160	1.125	8.500	34.02	56.75	.3941	399.3	115.65	24.59	2.814	74.29
12	12.75	20	.250	12.250	9.82	117.86	.8185	191.8	33.38	51.07	3.338	30.2
		30	.330	12.090	12.87	114.80	.7972	248.4	43.77	49.74	3.338	38.1
		..s	.375	12.000	14.58	113.10	.7854	279.3	49.56	49.00	3.338	43.8
		40	.406	11.938	15.77	111.93	.7773	300.3	53.53	48.50	3.338	47.1
		..x	.500	11.750	19.24	108.43	.7528	361.5	65.42	46.92	3.338	56.7
		60	.562	11.626	21.52	106.16	.7372	400.4	73.16	46.00	3.338	62.8
		80	.687	11.376	26.03	101.64	.7058	475.1	88.51	44.04	3.338	74.6
		100	.843	11.064	31.53	96.14	.6677	561.6	107.20	41.66	3.338	88.1
		120	1.000	10.750	36.91	90.76	.6303	641.6	125.49	39.33	3.338	100.7
		140	1.125	10.500	41.08	86.59	.6013	700.5	133.68	37.52	3.338	109.9
		160	1.312	10.126	47.14	80.53	.5592	781.1	160.27	34.89	3.338	122.6
14	14.00	10	.250	13.500	10.80	143.14	.9940	255.3	36.71	62.03	3.665	36.6
		20	.312	13.376	13.42	140.52	.9758	314.4	45.68	60.89	3.665	45.0
		30s	.375	13.250	16.05	137.88	.9575	372.8	54.57	59.75	3.665	53.2
		40	.437	13.126	18.61	135.32	.9397	429.1	63.37	58.64	3.665	61.3
		..x	.500	13.000	21.21	132.73	.9217	483.8	72.09	57.46	3.665	69.1
		60	.593	12.814	24.98	128.96	.8956	562.3	84.91	55.86	3.665	80.3
		80	.750	12.500	31.22	122.72	.8522	687.3	106.13	53.18	3.665	98.2
		100	.937	12.126	38.45	115.49	.8020	824.4	130.73	50.04	3.665	117.8
		120	1.093	11.814	44.32	109.62	.7612	929.6	150.67	47.45	3.665	132.8
		140	1.250	11.500	50.07	103.87	.7213	1027.0	170.22	45.01	3.665	146.8
		160	1.406	11.188	55.63	98.31	.6827	1117.0	189.12	42.60	3.665	159.6
16	16.00	10	.250	15.500	12.37	188.69	1.3103	383.7	42.05	81.74	4.189	48.0
		20	.312	15.376	15.38	185.69	1.2895	473.2	52.36	80.50	4.189	59.2
		30s	.375	15.250	18.41	182.65	1.2684	562.1	62.58	79.12	4.189	70.3
		40x	.500	15.000	24.35	176.72	1.2272	731.9	82.77	76.58	4.189	91.5
		60	.656	14.688	31.62	169.44	1.1766	932.4	107.50	73.42	4.189	116.6
		80	.843	14.314	40.14	160.92	1.1175	1155.8	136.46	69.73	4.189	144.5
		100	1.031	13.938	48.48	152.58	1.0596	1364.5	164.83	66.12	4.189	170.5
		120	1.218	13.564	56.56	144.50	1.0035	1555.8	192.29	62.62	4.189	194.5
		140	1.437	13.126	65.74	135.32	.9397	1760.3	223.64	58.64	4.189	220.0
		160	1.593	12.814	72.10	128.96	.8956	1893.5	245.11	55.83	4.189	236.7
18	18.00	10	.250	17.500	13.94	240.53	1.6703	549.1	47.39	104.21	4.712	61.1
		20	.312	17.376	17.34	237.13	1.6467	678.2	59.03	102.77	4.712	75.5
		..s	.375	17.250	20.76	233.71	1.6230	806.7	70.59	101.18	4.712	89.6
		30	.437	17.126	24.11	230.36	1.5997	930.3	82.06	99.84	4.712	103.4
		..x	.500	17.000	27.49	226.98	1.5763	1053.2	92.45	98.27	4.712	117.0
		40	.562	16.876	30.79	223.68	1.5533	1171.5	104.75	96.93	4.712	130.1
		60	.750	16.500	40.64	213.83	1.4849	1514.7	138.17	92.57	4.712	168.3
		80	.937	16.126	50.23	204.24	1.4183	1833.0	170.75	88.50	4.712	203.8
		100	1.156	15.688	61.17	193.30	1.3423	2180.0	207.96	83.76	4.712	242.3
		120	1.375	15.250	71.81	182.66	1.2684	2498.1	244.14	79.07	4.712	277.6
		140	1.562	14.876	80.66	173.80	1.2070	2749.0	274.23	75.32	4.712	305.5
		160	1.781	14.438	90.75	163.72	1.1369	3020.0	308.51	70.88	4.712	335.6
20	20.00	10	.250	19.500	15.51	298.65	2.0740	756.4	52.73	129.42	5.236	75.6
		20s	.375	19.250	23.12	290.04	2.0142	1113.0	78.60	125.67	5.236	111.3
		30x	.500	19.000	30.63	283.53	1.9690	1457.0	104.13	122.87	5.236	145.7
		40	.593	18.814	36.15	278.00	1.9305	1703.0	122.91	120.46	5.236	170.4
		60	.812	18.376	48.95	265.21	1.8417	2257.0	166.40	114.92	5.236	225.7
		80	1.031	17.938	61.44	252.72	1.7550	2772.0	208.87	109.51	5.236	277.1
		100	1.281	17.438	75.33	238.83	1.6585	3315.2	256.10	103.39	5.236	331.5
		120	1.500	17.000	87.18	226.98	1.5762	3754.0	296.37	98.35	5.236	375.5
		140	1.750	16.500	100.33	213.82	1.4849	4216.0	341.10	92.66	5.236	421.7
		160	1.968	16.064	111.49	202.67	1.4074	4585.5	379.01	87.74	5.236	458.5
24	24.00	10	.250	23.500	18.65	433.74	3.0121	1315.4	63.41	187.95	6.283	109.6
		20s	.375	23.250	27.83	424.56	2.9483	1942.0	94.62	183.95	6.283	161.9
		..x	.500	23.000	36.91	415.48	2.8853	2549.5	125.49	179.87	6.283	212.5
		30	.562	22.876	41.39	411.00	2.8542	2843.0	140.80	178.09	6.283	237.0
		40	.687	22.626	50.31	402.07	2.7921	3421.3	171.17	174.23	6.283	285.1
		60	.968	22.064	70.04	382.35	2.6552	4652.8	238.11	165.52	6.283	387.7
		80	1.218	21.564	87.17	365.22	2.5362	5672.0	296.36	158.26	6.283	472.8
		100	1.531	20.938	108.07	344.32	2.3911	6849.9	367.40	149.06	6.283	570.8
		120	1.812	20.376	126.31	326.08	2.2645	7825.0	429.39	141.17	6.283	652.1
		140	2.062	19.876	142.11	310.28	2.1547	8625.0	483.13	134.45	6.283	718.9
		160	2.343	19.314	159.41	292.98	2.0346	9455.9	541.94	126.84	6.283	787.9

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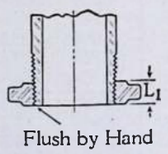
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American Standard Taper Pipe Threads (NPT)

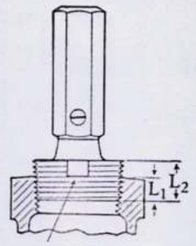


$E_0 = D - (0.050D + 1.1)p$
$E_1 = E_0 + 0.0625\ L_1$
$L_2 = (0.80D + 6.8)p$

p = Pitch
Depth of thread = $0.80p$
Total Taper ¾-inch per Foot



Tolerance on Product:
One turn large or small from notch on plug gauge or face of ring gauge.



Notch flush with face of fitting. If chamfered, notch flush with bottom of chamfer.

Dimensions, in Inches

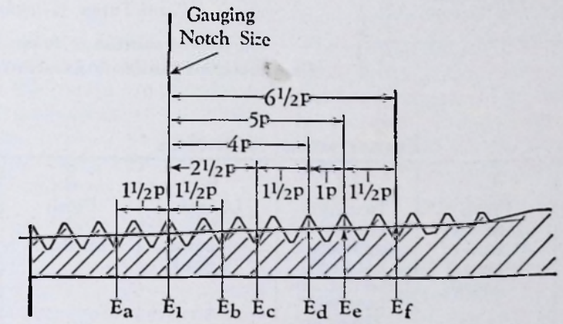
Nominal Pipe Size	D Outside Diameter of Pipe	E_0 Pitch Diameter at End of External Thread	E_1† Pitch Diameter at End of Internal Thread	L_1¶ Normal Engagement by Hand between External and Internal Threads	L_2§ Length of Effective Thread	p Pitch of Thread	Depth of Thread	Number of Threads Per Inch
⅛	0.405	0.36351	0.37476	0.180	0.2639	0.03704	0.02963	27
¼	0.540	0.47739	0.48989	0.200	0.4018	0.05556	0.04444	18
⅜	0.675	0.61201	0.62701	0.240	0.4078	0.05556	0.04444	18
½	0.840	0.75843	0.77843	0.320	0.5337	0.07143	0.05714	14
¾	1.050	0.96768	0.98887	0.339	0.5457	0.07143	0.05714	14
1	1.315	1.21363	1.23863	0.400	0.6828	0.08696	0.06957	11½
1¼	1.660	1.55713	1.58338	0.420	0.7068	0.08696	0.06957	11½
1½	1.900	1.79609	1.82234	0.420	0.7235	0.08696	0.06957	11½
2	2.375	2.26902	2.29627	0.436	0.7565	0.08696	0.06957	11½
2½	2.875	2.71953	2.76216	0.682	1.1375	0.12500	0.10000	8
3	3.500	3.34062	3.38850	0.766	1.2000	0.12500	0.10000	8
3½	4.000	3.83750	3.88881	0.821	1.2500	0.12500	0.10000	8
4	4.500	4.33438	4.38712	0.844	1.3000	0.12500	0.10000	8
5	5.563	5.39073	5.44929	0.937	1.4063	0.12500	0.10000	8
6	6.625	6.44609	6.50597	0.958	1.5125	0.12500	0.10000	8
8	8.625	8.43359	8.50003	1.063	1.7125	0.12500	0.10000	8
10	10.750	10.54531	10.62094	1.210	1.9250	0.12500	0.10000	8
12	12.750	12.53281	12.61781	1.360	2.1250	0.12500	0.10000	8
14 O.D.	14.000	13.77500	13.87262	1.562	2.2500	0.12500	0.10000	8
16 O.D.	16.000	15.76250	15.87575	1.812	2.4500	0.12500	0.10000	8
18 O.D.	18.000	17.75000	17.87500	2.000	2.6500	0.12500	0.10000	8
20 O.D.	20.000	19.73750	19.87031	2.125	2.8500	0.12500	0.10000	8
24 O.D.	24.000	23.71250	23.86094	2.375	3.2500	0.12500	0.10000	8

†Also pitch diameter at gauging notch.
§Also length of plug gauge.
¶Also length of ring gauge, and length from gauging notch to small end of plug gauge.

The above information taken from the American Standard for Pipe Threads, ASA—B2.1-1945.

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American Standard Straight Pipe Threads



Dimensions, in Inches

Nominal Pipe Size	Number of Threads per Inch	p Pitch of Thread	Increase in Pitch Diameter per Turn	Pitch Diameter: Straight Thread Couplings* (Internal Thread) for use with Taper Thread Pipe for Pressure Tight Joints (NPSC) Min. E_a	(NPSC) Max. E_b	Straight Thread (Free Fitting) Mechanical Joints† (NPSM) External Min. E_a	External Max. E_1	Internal Min. E_1	Internal Max. E_b	Straight Thread (Loose Fitting) Mechanical Joints† Locknut Connections (NPSL) External Min. E_c	External Max. E_d	Internal Min. E_e	Internal Max. E_f
⅛	27	0.03704	0.00231	0.3713	0.3782	0.3713	0.3748	0.3748	0.3782	0.3805	0.3840	0.3863	0.3898
¼	18	0.05556	0.00347	0.4847	0.4951	0.4847	0.4899	0.4899	0.4951	0.4986	0.5038	0.5073	0.5125
⅜	18	0.05556	0.00347	0.6218	0.6322	0.6218	0.6270	0.6270	0.6322	0.6357	0.6409	0.6444	0.6496
½	14	0.07143	0.00446	0.7717	0.7851	0.7717	0.7784	0.7784	0.7851	0.7896	0.7963	0.8008	0.8075
¾	14	0.07143	0.00446	0.9822	0.9956	0.9822	0.9889	0.9889	0.9956	1.0000	1.0067	1.0112	1.0179
1	11½	0.08696	0.00543	1.2305	1.2468	1.2305	1.2386	1.2386	1.2468	1.2523	1.2604	1.2658	1.2739
1¼	11½	0.08696	0.00543	1.5752	1.5915	1.5752	1.5834	1.5834	1.5915	1.5970	1.6051	1.6106	1.6187
1½	11½	0.08696	0.00543	1.8142	1.8305	1.8142	1.8223	1.8223	1.8305	1.8360	1.8441	1.8495	1.8576
2	11½	0.08696	0.00543	2.2881	2.3044	2.2881	2.2963	2.2963	2.3044	2.3099	2.3180	2.3234	2.3315
2½	8	0.12500	0.00781	2.7505	2.7739	2.7505	2.7622	2.7622	2.7739	2.7817	2.7934	2.8012	2.8129
3	8	0.12500	0.00781	3.3768	3.4002	3.3768	3.3885	3.3885	3.4002	3.4081	3.4198	3.4276	3.4393
3½	8	0.12500	0.00781	3.8771	3.9005	3.8771	3.8888	3.8888	3.9005	3.9084	3.9201	3.9279	3.9396
4	8	0.12500	0.00781	4.3754	4.3988	4.3754	4.3871	4.3871	4.3988	4.4067	4.4184	4.4262	4.4379
5	8	0.12500	0.00781			5.4376	5.4493	5.4493	5.4610	5.4688	5.4805	5.4884	5.5001
6	8	0.12500	0.00781			6.4943	6.5060	6.5060	6.5177	6.5255	6.5372	6.5450	6.5567
8	8	0.12500	0.00781							8.5196	8.5313	8.5391	8.5508
10	8	0.12500	0.00781							10.6405	10.6522	10.6600	10.6717
12	8	0.12500	0.00781							12.6374	12.6491	12.6569	12.6686

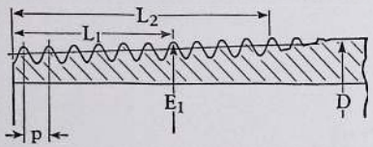
*Straight pipe threads in couplings are gauged with American Standard Taper Pipe Thread plug gauges, the notch (P.D. = E_1) to come flush at bottom of chamfer with gauging tolerance of one and one-half turns large or small. While this theoretically provides maximum and minimum pitch diameters as shown, the actual pitch diameters of the tapped hole will be slightly smaller than the values given.

†Mechanical joint straight pipe threads are gauged with straight thread gauges.

Crane Railing Pipe Threads . . . page 192

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British Standard Taper Pipe Threads



Whitworth 55° Form of Thread

Total Taper ¾-inch per Foot

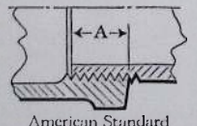
This information is taken from the British Engineering Standards Association Report No. 21-1938.

Dimensions, in Inches

Pipe Size (Nominal Bore)	D Approximate Outside Diameter of Pipe	E_1 Pitch Diameter at End of Internal Thread	L_1 Normal Engagement by Hand between External and Internal Threads	L_2 Length of Effective Thread	p Pitch of Threads	Depth of Threads	Number of Threads Per Inch
⅛	13/32	0.3601	0.1563	0.2545	0.03571	0.0229	28
¼	17/32	0.4843	0.2367	0.3814	0.05263	0.0337	19
⅜	11/16	0.6223	0.2500	0.3947	0.05263	0.0337	19
½	27/32	0.7793	0.3214	0.5178	0.07143	0.0457	14
¾	1 1/16	0.9953	0.3750	0.5714	0.07143	0.0457	14
1	1 11/32	1.2508	0.4091	0.6591	0.09091	0.0582	11
1¼	1 11/16	1.5918	0.5000	0.7500	0.09091	0.0582	11
1½	1 29/32	1.8238	0.5000	0.7500	0.09091	0.0582	11
2	2⅜	2.2888	0.6250	0.9204	0.09091	0.0582	11
2½	3	2.9018	0.6875	1.0511	0.09091	0.0582	11
3	3½	3.4018	0.8125	1.1761	0.09091	0.0582	11
3½	4	3.8918	0.8750	1.2386	0.09091	0.0582	11
4	4½	4.3918	1.0000	1.4091	0.09091	0.0582	11
5	5½	5.3918	1.1250	1.5795	0.09091	0.0582	11
6	6½	6.3918	1.1250	1.5795	0.09091	0.0582	11
7	7½	7.3860	1.3750	1.9250	0.10000	0.0640	10
8	8½	8.3860	1.5000	2.0500	0.10000	0.0640	10
9	9½	9.3860	1.5000	2.0500	0.10000	0.0640	10
10	10½	10.3860	1.6250	2.1750	0.10000	0.0640	10
11	11½	11.3700	1.6250	2.3125	0.1250	0.0800	8
12	12½	12.3700	1.6250	2.3125	0.1250	0.0800	8

Normal Engagement

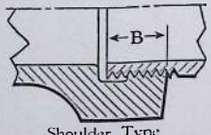
Between Male and Female Threads to Make Tight Joints



American Standard and API Line Pipe Threads

Dimensions given do not allow for variations in tapping or threading.

For normal engagement on Crane Railing Pipe Threads, see page 192.



Shoulder Type Drainage Fitting Threads

Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14
A	¼	⅜	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1	1 1/16	1⅛	1¼	1 5/16	1 7/16	1⅝	1¾	
B*						9/16	⅝	⅝	⅝	⅞	15/16	1	1 1/16	1 3/16	1¼	1⅜	1 9/16	1 11/16	1⅞

*Using American Standard Taper Male Thread external thread, however, should not be threaded small to gauge nor more than one turn large. with Crane shoulder type Drainage Fittings. The

Information on threaded pipe joints . . page 495

Threaded Pipe Joints

Threads

In screwed joints having strength, tightness, and durability, it is necessary to have clean-cut and uniform threads.

The threads should be tapered and smooth, cut with the correct taper, lead, thread angle, and diameters. Reasonable manufacturing tolerances are allowed on all of the thread elements to take care of variations in threading. The diameters should be such as to allow sufficient hand engagement and yet allow enough threads for wrench or power make-up.

The thread lengths should be long enough to compensate for pipe strains usually present in the various types of thread joint services. A short thread is satisfactory for joints where little or no pipe strains exist, but longer threads are required where extreme pipe strains are encountered, such as in Oil Field Casing Thread joints.

Standardized Threads

Several Standards have been established covering pipe threads for various purposes. The oldest and probably most commonly used is the American Standard for Pipe Threads, known as ASA Standard B-2.1. There are also the American Petroleum Institute Standards No. 5A, 6A, and 5L covering Oil Field Tubular Goods, such as Line Pipe and Casing Threads.

Thread Assembling

In making up screwed pipe joints it is very important that the threads in both parts be thoroughly cleaned. Any threads which may have become burred or bent should be straightened or removed and afterward a good grade of lubricant should be applied to the threads. The lubricant reduces the friction which allows the two parts to be pulled up further, resulting in a more effective pipe joint. Pipe joints should not be screwed together too rapidly and thereby avoid objectionably raising the temperature of the two parts. For Crane thread lubricant and compound, see page 464.

Normal Engagement

The normal amount of engagement to make a tight joint for various types of screwed material is given in the table on page 494. These dimensions have been established from tests made under practical working conditions.

The normal engagement specified for American Standard Pipe Thread and API Line Pipe Thread joints is based on parts being threaded to the American Standard for Pipe Threads or the API Standard for Line Pipe Threads. The shoulder type Drainage Fitting Thread engagement is based on using Crane Fittings and American Standard Pipe Thread dimensions on the external thread but holding the external thread to a special tolerance as covered in the footnote of the table.

In order to obtain the thread engagements listed in the table it is necessary to vary the torque or power applied according to the size, metal and weight of material used. For example, it requires considerably less power to make up a screwed joint using a light brass valve than a high pressure steel valve.

Screwed Companion Flanges

The normal length of thread engagement listed in the table on page 494 does not apply to Screwed Companion Flanges. The length of thread engagement for Screwed Companion Flanges depends upon the weight of the flange, considering pressure, and the type of thread joint employed.

There are two types of threaded flange joints in general use; namely, where the pipe and flange are refaced after assembly, as distinguished from the other, in which the pipe and the flange are not refaced. Pipe threaded for a refaced job should have a thread sufficiently long to extend slightly beyond the face of the flange when assembled, to allow for refacing. For the joint which is not to be refaced, the thread on the pipe should be slightly shorter so that the end of the threaded pipe will be about one thread from the face of the flange when assembled.

Leaky Joints

Leaky joints can usually be traced either to faulty threading or an improper lubricant. Frequently the trouble lies in the thread on the pipe which may have been cut with dull or improperly adjusted threading tools resulting in wavy, shaved, rough or chewed threads.

Wavy threads are noticeable both to the eye and touch, due to circumferential waves or longitudinal flats of slightly helical form rather than the desired true circular form. Shaved threads appear to have been threaded with two dies, one not matching the other, giving a double thread appearance at the start of the thread. Rough or chewed threads are noticeably rough and torn.

Should the threads have any of these defects it is possible that leaky joints might result.

Crane Threaded Products

Crane threaded materials have smooth, accurately cut threads properly gauged and carefully inspected for taper, lead, thread angle, height, out-of-roundness, and alignment.

They are threaded in compliance with established Standards as the requirements may be, and the start of each thread is properly chamfered for ease in assembling.

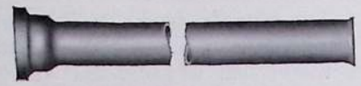
Crane has taken extraordinary precautions to insure satisfactory thread joints by maintaining constantly careful inspection of not only the product itself but the threading equipment as well, which is the best available.

A complete gauging system has also been established which includes Master Gauges approved by the National Bureau of Standards, Reference Gauges, and Working Gauges. These gauges are checked periodically and frequently so as to keep them well within the allowable tolerances. In fact, Crane threading is held to much closer tolerances than actually required to make a tight joint.

40

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Cast Iron Water Pipe



All pipe sizes listed use A.W.W.A. Class D fittings. When specified, sizes 14 to 24-inch are available (with smaller O.D.) for use with Class B fittings.

A.W.W.A. Class A-B body pattern covers pipe sizes 4 to 12-inch (also available, if specified, for 14 to 24-inch sizes); Class C-D body pattern covers sizes 14 to 24-inch.

Class 150 and Class 250 Cast Iron Water Pipe in sizes 4 to 24-inch comply with Federal Specification WW-P-421.

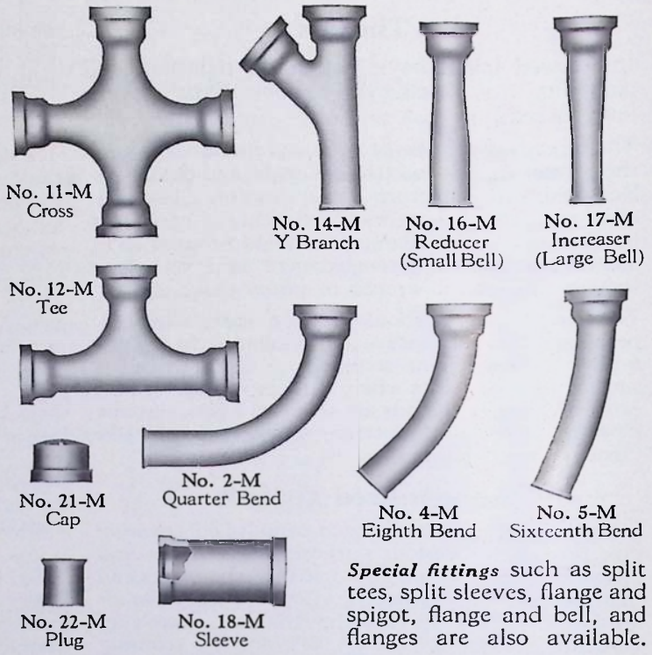
In the table below, weight of pipe is taken to the nearest five pounds. Weight of pipe per foot including bell is based on the weight of pipe to the nearest pound.

Pipe Sizes, Dimensions, and Weights

Nominal Size I.D. Inches	Actual Size O.D. Inches	Thickness Inches	Weight, Pounds: Plain End per Foot	With Bell per Foot	16-Foot Length
CLASS 150 150 Pounds Working Pressure 346-Foot Head					
3*	3.96	.33	12	13.1	210
4	4.80	.34	15	16.1	255
6	6.90	.37	24	25.7	410
8	9.05	.42	36	38.6	615
10	11.10	.47	49	52.2	835
12	13.20	.50	62	66.1	1055
14	15.65	.55	82	86.9	1390
16	17.80	.60	102	108.1	1730
18	19.92	.65	123	130.4	2085
20	22.06	.68	143	152.0	2430
24	26.32	.76	191	202.9	3245
CLASS 200 200 Pounds Working Pressure 462-Foot Head					
8	9.05	.46	39	41.6	665
10	11.10	.52	54	57.2	915
12	13.20	.57	70	74.1	1185
14	15.65	.62	91	97.0	1550
16	17.80	.68	114	121.6	1945
18	19.92	.74	139	147.9	2365
20	22.06	.78	163	173.6	2775
24	26.32	.88	219	233.1	3730
CLASS 250 250 Pounds Working Pressure 576-Foot Head					
3*	3.96	.36	13	13.8	220
4	4.80	.38	17	18.1	290
6	6.90	.43	27	28.7	460
8	9.05	.50	42	44.6	715
10	11.10	.57	59	62.3	995
12	13.20	.62	77	81.1	1300
14	15.65	.69	102	108.0	1730
16	17.80	.75	126	133.6	2135
18	19.92	.83	156	164.9	2640
20	22.06	.88	183	193.6	3095
24	26.32	1.00	248	262.1	4195

*3-inch inside diameter is Manufacturer's Standard

Fittings for Cast Iron Water Pipe



Special fittings such as split tees, split sleeves, flange and spigot, flange and bell, and flanges are also available.

Fitting Sizes and Weights

Sizes Inches	Weight per Fitting, in Pounds: No. 2-M	No. 4-M	No. 5-M	No. 11-M	No. 12-M	No. 14-M	No. 16-M	No. 17-M	No. 18-M	No. 21-M	No. 22-M
3	65	53	53	125	94	78	...	...	36	20	7
4	82	66	66	166	128	103	...	...	47	27	8
6	130	105	105	257	200	181	...	...	68	40	14
8	200	150	150	372	294	291	...	...	104	59	25
10	278	202	202	493	395	434	...	...	123	84	38
12	366	265	265	623	512	632	...	...	174	142	50
3×2	...	...	...	...	...	...	35	39	...	...	...
4×3	...	...	...	153	120	...	45	50	...	...	...
×2	...	...	...	...	...	...	40	44	...	...	...
6×4	...	...	...	221	183	167	97	104	...	...	...
×3	...	...	...	204	170	...	88	100	...	...	...
8×6	...	...	...	325	270	268	143	150	...	...	...
×4	...	...	...	294	255	234	119	132	...	...	...
10×8	...	...	...	443	371	398	198	201	...	...	...
×6	...	...	...	406	351	366	169	180	...	...	...
×4	...	...	...	377	338	...	146	162	...	...	...
12×10	...	...	...	577	491	588	261	267	...	...	...
×8	...	...	...	545	474	553	231	240	...	...	...
×6	...	...	...	512	458	520	202	218	...	...	...
×4	...	...	...	486	445	...	179	201	...	...	...

Weight of Lead and Hemp Required per Joint

(Based on Lead 2 Inches Thick)

Pipe Size Inches	3	4	6	8	10	12	14	16	18	20	24
Lead Pounds	6	7½	10¼	13¼	16	19	22	30	33¾	37	44
Hemp Pounds	.18	.21	.31	.44	.53	.61	.81	.94	1	1¼	1½

Prices and additional data furnished on application.

Crane Fabricated Piping

Crane Shop Fabricating Facilities....pages 498 to 501
Crane Pipe Bends....pages 502 to 504

Crane Flanging Processes:
- Screwed Flanged Joints....page 505
- The Cranelap Joint....pages 505 to 508
- Welded Flanged Joints....page 509

Flange Facings and Finishes....pages 510 and 511
Crane Welded Piping....pages 512 and 513
Unit Fabrication of Piping and Valves....pages 514 and 515
Dimensions of Crane Welded Headers....pages 516 and 517

Crane Pipe Coils:
- Comments....page 518
- Cylindrical and Flat Spiral Types....page 519
- Flat and Oval Types....page 520
- Box Type....page 521
- Minimum Dimensions....page 521

Welded Double Pipe Heat Exchangers....page 522

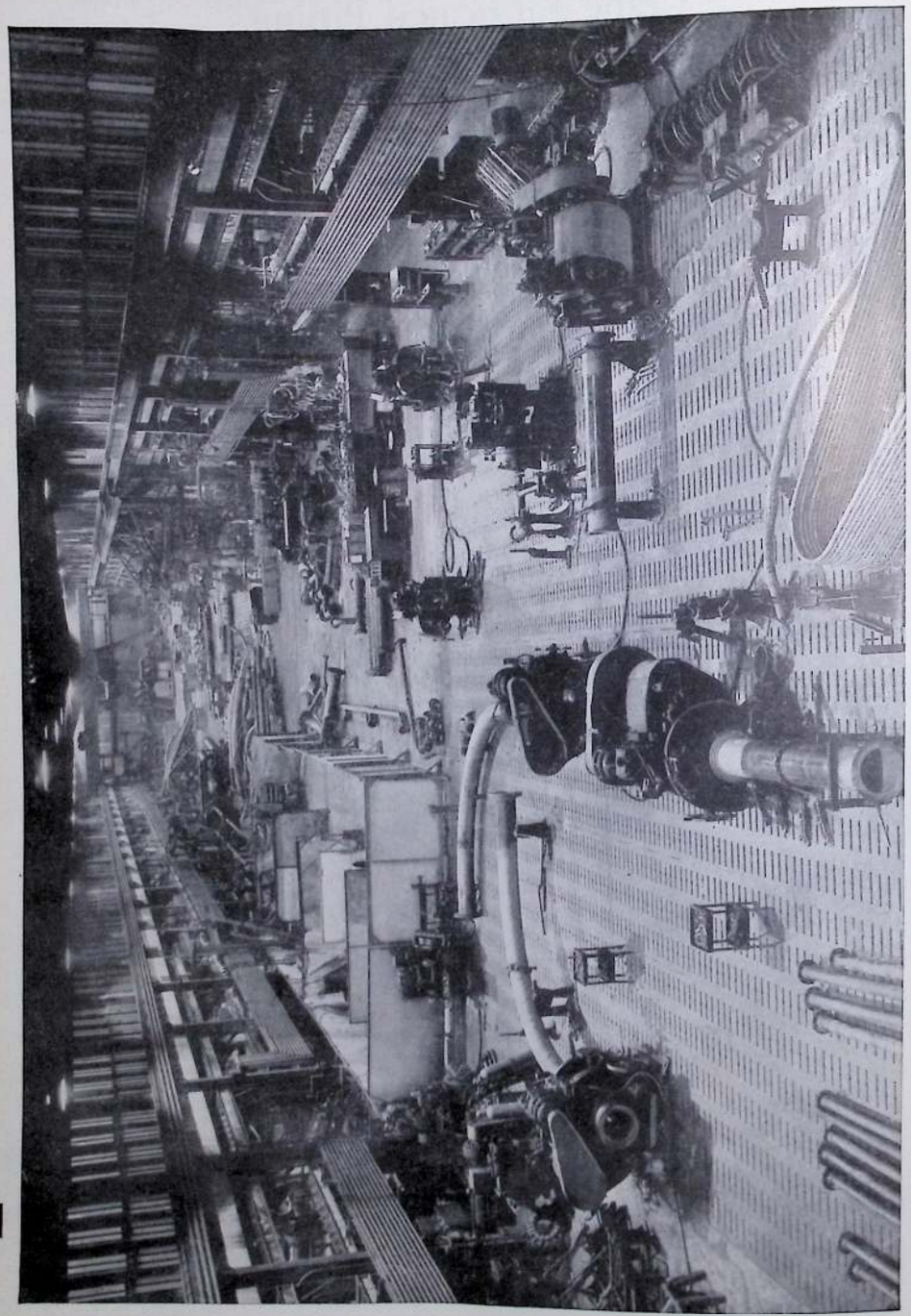
The increasing use of higher pressures and temperatures has elevated the art of designing, erecting, and purchasing fabricated piping to its rightful position of importance. Discriminating buyers now realize that the purchase of piping requires the same careful thought and attention to details as does the selection of steam generators, prime movers, refinery cracking stills, valves, and other major items of modern plants.

Years ago, Crane realized the desirability of having the production and development of fabricated piping go hand in hand with the constant improvement in valves, fittings, and allied articles. In this manner, materials of uniform design, workmanship, and performance have been developed.

The nature of fabricated piping precludes any attempt to list completely the variety of materials and operations available in a modern fabricating shop. The special and peculiar requirements of industry and its processes daily present problems which must be solved. Attention is invited to the following pages which tell a brief story about Crane Fabricated Piping; additional information will be furnished on request.

Integrated piping systems from a single manufacturing source — one responsibility for proper and complete fabrication

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A portion of the Crane Pipe Fabricating Shop in Chicago

One Source of Supply

Exacting users of materials for piping installations will recognize the advantages of purchasing the fabricated piping from a manufacturer who also produces a complete line of valves, fittings, bolts, gaskets, and accessories.

One responsibility: When the task of furnishing all of the material rests with Crane, there is but one responsibility—one uniform standard of materials, workmanship, and service. Whether the joints used are threaded, flanged, or beveled for welding, the same standards and gauging systems are used uniformly on all of the products.

This assures the user that the component parts of the piping system will fit accurately, provide reliability and safety, and will be easily installed, with a minimum of erection and of maintenance costs.

Simplicity of ordering: An order for the complete piping job is handled as an integral unit; there is not the division of responsibility regarding the dimensions and related details of the various items that occurs when the component parts of a piping system are ordered from several sources of supply.

Time saving: There is a saving in time and expense when orders and detailed drawings are prepared for only one source of supply. The delays caused by shipments from several sources are eliminated.

Ease of maintenance: When repairs or replacements are necessary because of the demands of service, they are effected easily when all of the original material was secured from one source of supply.

Advantages of Crane Shop Fabrication

Accuracy: A piping system, when placed in service, should develop the predetermined results and fulfill all of the expectations of a proper design. This should be accomplished expeditiously and at a minimum of final erected cost consistent with the use of good materials and workmanship. Obviously, this purpose will be defeated unless each piece, large or small, of both simple and complex piping systems, receives the attention necessary to assure accuracy and a high quality of workmanship. Crane shop fabrication accomplishes this desirable end.

Proficiency: In the Crane fabricating shops the mechanics are employed solely on the production of fabricated piping. Such continuity of practice means that they do not lose their proficiency, particularly desirable for welding and other complex operations.

Safety: Safety is a prime requisite of every piping installation. Crane shop fabrication assures purchasers that every necessary precaution has been employed to eliminate hidden hazards of piping.

A weld may appear excellent on the exterior, yet under the surface it may contain gas pockets or have faulty penetration. A threaded flange joint gives no indication in its external appearance, of improper threading. These are but two of the many hidden hazards of piping.

Shop appliances: Shop fabrication requires the use of special machinery, clamps, jigs, and other convenient appliances which are impractical for field service. This equipment permits the alignment and squaring-up of all flanged faces or ends of piping, also accuracy of dimensions and angles—all within the closest practical limits. Such characteristics assure the final fitting of every piece into position without alteration or improper strain, resulting in increased safety and a saving of time and labor.

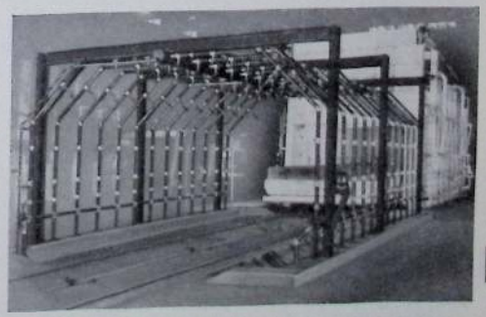
Stress relieving, annealing, or heat treating, when necessary, are readily performed in the shop. All of these advantages are almost impossible of accomplishment in the field.

Working conditions: Working conditions, almost invariably, are better in the shop than in the field. The shop has facilities for handling heavy or bulky pieces, therefore each mechanic is working at all times in a comfortable position and is not concerned about his safety.

Testing: Crane shop fabrication assures dependability because the product is tested and proved sound before shipment. Piping which is fabricated in the field usually must be installed in its final position before it can be tested, and, in the event of failure, the removal for replacement or repair proves expensive and causes delay.

Simplified assembly: The erecting force in the field should only be called upon to assemble a piping system. It should neither be expected to design and fabricate piping, nor to manufacture economically, under adverse field conditions, a product comparable with that of the modern fabricating shop.

Unit fabrication: For further information on unit fabrication, see pages 514 and 515.



Heat treating furnace with spray equipment for quick quenching of product.

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Scope of Crane Shop Facilities

Crane can advantageously supply piping for any industry.

Shops at strategic points: Many shops are maintained for supplying the piping needs of industry. A goodly number of the Crane branch houses are equipped for the simpler jobs—the larger branch houses for more elaborate jobs—and fabricating shops embracing the full line of pipe fabrication are located at strategic centers throughout the country.

All types of joints: Any type of joint can be furnished—screwed, flanged, welded, or special. The selection of any type of joint presents a basic engineering or mechanical problem. Crane makes its recommendations accordingly—having an all-inclusive line, it can exercise a degree of impartiality conducive to best serving the interests of the purchaser.

Large stocks: Large stocks of the various kinds of pipe, flanges, valves, fittings, and accessories are carried at all fabricating shops and branches.

Crane is prepared for the job, whether it calls for a single piece of pipe cut to length, or the complete piping equipment of an industry.

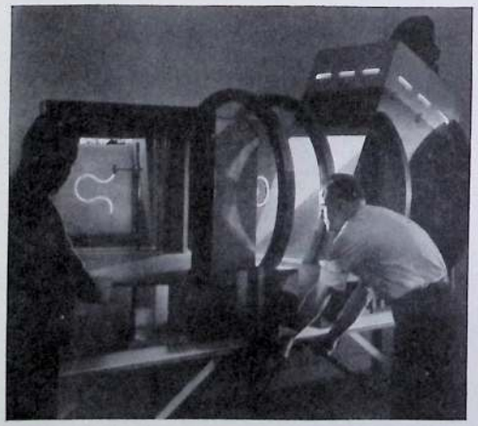
Metallurgical and Engineering Control

Laboratories: In the year 1888, Crane established a chemical laboratory with full control over the raw materials used in its products. Constantly expanded, this service has grown into complete research, metallurgical, and testing laboratories. Long a dominant factor in the development of Crane products, all of the accumulated data held by these departments—the applied experience of Crane engineers and research men—are utilized in the production of Crane Fabricated Piping.

Engineering: All fabrication of piping in the Crane shops is under a system of constant procedure control. A thorough gauging system is employed in all operations.

Trained engineers are responsible at all times for the design, superintendence during manufacture, and constant checking of the product.

The services outlined eliminate guesswork in the production of Crane Fabricated Piping.



Studying design through photoelasticity in Crane Research Laboratory.



Constant checking and gauging of Crane Fabricated Piping assures perfect alignment.

Estimating and Ordering

Estimates: A reliable estimate of the cost of any piping system will be furnished promptly upon receipt of an inquiry accompanied by blueprints and specifications.

No matter how complex the layout or how involved the specification, a complete and accurate quotation is assured.

Orders: Crane has specialized for many years in the handling of orders for fabricated piping. Men, well trained and experienced in this work, enter the shop orders direct from complete blueprints, detail sketches, or bills of material, constantly checking all dimensions and details.

Submit inquiries to the nearest Crane representative.

Crane Shop Fabricating Facilities

Equipment

The Crane shops are fully equipped with machinery and facilities for the various operations required in the production of a complete line of fabricated piping.

Much of the shop equipment is special—designed and built to develop the manufacturing technique necessary for the fabrication of piping of uniform accuracy and quality of workmanship.

Many forms of special jigs and appliances are employed constantly to supplement the effectiveness of the machines and other facilities.

Pipe Bending

In Crane shops, the art of bending pipe has been developed to a high degree—pipe bends of many sizes and shapes are in constant production.

Pipe bends have a wide range of usefulness. No two general piping installations are alike, hence pipe bends are especially adapted to solve the many problems of space requirements. The proper proportions of a pipe bend usually are essentially a matter of bending pipe to the dimensions necessary to fit into the available space.

To meet these needs of industry, Crane pipe bending facilities are available; shops are equipped to fabricate pipe bends from a large range of sizes, weights, and kinds of pipe. See pages 502 to 504.

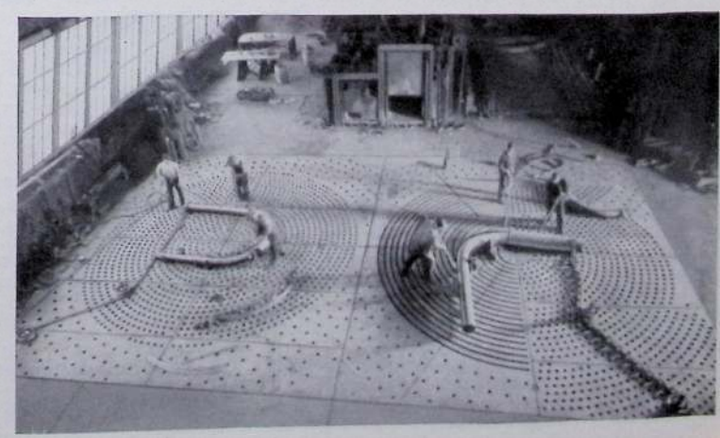
Flanging

Crane shop facilities include equipment for producing the many types of flanged joints in current use. These can be furnished not only in their regular forms but also in the various modifications and special adaptations required. Precision gauges govern every operation, assuring the utmost accuracy. For details, see pages 505 to 509.

Finishing

Special finishing machines enable Crane shops to furnish fabricated piping with a variety of finishes—regular and special. See pages 510 and 511.

Cutting, beveling, threading, making-on screwed flanges, facing all types of flanges, machining Cranelap joints, and various other operations for finishing the ends of Crane Fabricated Piping are performed on these machines with precision and a close adherence to accurate gauging standards.



Pipe bending plate in a Crane Pipe Fabricating Shop.

Welding

Crane pioneered in the welding of fabricated piping. For more than forty years, welding has been used in the fabrication of Crane headers and other products. Untiring research and experiment in the shops and laboratories during this long period are responsible for the constant refinement in the technique of Crane welding.

Crane welders use all modern methods of welding with equal facility and are subjected periodically to qualification tests.

Crane Fabricated Piping includes an almost infinite variety of shop-welded product. For detailed information on welding, see pages 512 to 517.

Swedging

Swedging facilities are available for all sizes of pipe. The facilities include furnaces for heating, powerful forging hammers, and dies to assure accurate fabrication.

Cutting and Threading Pipe

Crane shops are equipped to cut and thread pipe for all commercial services; regular and special threads can be furnished. Accurate threading to gauge, so characteristic of Crane screwed products, is similarly found in pipe cut and threaded in Crane shops.

Testing

Crane shop facilities include equipment for testing fabricated piping as specified in the various codes, or in accordance with the provisions of a specification. The usual hydrostatic tests are supplemented by air-under-water and other special tests if required.

Cleaning Fabricated Piping

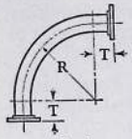
All fabricated piping is regularly cleaned internally by a mechanically driven rotary cleaning tool, or with a wire brush, or blown out with compressed air to remove loose foreign material resulting from fabrication. When specified on orders, special cleaning by pickling or sand-blasting, or both, will be performed at an extra charge.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Published by AsbestosClaims.Law
asbestosclaims.law/library/21276/273

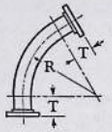
Standard Types of Pipe Bends

Crane Pipe Bends are made from pipe which is filled with sand, heated carefully until the entire sand core produces a uniform temperature, then clamped on the bending floor to forms which have been accurately laid out. Power winches are applied to draw the pipe around the forms, and the point of power application is repeatedly shifted to prevent the formation of wrinkles on the inside wall. A new heat is made for each bend.

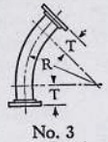
All bends are completed in the pipe before beveling, threading, or flanging, to assure dimensional accuracy. A system of repeated checking assures that every dimension and angle of the completed pipe bend will be accurate, and that the ends or flanges will be square with the axis of the pipe. Crane Pipe Bends are full area, free from wrinkles, buckles, and thin spots; they are cleaned of all scale, chips, and oil. They are easy to erect, fitting into place exactly.



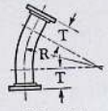
No. 1
Quarter Bend, 90°



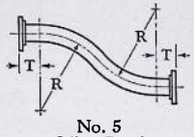
No. 1½
Angle Bend, 46° to 89°



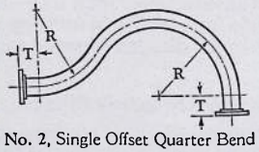
No. 3
45° Bend



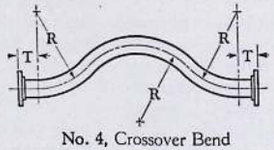
No. 3½
Angle Bend, Under 45°



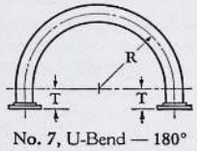
No. 5
Offset Bend



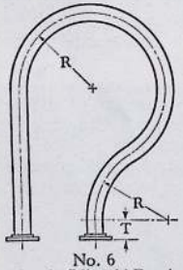
No. 2, Single Offset Quarter Bend



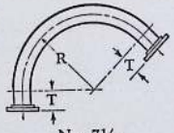
No. 4, Crossover Bend



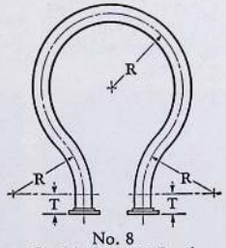
No. 7, U-Bend — 180°



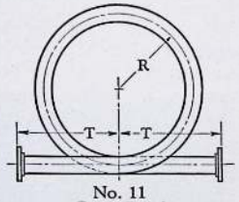
No. 6
Single Offset U-Bend



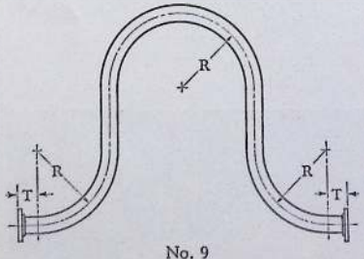
No. 7½
Angle Bend
91° to 179°



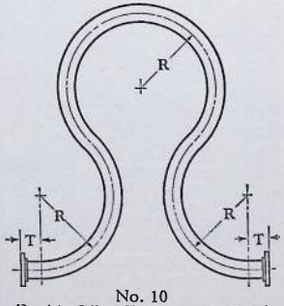
No. 8
Double Offset U-Bend



No. 11
Circle Bend



No. 9
Expansion U-Bend



No. 10
Double Offset Expansion U-Bend

For table of radii and tangents, see page 503.

For notes on pipe bends, see pages 503 and 504.

To calculate working pressure, stress, or wall thickness of pipe, see pages 541 to 545.

Cautionary note regarding the use of minimum radii and tangents:

The table and notes on page 503 outline the minimum radii and tangents which can be furnished for various conditions. *The use of such minimum dimensions is not desirable, nor is it recommended except when absolutely necessary.*

The radii of pipe bends preferably should equal or exceed the dimensions shown in column "A", defining "Minimum Recommended Radius".

When possible, the tangents of pipe bends should be greater than the dimensions shown in column "C", defining "Minimum Length of Tangent".

The tangents can be of any dimensions up to the limits imposed by the length of pipe available or the shipping facilities. See paragraphs on "Long Lengths of Pipe", page 504.

Standard Types of Pipe Bends (Cont.)

Radii and Tangents of Pipe Bends, in Inches

Size of Pipe	Column "A" R Minimum Recommended Radius — Steel or Genuine Wrought Iron Pipe — Standard or Extra Strong Weight	Column "B" R Shortest Radii to which pipe can be bent (*See Note below*) — Steel Pipe Only — Threaded Ends, Screwed, or Welded Flanges — Standard Weight Pipe	Steel Pipe Only — Threaded Ends, Screwed, or Welded Flanges — Extra Strong Weight Pipe	Steel Pipe Only — Cranelap Joints — Standard Weight Pipe	Steel Pipe Only — Cranelap Joints — Extra Strong Weight Pipe	Genuine Wrought Iron Pipe — Threaded Ends, Screwed, or Welded Flanges — Standard Weight Pipe	Genuine Wrought Iron Pipe — Threaded Ends, Screwed, or Welded Flanges — Extra Strong Weight Pipe	Genuine Wrought Iron Pipe — Cranelap Joints — Standard Weight Pipe	Genuine Wrought Iron Pipe — Cranelap Joints — Extra Strong Weight Pipe	Column "C" T Minimum Length of Tangent (*See Note below*) — Steel or Genuine Wrought Iron Pipe Standard or Extra Strong Weight — Threaded Ends or Screwed Flanges	Cranelap Joints
¼	1¼	1	⅝			1¼	1			1	
⅜	1⅞	1¼	¾			1⅞	1½			1¼	
½	2½	1½	1	2	2	2½	2	2½	2	1½	2
¾	3¾	1¾	1¼	3	3	3	2½	3	3	1¾	2
1	5	2	1½	4	4	4	3	4	4	2	2
1¼	6¼	2¼	1¾	4	4	5	4	5	4	2	2½
1½	7½	2½	2	5	5	6	5	6	5	2½	3
2	10	3	2½	6	6	8	5	8	6	3	4
2½	12½	5	4¼	10	10	10	8	10	10	4	5
3	15	8	6	12	12	12	10	12	12	4	6
3½	17½	10	8	12	12	14	12	14	12	5	6
4	20	12	10	14	14	16	12	16	14	5	6
5	25	18	14	18	14	20	15	20	15	6	7
*6	30	22	15	22	15	26	18	26	18	7	7
8	40	30	23	30	23	30	28	30	28	9	8
10	50	36	30	36	30	36	32	36	32	12	10
12	60	46	36	46	36	46	42	46	42	14	10
*14 OD	70	60	48	60	48	60	54	60	54	16	14
*16 OD	96	80	60	80	60	80	70	80	70	18	16
*18 OD	108	90	66	90	66	90	80	90	80	18	18
*20 OD	120	100	72	100	72	100	90	100	90	18	18
*24 OD	144	144	108	144	108	144	122	144	122	18	20

*For sizes 14-inch O.D. and larger, the radii shown are based upon pipe with a wall thickness of $\frac{7}{16}$-inch or lighter under the "Standard Weight Pipe" column, and a wall thickness of $\frac{1}{2}$-inch or heavier under the "Extra Strong Weight Pipe" column.

Length of Pipe in Bends and Calculation of Pipe Bends . . . . pages 546 to 548

Notes on Standard Types of Pipe Bends

Minimum recommended radius: The figures shown in column "A" represent a schedule of dimensions that is consistent with good practice for determining ordinary minimum radii of pipe bends.

Shortest radius: The dimensions shown in column "B" are based upon actual manufacturing conditions and should not be lowered. *Refer to the cautionary note on page 502.*

Minimum length of tangent: The dimensions shown in column "C" are based upon actual manufacturing conditions for tangents with a threaded end, screwed flange, or Cranelap joint. These dimensions must be maintained without deviation for minimum lengths. *Refer to the cautionary note on page 502.*

Tangents for pipe bends with plain or beveled ends: Pipe bends with the ends plain or beveled for welding can be furnished without tangents. However, for convenience in erection, it is recommended that pipe bends with beveled ends have tangents at least equal to the minimum lengths given in the table for threaded ends in column "C". Such tangents will provide space for applying jigs or clamps to line up and fasten the piping before welding.

Tangents for pipe bends with welding flanges: Pipe bends fitted with slip-on welding flanges can be furnished with a minimum length of tangent equal to the length through the hub of the slip-on welding flange being used.

Pipe bends fitted with welding neck flanges can be furnished without tangents, since these flanges may be butt-welded directly at the end of the arc of pipe bends with beveled ends.

This is only recommended when minimum dimensions must be maintained. When possible, the use of a tangent is desirable for the same reasons as outlined in the paragraph pertaining to pipe bends with beveled ends.

For dimensions of flanges, see pages 296 and 297.

Continued on page 504

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asbestosclaims.law/library/21276/274

Comments on Pipe Bends

Compound and unusual bends: Crane facilities are not limited to the production of common types of pipe bends such as shown on page 502. Compound and unusual bends can be supplied in any practical shape. Some of the photographs in this section of the catalog illustrate a few of the uncommon types made in Crane shops. Compound bends, or bends in more than one plane, do not require any tangent or straight portion between the arcs.

Long lengths of pipe: When designing or ordering pipe bends, the maximum available lengths of welded or seamless pipe should be considered.

Steel pipe is carried in stock in extra long or double random lengths for the fabrication of bends requiring long lengths of pipe, and for eliminating an intermediate joint when practical and desirable; refer to page 478.

Genuine wrought iron pipe is available only in average mill lengths of approximately 19 feet. When the required lengths are not available, two or more pieces of pipe can either be welded together or provided with intermediate flanged joints to produce a desired bend. The intermediate joint should be definitely located if it is an important factor in erection.

Shipping facilities present the only practical limit to the shape or length of pipe bends. Care must be used, when ordering large or complicated pipe bends, to keep the over-all dimensions within the maximum shipping facilities and clearances between the factory and destination.

Ends of pipe bends: Ends of pipe bends can be furnished plain, beveled for welding, threaded, or flanged. A list of all types of flanged joints will be found on pages 505 to 509.

Special materials: Pipe bends can be made from special piping materials such as brass, aluminum, nickel, Monel, silicon bronze, stainless steels and other alloy steels, as well as rubber-lined pipe. Facilities are available for heat-treating alloy steels after fabrication, if required.

Commercial pipe bends: *Pipe bends when made to approximate dimensions only*, for down-spouts, ash handling, railings, and other non-fluid and non-pressure mechanical purposes, can be furnished at prices lower than those of regular pipe bends.

Galvanizing: Pipe bends can be furnished either galvanized on the inside and outside, or galvanized on the outside only.

Painting: Pipe bends are painted on the outside as a protection against rust in transit.

Protectors: The flanged ends of all pipe bends are provided with flange protectors before shipment; threaded ends have thread protectors.

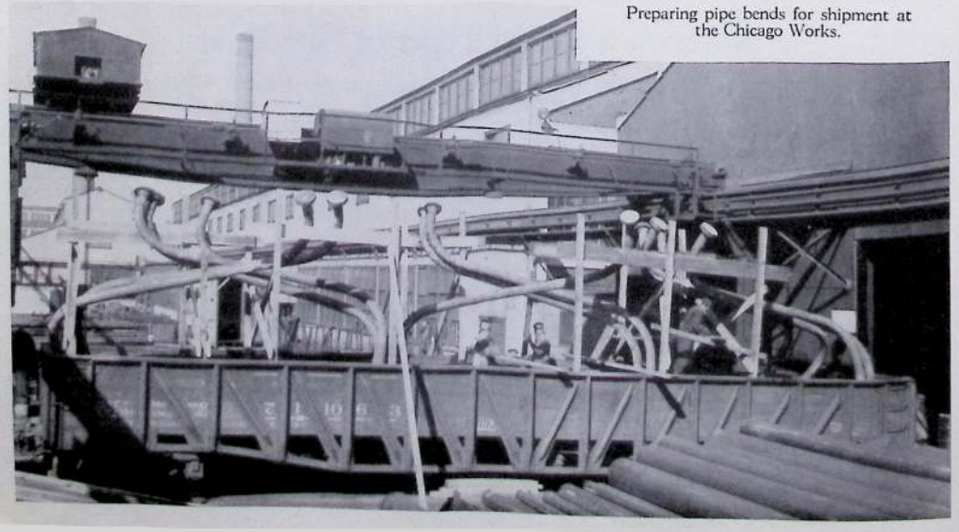
Pipe: For information on pipe, see pages 477 to 491.

Engineering data: Additional information and engineering data will be found on the following pages:

Calculating working pressure, stress, or wall thickness.....pages 541 to 545
Calculation of pipe bends.....pages 546 and 547
Length of pipe in bends.....page 548
Thermal expansion and modulus of elasticity of pipe.....page 549

Prices: Prices on all pipe bends are on application.

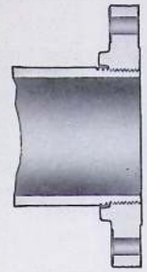
Inquiries and orders: Inquiries and orders should specify: quantity; size, weight, and kind of pipe and whether black or galvanized; complete dimensions; kind of end connections (plain, beveled, threaded, or flanged.) If flanged ends are wanted, specify the kind of flanges, facings, and type of joints.



Preparing pipe bends for shipment at the Chicago Works.

Flanging Processes

Screwed Flanged Joints

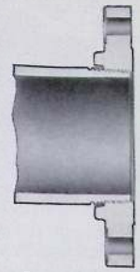


Screwed Flange Made On and Refaced

Brass Flanges.....page 188
Iron Flanges.....pages 202 to 204
Steel Flanges.....pages 291 to 298
18-8 Mo Flanges.....page 383

Drilling Templates..pages 458 to 463
Facings.....pages 510 and 511
Thread Lubricants.....page 464

The screwed flanged joint has proved its general utility and satisfactory performance, primarily for the low and moderate pressure and temperature services — especially when fabricated in the Crane shops, using proper threading and pull-up machines.



Screwed Flange Made On, Not Refaced

Application: The screwed flanged joint can be applied to straight pipe, pipe bends, the ends and nozzles of welded headers, and to the flanged ends of welded assemblies. It can be applied to butt-welded, lap-welded, and seamless steel pipe, or genuine wrought iron pipe, of practically all commercial weights and thicknesses.

Flanges: Any of the screwed flanges listed in this catalog can be used — cast iron, forged steel, and brass, straight or reducing sizes.

Special piping materials: The screwed flanged joint can be furnished on special piping materials such as brass, copper, aluminum, nickel, stainless steels, and Monel. Flanges of the same material can be furnished. Full information on application.

Threading: The threading of both the pipe and the flange is to accurate gauge. The flange is secure on the pipe after the joint is made up.

Alignment of bolt holes: Crane shop fabrication assures proper alignment of the bolt holes in all flanges. When specified, special alignment of the bolt holes can be furnished.

Screwed flange, made on and refaced: After the flange and the pipe have been properly threaded, the flange is made up tight by a powerful machine until the end of the pipe projects slightly beyond the face of the flange. A light refacing cut is then taken across both the flange face and the pipe end.

The refacing assures that the end of the pipe will be flush with the face of the flange, thus providing a proper gasket-bearing surface to the inside of the pipe. It also assures perfect alignment of the pipe.

Screwed flange, made on, not refaced: After the flange and the pipe have been properly threaded, the flange is made up tight by a powerful machine until the end of the pipe is within one-half to one thread from the face of the flange.

The Cranelap Joint

The Cranelap joint approaches more closely than any other type the function of an all-purpose flanged pipe joint. It eliminates the individual, inherent disadvantages of the other types of joints.

The Cranelap joint is predominantly the most effective and practical joint. With either plain facing or the numerous modifications, it has given such universal satisfaction over a long period of time that it is recommended for intermediate and moderately high pressure steam and water lines, and for many other difficult services. The wide range of utility and service applications makes the Cranelap joint a modern flanged joint with very few limitations.

Cranelap joints are well suited for low pressure service, particularly in those sizes where large flange diameters are employed.

In the Cranelap joint the end of the pipe is lapped to produce a square corner at the junction of the inside periphery of the pipe and the face of the lap. When bolted up, the joint is made directly on the pipe itself; there is no thread in the flange to leak under distortion due to bolting load, pressure and temperature, or expansion and contraction strains.

These laps are made by a process which is a combination of upsetting and forging, the operation being performed while the metal is at a proper forging heat.

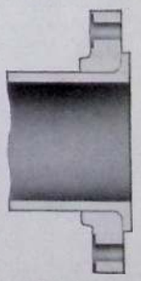
CRANELAP JOINTS

150-Pound	600-Pound
300-Pound	900-Pound
400-Pound	1500-Pound

Additional description...pages 506 and 507
Dimensions.....page 508
Facings.....pages 510 and 511

Regular Cranelap joints are made on both steel and genuine wrought iron pipe. See note on page 506.

Prices on application



Regular Cranelap Joint with plain face, serrated finish.

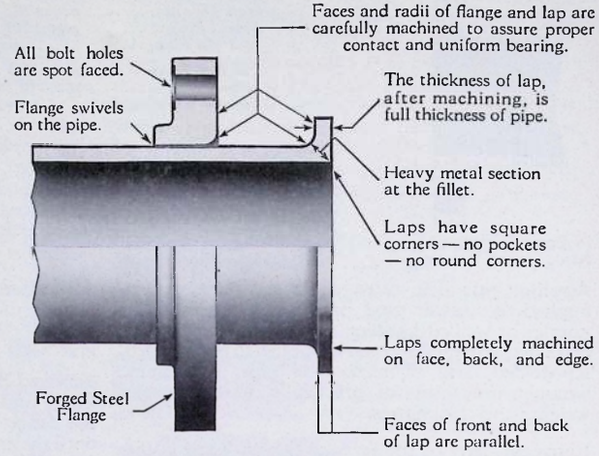
(Continued on next page)

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Flanging Processes

The Cranelap Joint (Cont.)

Features and Advantages



Square corner laps: The Cranelap joint has a square corner lap—it should not be confused or compared with a joint having a round corner lap. The square corner lap assures a smooth joint on the inside of the pipe, without a pocket or depression; it provides a metal thickness at the turn, or fillet, which is much heavier in section than the round corner lap; consequently much greater strength is developed.

Full thickness laps: The rough laps of all plain Cranelap joints are of sufficient thickness to produce, after machining both the front and the back, a finished thickness of lap equal to or greater than the wall thickness of the pipe on which the lap is made.

Male and female, tongue and groove, double thickness, ring joint, and radial back Cranelap joints have the laps of sufficient thickness to permit machining without reducing the thickness of the lap at any point to less than that of the pipe wall.

Machining of the laps and flanges: All laps are completely machined on the front, back, and edge. The back of the lap is machined to provide a face which is parallel to the front or contact face. The face and the radius of the flange are carefully machined to match the corresponding face and radius of the lap on the pipe. The bolt holes of the flanges are spot faced.

The features of the machining outlined above are important. The spot facing of the bolt holes of the flange provides a uniform bearing surface for the nuts of the bolts or studs. In addition, the facing of the flange and the parallel facing of the back and front of the lap assure an even bearing throughout the joint, and a uniform pressure on the gasket.

Swivel flanges of forged steel: Flanges on Cranelap joints swivel on the pipe, facilitating alignment of the piping. This makes erection easier, because the swivel flange accommodates itself readily to any variations in the position of adjacent bolt holes.

All flanges used on Cranelap joints are of forged steel—unbreakable, and of high strength.

Marine service: Cranelap joints comply with the regulations of the following bureaus: U. S. Coast Guard, Marine Engineering Regulations and Material Specifications—Lloyds Register of Shipping, Ships Registered in U.S.A.—American Bureau of Shipping, Special Inspection Required.

Notes on Cranelap Joints

Pipe: Cranelap joints with plain face are regularly made from lapwelded steel or lapwelded genuine wrought iron pipe, using standard, extra strong, or double extra strong weights—or from seamless steel pipe in any of the regular thicknesses.

Cranelap joints with radial back, double thickness or 200% lap, ring joint, male and female, or tongue and groove facing require the use of lap-welded or seamless steel pipe only; the pipe should have a wall thickness equal to that of extra strong or heavier weight pipe.

In sizes smaller than are obtainable in lapwelded steel pipe, all Cranelap joints are made only on seamless steel pipe. For pipe, see pages 477 to 491.

Van Stone joints: Whenever Van Stone joints are specified, Cranelap joints will be furnished.

Plain face: Cranelap joints with plain face, serrated finish, as illustrated on page 511, will always be furnished unless otherwise specified.

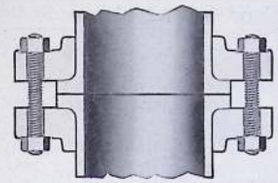
Application of Cranelap joints: Cranelap joints can be applied to straight pipe, pipe bends, the ends and nozzles of welded headers, and the flanged ends of welded assemblies.

Cranelap joints on special piping materials: Cranelap joints can be fabricated on many special piping materials—brass, aluminum, nickel, Monel, stainless steels, and numerous other alloy steels. Facilities are available for heat-treating when required. Information and prices furnished on request.

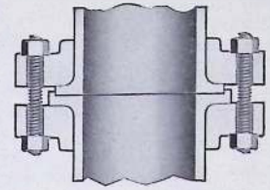
Reducing Cranelap flanges: Reducing Cranelap flanges are not furnished or recommended; another type of flanged joint or connection should be used.

Flanging Processes

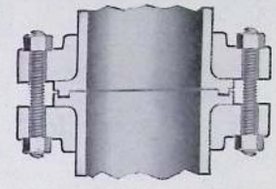
Modifications of the Cranelap Joint and Facings



Double Thickness or 200% Lap, Cranelap Joint



Large Male and Female Cranelap Joint (female in the lap)



Large Tongue and Groove Cranelap Joint

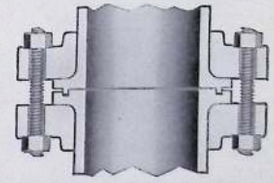
In addition to the plain face Cranelap joint shown on the preceding page, various modifications can be furnished, as shown on this page. Modified Cranelap joints require the use of lapwelded or seamless steel pipe only, and of a wall thickness equal to or heavier than extra strong weight. They are applicable to primary service pressures of 300 pounds or higher.

Modified Cranelap joints have the laps completely machined — on the face, back, and edge. All except the radial back have a straight face on the back.

Double Thickness or 200% Lap Cranelap Joints

Double thickness Cranelap joints are exactly the same as the regular Cranelap joint with plain face, except that the thickness of the lap, after machining, is twice the wall thickness of the pipe used.

For dimensions of double thickness Cranelap joints, use the dimensions of plain Cranelap flanges on page 508. A dimension of twice the wall thickness of the pipe should be used in establishing the thickness of the lap for obtaining dimension "L".



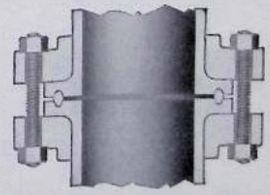
Small Tongue and Groove Cranelap Joint

Large Male and Female Cranelap Joints

In the lapped end with male face, the thickness of the lap, after machining, will be the wall thickness of the pipe used, except that the minimum thickness of lap will be ¼-inch when the wall thickness of the pipe is less than ¼-inch, such as on 2-inch and smaller extra strong pipe. In the lapped end with female face, the thickness of the lap, after machining, will be the wall thickness of the pipe used, plus the depth of the female facing.

Large or Small Tongue and Groove Cranelap Joints

In either the large tongue and groove or the small tongue and groove Cranelap joint the thickness of the lap, after machining, will be the wall thickness of the pipe used, plus the height of the tongue or the depth of the groove.



Ring Joint Cranelap Joint

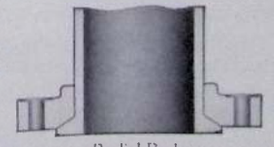
Ring Joint Cranelap Joints

The ring joint Cranelap joint is furnished with a specially designed groove which employs a steel ring, this combination making a pressure-tight joint. The joint has a thickness of lap, after machining, equal to the wall thickness of the pipe used, plus the depth of the groove. For dimensions of ring joints, see pages 470 and 471.

Radial Back Cranelap Joints

Radial back Cranelap joints derive their name from the shape of the back — they have a radial back instead of the straight back as furnished on other Cranelap joints. Regular 300, 400, 600, 900 or 1500-Pound Forged Steel Cranelap Flanges are used, except that the faces have a radius machined to fit the radius on the back of the lap on the pipe.

Dimensions of radial back Cranelap joints are furnished on application.



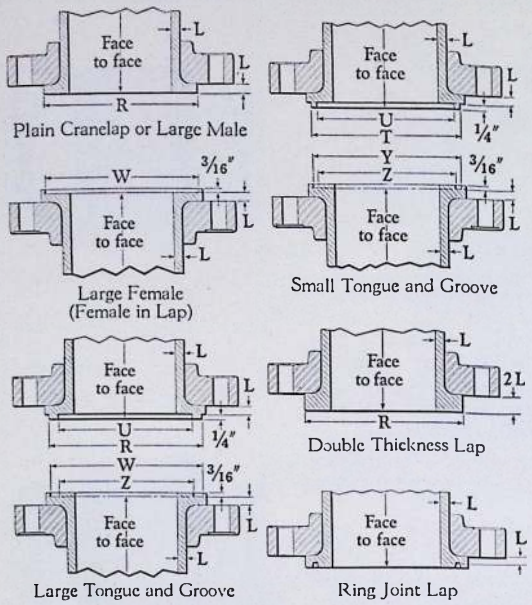
Radial Back Cranelap Joint

Prices on application ***Dimensions . . page 508***

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Flanging Processes

Dimensions of Cranelap Joints



Dimensions, in Inches

Size of pipe	R	T	U	W	Y	Z
½	1⅜	1⅜	1	1 7/16	1 7/16	15/16
¾	1 11/16	1 11/16	1 5/16	1¾	1¾	1¼
1	2	1⅞	1½	2 1/16	1 15/16	1 7/16
1¼	2½	2¼	1 7/8	2 9/16	2 5/16	1 13/16
1½	2⅞	2½	2⅛	2 15/16	2 9/16	2 1/16
2	3⅝	3¼	2⅞	3 11/16	3 5/16	2 13/16
2½	4⅛	3¾	3⅜	4 3/16	3 13/16	3 5/16
3	5	4⅝	4¼	5 1/16	4 11/16	4 3/16
3½	5½	5⅛	4¾	5 9/16	5 3/16	4 11/16
4	6 3/16	5 11/16	5 3/16	6¼	5¾	5⅛
5	7 5/16	6 13/16	6 5/16	7⅜	6⅞	6¼
6	8½	8	7½	8 9/16	8 1/16	7 7/16
8	10⅝	10	9⅜	10 11/16	10 1/16	9 5/16
10	12¾	12	11¼	12 13/16	12 1/16	11 3/16
12	15	14¼	13½	15 1/16	14 5/16	13 7/16
14 OD	16¼	15½	14¾	16 5/16	15 9/16	14 11/16
16 OD	18½	17⅝	16¾	18 9/16	17 11/16	16 11/16
18 OD	21	20⅛	19¼	21 1/16	20 5/16	19 3/16
20 OD	23	22	21	23 1/16	22 1/16	20 15/16
24 OD	27¼	26¼	25¼	27 5/16	26 5/16	25 5/16

This schedule of dimensions conforms to the American Steel Flange Standard (B16e-1939).

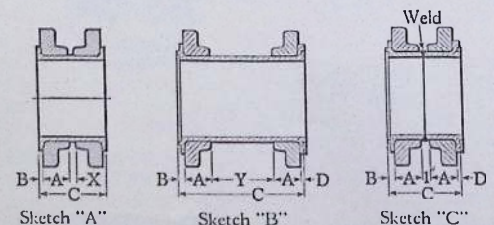
Plain Cranelaps are regularly made on lapwelded steel or genuine wrought iron pipe, using standard, extra strong, or double extra strong weights — or on seamless steel pipe, using any regular thickness. Plain Cranelaps are applicable to all pressure classes, i.e. 150-Pound and higher; the thickness of the lap is the same as the thickness of the pipe wall.

Male and female, tongue and groove, double thickness or 200% lap, and ring joint Cranelaps require the use of lapwelded or seamless steel pipe only, and of a wall thickness equal to or heavier than extra strong weight, except that the minimum lap thickness on the male for large male and female joints will be ¼-inch where the pipe wall thickness is less than ¼-inch (i.e. extra strong weight pipe, sizes 2-inch and smaller). These Cranelaps, called "modified Cranelaps", are applicable to the 300-Pound and higher pressure classes only.

Dimensions of radial back Cranelaps are furnished on application. For dimensions of grooves on ring joint Cranelaps, refer to pages 470 and 471.

Description . . . pages 505 to 507 *Cranelap Flanges . . . pages 291 to 297* *Ring Joints . . . . pages 470 and 471*

Minimum Face to Face of Piping with Cranelap Joints



The minimum face to face dimensions of straight pipe with Cranelap joints are obtained as follows:

Sketch "A": Formula for straight pipe with plain face Cranelap joints:

C=X+2(A+B) Where X=16½" on 1 to 1½" pipe
X=26" on 2" pipe
X=1" on 2½" and larger pipe

Sketch "B": Formula for straight pipe with the modified Cranelap joints—male and female, tongue and groove, ring joint, radial back, and double thickness lap:

C=Y+(2A)+B+D Where Y=16½" on 1 to 1½" pipe
Y=26" on 2 and 2½" pipe
Y=10" on 3" and larger pipe

Sketch "C": The minimum face to face outlined for sketch "B" can be reduced if a butt weld is located between the flanges, as illustrated in "C".

If the procedure of sketch "C" is followed, the minimum face to face of straight pipe with the modified Cranelap joints is in accordance with the formula:

C=1"+(2A)+B+D

Flanging Processes

Welded Flanged Joints

Welded flanged joints can be furnished in the types illustrated here.

The Cranelap stub ends with Cranelap flange, also illustrated, affords an auxiliary flanged connection for welding.

Application: Any of the welded flanged joints shown at the right can be applied to straight pipe, pipe bends, the ends and nozzles of welded headers, and the flanged ends of welded assemblies. Special shop equipment assures the perfect alignment of flange faces on all Crane Welded Flanged Joints.

Welding: The shop welding of these flanged joints is performed by Crane welders working under approved procedure control.

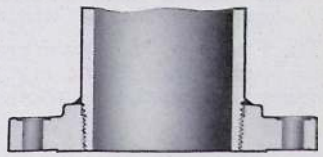
Special piping materials: These types of welded flanged joints can be furnished on many special piping materials, including numerous alloy steels, with facilities for heat-treating after fabrication.

Information and prices furnished on application.

Forged Steel Screwed Flange, Seal-Welded

A Crane Forged Steel Screwed Flange is used in this joint. The pipe and the flange are accurately threaded; the flange is made up tight on the pipe, seal-welded, and then refaced. The joint is sealed by fillet-welding the back of the flange to the pipe, thus assuring no leakage through the threads.

The refacing assures perfect alignment of the flange faces, and that the end of the pipe is flush with the face of the flange for a proper gasket-bearing surface to the inside of the pipe. The threads retain the function of holding the flange securely on the pipe, hence there is no shearing action.



Screwed Flange
Seal-Welded and Refaced

Forged Steel Welding Neck Flange

Crane Welding Neck Flanges are of forged steel. They are machined with a beveled end and bored to match the inside diameter of the pipe to which they are applied. A butt-weld is used to attach the welding neck flange to the pipe, which is also machine beveled.



Welding Neck Flange
Butt-Welded to Pipe

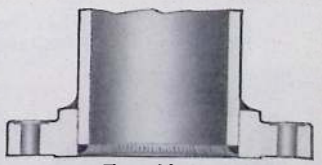
Forged Steel Slip-On Welding Flange

Crane Forged Steel Slip-On Welding Flanges are bored for a snug fit on the pipe and, when applied to fabricated piping, are welded at the front and back through the two methods defined below and illustrated at the right.

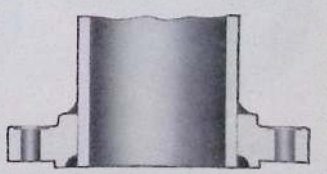
Type No. 1: Type No. 1 is Crane standard for welded flanged joints on carbon steel and genuine wrought iron piping with 150 and 300-Pound Forged Steel Slip-On Welding Flanges. Regular flanges are utilized with the end of the pipe set back from the face of the flange and the flange welded to the pipe both in front and back. Type No. 2 for this class of piping is furnished on special order only.

Type No. 2: Type No. 2 is Crane standard for welded flanged joints on carbon steel and genuine wrought iron piping with 400-Pound or higher pressure class forged carbon steel flanges, and for all iron-pipe-size alloy piping where alloy flanges of all pressure-classes are used. Slip-on flanges with a special front groove for welding are used. The pipe is flush with the flange face; this is accomplished by refacing after both the front and back of the flange are welded to the pipe.

Code limitation: When piping must comply with either the Pressure Piping Code or the A.S.M.E. Unfired Pressure Vessel Code, the use of the slip-on welding flange joint is limited to a primary service pressure rating of 300 pounds per square inch.



Type No. 1
Slip-On Welding Flange
Welded Front and Back

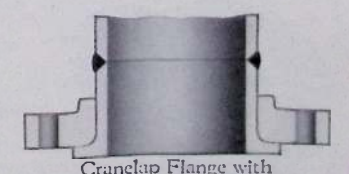


Type No. 2
Slip-On Welding Flange
Welded Front and Back
and Refaced

Cranelap Stub Ends and Cranelap Flange

The Cranelap stub end with Cranelap flange can be applied to fabricated piping. Both the stub end and the pipe are machine beveled. A butt-weld is used to complete the joint.

This type of joint has all of the advantages of the regular Cranelap joint, as described on pages 505 to 507. In most cases, piping can be fabricated with Cranelap joints applied directly, which eliminates the weld necessary for the application of the Cranelap stub end with Cranelap flange.



Cranelap Flange with
Cranelap Stub End
Butt-Welded to Pipe

Facings . . . pages 510 and 511
Flanges . . . . pages 291 to 298 *Cranelap Stub Ends . . . pages 280 to 283* *Welding Fittings*

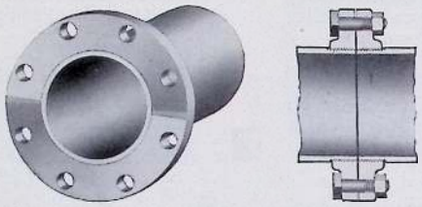
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Flange Facings and Finishes

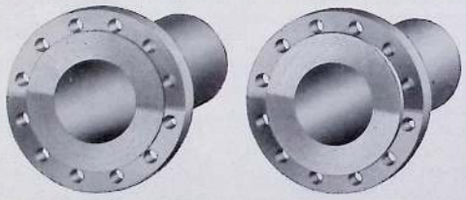
Crane Fabricated Piping includes a variety of facings and finishes for flanged joints. Shown and described on these pages are details of those regularly furnished on flanged joints in the many pressure classes. Also shown and described are other facings and finishes available on special orders.

The word "facing" refers to the type of face that is machined on flanges or lap joints. It should not be confused with the word "finish", which refers to the kind of finish that is applied to the actual contact surface of the face. For example, the "facing" on a flange machined with a ¼-inch high projection is commonly known as a "¼-inch high male face", but the "finish" on the contact surface of the male projection can be either "serrated" or "smooth".

There are many finishes in general use for flange and lap joint facings. Crane, in regular practice, employs either the serrated or smooth finish.

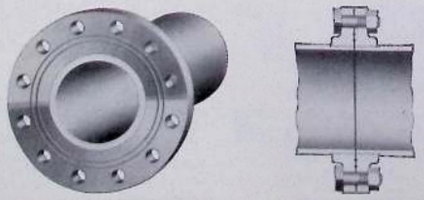


Plain Face
Smooth Finish



1/16-inch High Raised Face
Serrated Finish

¼-inch High Male Face
Serrated Finish



Plain Face
Smooth Finish—"V" Grooved

Serrated finish: The machining of faces with this finish is accomplished with a round nose or form tool which cuts concentric grooves. On cast iron and ferrosteel flange facings there are approximately 16 serrations to the inch, and on steel flange facings, approximately 32 serrations to the inch.

Smooth finish: The machining of faces with this finish is accomplished with tools which leave an even, uniform surface, designated as "smooth".

Caution: Although not used by Crane, the term "plane face" is sometimes encountered. It usually means "smooth finish". As it is not a "facing" and is often confused with plain (or flat) face, the use of the term is misleading and should be avoided.

Iron and steel flanged joints—regular practice: Flanged joints when using 125-Pound Cast Iron or Ferrosteel Screwed Flanges are regularly furnished plain faced with smooth finish. Serrated or special finishes can be furnished but at an extra charge.

Flanged joints when using 250-Pound Cast Iron or Ferrosteel Screwed Flanges, and 150-Pound or 300-Pound Forged Steel Screwed, Welding Neck, or Slip-On Welding Flanges are regularly furnished with a 1/16-inch high raised face having a serrated finish. Smooth or special finishes and special facings can be furnished but at an extra charge.

Raised faces should be removed from 150-Pound Steel Flanges before bolting against 125-Pound Iron Flanges, and only a full face gasket should be used.

Flanged joints utilizing steel valves and fittings with 400, 600, 900, 1500, or 2500-Pound Forged Steel Screwed, Welding Neck, or Slip-On Welding Flanges bolted on are regularly furnished with a ¼-inch high large male face with serrated finish on the end flanges and a 3/16-inch deep large female face with smooth finish on the companion flanges.

Special facings, and smooth or special finishes on male faces can be furnished but at an extra charge.

Brass and bronze flanged joints: Flanged joints when using brass or bronze flanges are regularly plain faced with smooth finish and "V" grooved. Full face gaskets should always be used when assembling all brass or bronze joints. Metallic gaskets are not recommended.

Raised faces should be removed from iron and steel flanges before bolting against brass or bronze flanges.

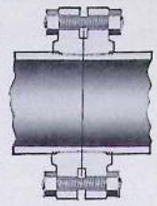
Brass Flanges.....page 188
Iron Flanges.....pages 202 to 204
Steel Flanges.....pages 291 to 298
Templates for drilling.....pages 458 to 463
Dimensions of special facings.....pages 468 to 471

Flange Facings and Finishes (Cont.)

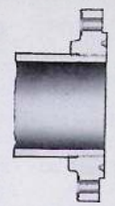
¼-inch High Double Male
Large Male and Female
Small Male and Female

Ring Joint
Large Tongue and Groove
Small Tongue and Groove

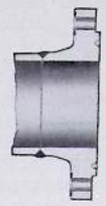
Flanged joints, when using 300, 400, 600, 900, 1500, and 2500-Pound Forged Steel Screwed, Welding Neck, or Slip-On Welding Flanges, can be furnished with ¼-inch high double male, large male and female, small male and female, large tongue and groove, small tongue and groove, and ring joint facing.



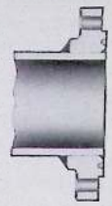
¼-inch High Double Male



Ring Joint on Screwed Flange



Ring Joint on Welding Neck Flange



Ring Joint on Slip-On Welding Flange

Flanged joints, when using 150-Pound Forged Steel Screwed, Welding Neck, or Slip-on Welding Flanges, can be furnished with ring joint facing. The ring joint face is also furnished on Cranelap joints; see page 507.

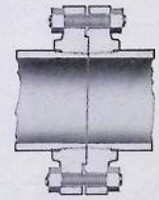
The ring joint facing should not be used with or against iron, brass, or bronze valves, flanges, or fittings.

Finish: Male faces are regularly furnished with serrated finish. Female faces, tongue faces, and groove faces are regularly furnished with smooth finish.

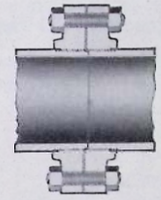
Smooth finish can be furnished on the male faces when ordered; special prices will apply.

Caution: Care should be taken in the use of small male and female joints to insure that the pipe is thick enough to permit sufficient bearing surface to prevent crushing the gasket.

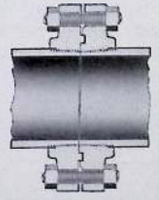
Gaskets: For best results, when corrugated copper and corrugated soft iron gaskets are used, they should be coated with Crane High Temperature Thread Compound. See pages 474 to 476 for gaskets and page 464 for thread compound.



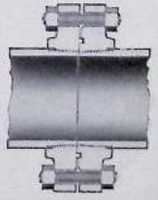
Large Male and Female



Small Male and Female



Large Tongue and Groove



Small Tongue and Groove

Cranelap Joint Facing Finishes

Regular Cranelap joint: The regular Cranelap joint with raised face is regularly furnished with a serrated finish, approximately 32 serrations per inch. Smooth finish can be furnished when specified.

Modified Cranelap joints: The modified Cranelap joint facings are finished as follows:



Cranelap Joint — Plain Face
Serrated Finish

Radial back and double thickness lap Cranelap joints with raised face are regularly furnished with a serrated finish, approximately 32 serrations per inch. A smooth finish can be furnished when so specified on orders.

On large male and female, large tongue and groove, and small tongue and groove Cranelap joints, the male faces are regularly furnished with a serrated finish (approximately 32 serrations per inch), and the female, tongue, and groove faces are regularly furnished with a smooth finish. Smooth finish can be furnished on the male faces when specified.

Gaskets: For best results, when corrugated copper and corrugated soft iron gaskets are used, they should be coated with Crane High Temperature Thread Compound. See pages 474 to 476 for gaskets and page 464 for thread compound.

Dimensions of Cranelap Joints....page 508

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Crane Welded Piping

Crane Fabricated Piping includes a wide variety of shop welded product — headers, welded assemblies receiver separators, vessels, etc. — for all current operating pressure and temperature services.

The welding of shop fabricated piping probably finds its greatest usefulness in the production of welded headers from pipe.

A few of the advantages of welded headers are: the elimination of joints; a saving in weight; a conservation of space when necessary; the location of branches or nozzles at any desired, practical intervals; continuity of insulation; and the freedom to apply any type of joint to the nozzles or connections.

Shop fabrication of welded headers is recommended. See page 499 for the "Advantages of Crane Shop Fabrication".

For information on the dimensions and design of Crane Welded Headers, see pages 516 and 517.

Welding processes: All modern methods of fusion welding are employed in the fabrication of Crane welded piping.

When orders do not specify which process should be used, Crane employs the method best adapted to the character of the work and which will produce the best results.

Codes; qualification of welders: Crane welded piping can be fabricated to conform to the requirements of the various codes. Crane welders must pass tests in accordance with the A.S.M.E. Unfired Pressure Vessel Code and the A.S.A. Code for Pressure Piping. The qualifications are for various methods of welding.

Stress relieving: Crane welded piping will be stress relieved in accordance with the codes. Welded nozzles, in both the unreinforced and reinforced types, and other welds are stress relieved when it is considered necessary, even though the codes do not stipulate that stress relief is required.

The practice of stress relief as outlined above will be followed unless orders or inquiries specify otherwise.

Notes on Crane Welded Piping

Ends of welded piping: Welded headers and piping can be supplied with the ends plain, beveled for welding, threaded, or flanged, utilizing any of the types of flanged joints which are listed; see pages 505 to 511.

Long lengths of pipe: When designing or ordering welded headers and piping, consideration should be given to the maximum lengths of welded or seamless pipe available; see page 478.

When the necessary lengths are not available, two or more pieces of pipe can be welded together or provided with intermediate flanged joints to produce the desired header or welded assembly. Any intermediate joint should be definitely located if its location is an important factor in erection.

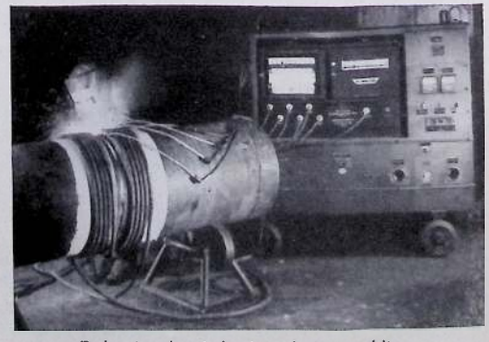
Shipping facilities present the only practical limit to the shape or length of welded headers and assemblies. Care must be used to keep the over-all dimensions within the maximum shipping facilities and clearances between factory and destination.

Special materials: Facilities are available for welding or brazing into various types of fabricated assemblies, piping materials such as brass, copper, aluminum, and Monel.

Numerous alloy steels, including stainless steels, also can be welded. Facilities for heat-treating alloy steels after fabrication are available when required. Crane shops have welding rods and electrodes for welding alloy steels which give the deposited metals approximately the same characteristics as the parent metals. Details on special materials will be furnished on application.

Galvanizing: Welded headers and welded piping can be furnished galvanized on the inside and outside, or galvanized on the outside only. The galvanizing is done after fabrication. Information on application.

Inquiries and orders: Inquiries or orders for welded products should specify the quantity; the dimensions; size, weight, and kind of pipe; also if the ends are to be plain, beveled for welding, threaded, or flanged. If flanged, the kind of flange, facing, and type of joint should be specified. It is advisable to have a sketch accompany all orders or inquiries.



Preheating by induction during welding. Piping is stress relieved by the same method.

Pipe . . . pages 477 to 491

Crane Welded Piping (Cont.)

Types of Welds



Butt Weld
For metal thickness of ¾-inch or less



Butt Weld
For metal thickness greater than ¾-inch



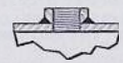
Butt Weld
With machined backing ring for any metal thickness



Welded Coupling
Threaded



Welded Coupling
Bored for Socket Welding



Welded Pad
Threaded
(Also made Socket-Welding)

There are numerous types of welds for various connections and purposes. Those in general use are as follows:

Butt welds: Two types of butt welds furnished are shown at the upper left—one is for light sections, and one for heavy sections. All piping is machine-beveled before butt welds are applied.

Butt welds with machined (illustrated at the left) or plain backing rings, can also be furnished.

Welded couplings and welded pads: Smaller sizes of screwed and socket-weld connections are furnished in two types—welded couplings and welded pads, as illustrated at the lower left.

For welded couplings, the regular practice is to use a half coupling of either the extra heavy seamless, the 3000-Pound W.O.G., or 6000-Pound W.O.G. Steel pattern. One end is beveled and the weld is made as illustrated. For welded pads, the regular practice is to use a section of steel bar stock or a forged steel pad. One end is beveled, the weld is made, and the opening is drilled and tapped, or bored for socket-welding, as the final operation. WeldOlets can also be supplied; see page 287. Orders and inquiries should specify type wanted.

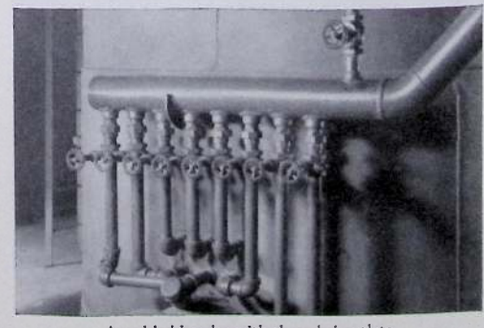
Welded nozzles: Crane Fabricated Piping utilizes two types of welded 90° or angular nozzles — the "standard type" which is not reinforced, and the "reinforced type" which provides reinforcement of the nozzle weld. One of two types of welds is used; see illustrations at the right.

Reinforcing of welded nozzles will be done as required by the customer and in accordance with the A.S.M.E. Unfired Pressure Vessel Code or the A.S.A. Pressure Piping Code, when compliance with these Codes is mandatory.

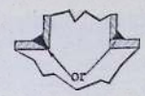
The ring type of reinforcement will be furnished in the absence of definite specifications on orders for fabricated piping with reinforced welded nozzles.

Other types of reinforcement can be furnished according to individual specifications, when so stipulated.

Mitre weld: The mitre weld, illustrated at the right, may be used for fabricated piping, especially in the larger sizes, or for unusual conditions.



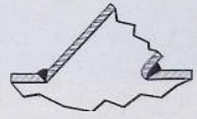
A welded header with threaded outlets.



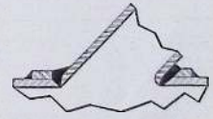
90° Nozzle Weld
Standard Type



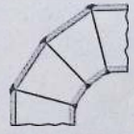
90° Nozzle Weld
Reinforced Type



Angular Nozzle Weld
Standard Type



Angular Nozzle Weld
Reinforced Type



Mitre Weld



Welded End Closure

The use of pipe bends or welding elbows is recommended in preference to mitre welds. However, where space or design limitations require, or when suitable welding elbows are not available, mitre welding can be used. Mitre welds are made up of various combinations of segments, angles, etc., and must be designed for each condition encountered.

Welded end closure: The welded end closure regularly furnished is illustrated above. Crane Welding Caps (ellipsoidal shape) are used unless otherwise specified. For welding caps, see pages 281 and 283. Other types, such as flat head, dished head, etc., can be furnished when ordered.

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Unit Fabrication
Piping and Valves

Piping specifications for central stations and industrial power plants have undergone many changes in recent years, especially since piping materials have been developed to meet the demands of the extremely high pressures and temperatures prevalent today.

Long, patient, and intelligent engineering research and experiment have developed new equipment and alloys capable of handling pressures and temperatures which would have seemed fantastic but little more than a decade ago. It follows that as service demands become more severe, piping materials themselves must and do meet the challenge of more exacting design, materials, and construction.

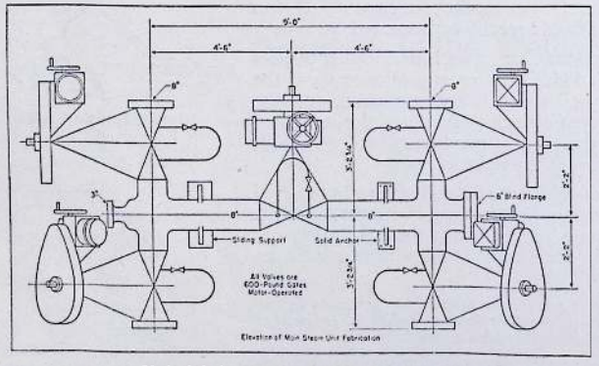
The present trend in power plant design is to make the main steam headers large in diameter and relatively short in length. Stop valves for boiler, turbine, and auxiliary leads can be grouped closely on such a header. Feed water headers and auxiliary or service assemblies follow this trend.

Among the many innovations contributing to the efficiency of modern piping materials, welding has played an important part. That, in turn, has pointed the way to shop fabrication of headers, assemblies, and even complex piping units. These can be delivered complete to the job, thereby saving considerable time in installation costs, as well as assuring compliance with the strictest intent of the design and dependable performance when placed in operation.

Where installations suggest that welding end valves and headers are preferred, it is becoming common practice to have the header with its valves and other piping welded into convenient assemblies. Suitable flanged or beveled end connections can be provided so the assemblies may be connected to adjacent flanged or welded piping lines.

There are many advantages in having piping units fabricated in the shop, as portrayed on pages 499 to 501, 512 and 513.

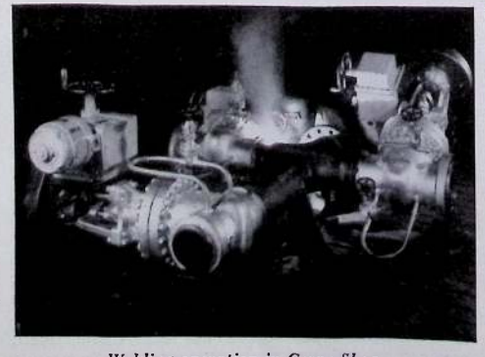
A secondary but important consideration is that a modern fabricating shop has the facilities needed to care for all possible emergencies and unusual requirements. Unavoidable last minute changes or additions, the replacement of a component part of an assembly which occasionally fails under test, and realignment after fabrication are but a few of the contingencies encountered and overcome daily in the shop fabrication of complete assemblies.



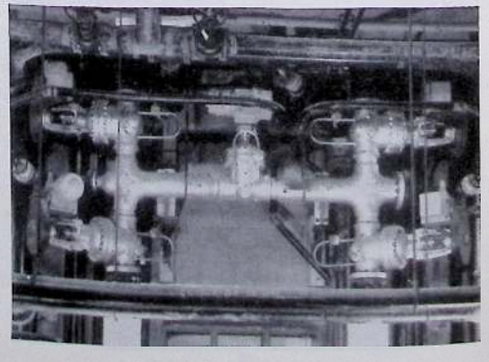
Unit fabrication in the blueprint stage.

The illustrations are an example of Crane Unit Fabrication—from the drawing board—through manufacture—and finally, installed in the piping system.

This 8-inch assembly for the steam distribution system of a central station is operating at 550 pounds pressure and 850° F. temperature. The total weight is 12,500 pounds.



Welding operation in Crane Shop.



The completed installation.

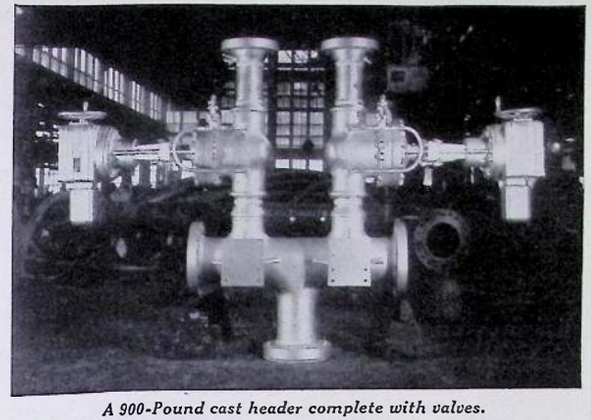
Unit Fabrication
Piping and Valves (Cont.)

It is generally agreed among engineers that headers and major piping assemblies, such as those illustrated, are the heart of the main steam, boiler feed, and auxiliary lines in high-pressure high-temperature power plants.

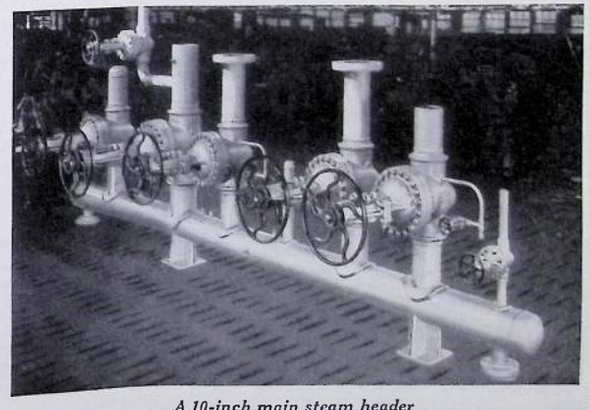
Some of the illustrations on these pages show cast carbon-moly steel headers. These are gaining in favor where the required length permits their use. This design permits the application of liberal radii for nozzle outlets, thus providing better flow characteristics. Velocities have been speeded up to a point where the effect of cavitation at the outlet nozzles of a header may reach serious proportions. This is minimized through the careful nozzle design possible in a cast header.

In large header structures involving many outlets, the problem of reinforcing is overcome through the exacting design of a casting, and uniform results can be predicted from the final annealing operation.

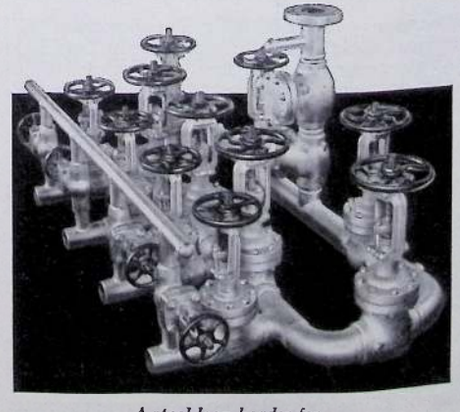
While most of the illustrations show assemblies for higher pressures and temperatures, the plan of pre-fabricated assemblies is also applicable to lower pressure jobs.



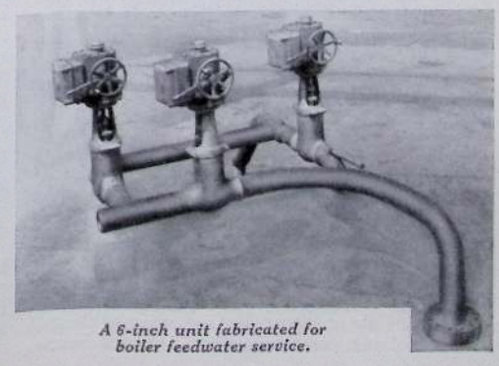
A 900-Pound cast header complete with valves.



A 10-inch main steam header for central station installation.



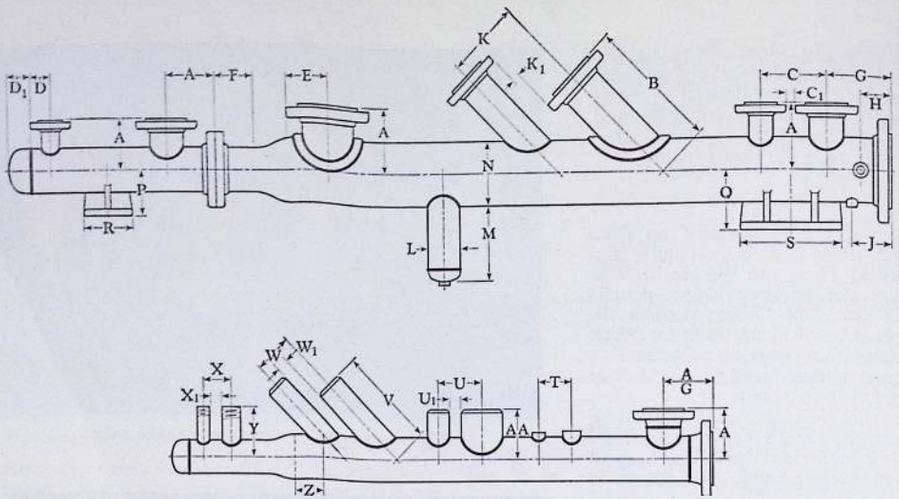
A steel loop header for boiler feedwater service.



A 6-inch unit fabricated for boiler feedwater service.

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Dimensions of Crane Welded Headers



Design recommendations: It is impossible to outline in complete detail fixed recommendations for the dimensions of welded headers, because the specific requirements often necessitate the use of special or unusual dimensional design. However, for the major portion of ordinary requirements, it is possible to keep within the limitations of standard practice.

To this end, the composite header sketches shown above and the data following are presented as a guide for designing and for determining the dimensions of welded headers.

Caution: In the data following, reference is made, in many cases, to recommended minimum dimensions. The principles of good header design preclude the use of these minimum dimensions, and consequent close clearances, except when necessary.

As an example, refer to dimension "C" (center to center of adjacent flanged end nozzles) in the sketch above and in the data section following, and note that the recommended minimum should be used only when close nesting of the branch outlet piping is required, or when the space for the header length is limited. Obviously, the use of the minimum dimension "C" is not desirable when greater spacing of adjacent nozzles can be effected.

Recommended minima: While the recommended minimum dimensions appearing in the following data are accurate for general purposes, slight variations are possible. For specific problems of this nature, full information will be furnished upon receipt of inquiries, which preferably should be accompanied by a sketch.

Dimensions "A" and "B": The center to face dimension of flanged end welded nozzles should be the same as the corresponding dimension of flanged fittings of similar pressure rating and of similar type.

Dimensions "C"-"C_1" and "K"-"K_1": The recommended minimum center to center dimension of adjacent flanged end welded nozzles should be one-half the diameter of one outlet flange, plus one-half the diameter of the other outlet flange, plus one inch (1"). This will provide sufficient clearance for welding the nozzles to the header and also for bolting up the adjacent flanged joints.

If the nozzle welds are reinforced, certain types of reinforcement may require more than one inch of clearance between adjacent flanges of nozzles. However, if ring reinforcement is used, this qualification does not apply, as the one inch clearance between adjacent flanges (dimensions "C_1" and "K_1") provides sufficient clearance for the application of welded reinforcing rings.

Dimensions "D" and "E": The dimension "D" (center of welded nozzle to center of the butt weld of an end closure) and the dimension "E" (center of welded nozzle to the beginning of a swedged reduction in the diameter of the header) should not be less than one-half the diameter of the flange on the welded nozzle.

Dimension "D_1": For dimensions of the welding caps used for end closures, see page 286. See pages 280 to 283 for description of caps.

Dimensions of welding caps used for end closures for pipe heavier than extra strong will be furnished on application.

Dimension "F": The minimum lengths of tangents on swedged or reduced ends should be the same as the minimum tangents used on pipe bends. See column "C" in the table on page 503 and the notes relating to tangents on page 502.

Dimensions of Crane Welded Headers (Cont.)

Dimension "G": When the diameter of the welded nozzle is smaller than the diameter of the header, it is possible, in some instances, to make the dimension from center of nozzle to face of header flange less than the normal dimension ("A"), which is the corresponding flanged fitting dimension.

Dimension "G" should not be less than one-half the diameter of the outlet flange, plus the length through the hub of the header flange (including welding neck type), plus any additional space, if necessary, for the insertion of bolts.

Dimension "H": The pipe connection for flow meter purposes should be located according to the requirement of the flow meter manufacturer. However, clearance for the hub of the flange is necessary.

Dimension "J": Welded coupling nozzles or welded pads for a drain or other purposes should be so located that dimension "J" provides ample clearance for the hub of the header flange, and also for the insertion or removal of the bolts for the header flange when piping is connected to the welded coupling nozzle or pad.

Dimensions "L" and "M": The diameter of welded drip pockets ("L") should be approximately one-half to two-thirds of the diameter of the header ("N"). The length of welded drip pockets ("M") should be, as a recommended minimum, approximately two to three times the diameter ("L"). It is recommended that the drain connection be not less than 1-inch, also that the size should be based on the service requirement.

For low pressure saturated steam lines, drip pockets should be larger than those used on high pressure superheated steam lines, because more condensate will be present in the low pressure saturated steam lines than in the high pressure superheated steam. Drip pockets should not be located immediately opposite and below a vertical branch outlet of a header, because the flow from the header through the vertical branch will produce a syphonic action and render the drip pocket partially or even entirely ineffective, especially when a high velocity of flow is employed.

Dimensions "P" and "Q": The fabrication of headers by welding readily permits variations in the location, design, and dimensions of supports and anchorage bases.

In the absence of any special requirement, it is recommended that the dimension "P" (center of header to face of base support) and the dimension "Q" (center of header to face of anchorage base) be the same as the corresponding dimensions of base fittings of similar pressure rating and of similar type.

These recommended dimensions provide clearance for insulation.

Dimensions "R" and "S": The dimensions of the support bases ("R") should be the same as the corresponding dimensions of base fittings of similar pressure rating and type.

The dimensions of anchorage bases ("S") should be larger than those of support bases and should be developed to suit the conditions.

When bases are to be drilled for bolts, the size and the location of the holes should be specified. When an anchorage base is used; it should be bolted securely; however, the supporting base should then be free, in order not to interfere with the longitudinal movement of the header when expanding or contracting.

Dimension "T": The minimum center to center dimension of adjacent welded coupling nozzles or welded pads ("T") is governed by the pipe sizes of these connections. Adequate space should be provided for the installation of any valves, unions, etc., in the connected piping.

Dimensions "AA", "V", and "Y": It is recommended that the center to end dimension of beveled end welded nozzles ("AA" and "V") and threaded end welded nozzles ("Y") be the same as the center to face dimensions of corresponding flanged fittings of similar pressure rating and type.

When necessary, it is possible to reduce dimensions "AA", "V", and "Y" below the standard recommended above, but in such a case care should be used to have these dimensions of adequate length for proper butt-welding or screwing-up of the branch piping to the ends of the nozzles in the header.

Dimensions "U"-"U_1", "W"-"W_1", and "X"-"X_1": The minimum center to center dimension of adjacent beveled end or threaded end welded nozzles is governed by the pipe sizes of these nozzles. Adequate space should be provided for the installation of any valves, unions, flanges, etc. in the piping connected to the nozzles.

It is also necessary that the dimensions "U_1", "W_1", and "X_1" be of sufficient length to provide adequate space for the welding of the nozzles to the header.

Dimension "Z": The dimension "Z" can be determined by the same formula used for dimension "E", i. e., the same as one-half the flange diameter on a 90° welded nozzle.



A Crane fabricated header, welded and flanged.

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Pipe Coils

Pipe coils can be obtained in varied designs and sizes, dependent upon the space available for installing, and other factors. They provide a practical, efficient, and economical means for the transfer of heat from one fluid to another.

Crane fabricating shops, located for nation-wide service, are equipped to produce the complicated types of pipe coils as well as the simple or standardized types.

Materials: Carbon steel pipe, seamless or welded, of standard or extra strong weights, predominate the pipe coil field, although other tubular materials are available. Seamless pipe, rather than butt-welded or lap-welded, is recommended, to overcome any possible leakage in service.

Testing, stress-relieving, and heat-treating: Crane regularly tests all pipe coils either hydrostatically, or on air, before shipment. Special tests will be made if indicated in the order. Facilities for stress-relieving or heat-treating coils made from carbon, or alloy steels, or other materials, are available. Details will be furnished on application.

Dimensional tolerances: Commercial pipe coils are subject to certain manufacturing tolerances in dimensions. Additional information on this subject will be furnished on request.

Galvanizing: Pipe coils can be furnished galvanized on the outside only. It is possible, however, in limited instances, to galvanize on the inside as well.

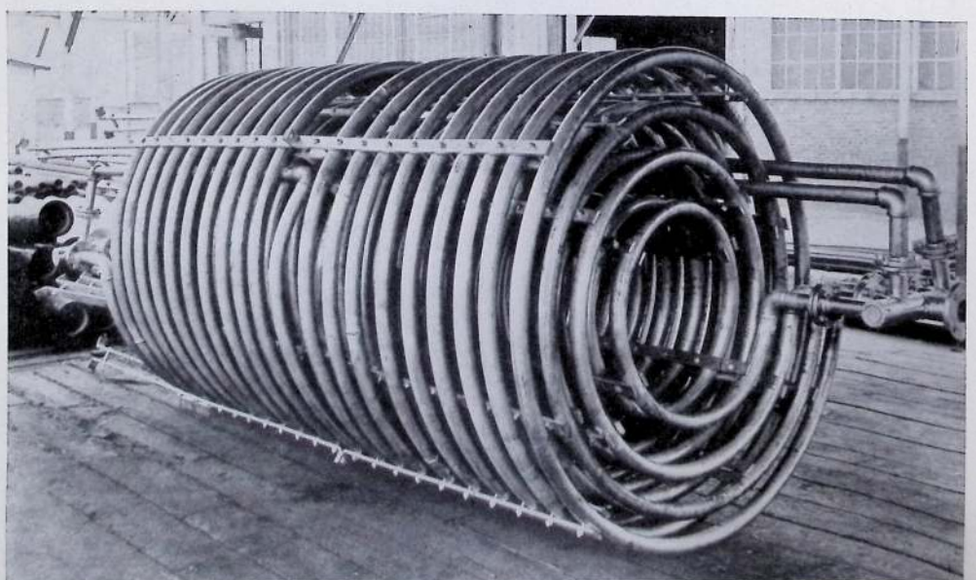
Painting: Unless specified in detail on the order, all pipe coils are shipped unpainted.

Straps and supports: Straps will be furnished for all types of pipe coils if the over-all size is large enough to warrant support for maintaining their shape in shipment. These straps can be used as supports in installation.

Welded headers: To conserve space, save weight, and eliminate many joints, welded headers are recommended for connecting the inlets and outlets of two or more pipe coils used in a battery. For further information on Crane Welded Headers, refer to pages 516 and 517.

On the following pages are illustrations of pipe coils more commonly used.

For additional information on common types available, dimensional tolerances, straps, supports, and engineering data, request a copy of Circular No. 318 from the nearest Crane branch.



Unusual assembly of multiple cylindrical pipe coils. Coils 3 feet, 4 feet, 5 feet, and 6 feet in diameter. Notice the fabricated header on this coil, specially designed to provide flanged connections. Fabricated in the Birmingham Shop.

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Pipe Coils (Cont.)

Cylindrical

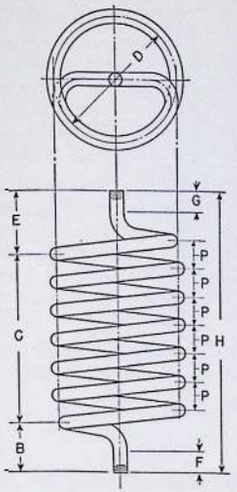


Figure No. C-1

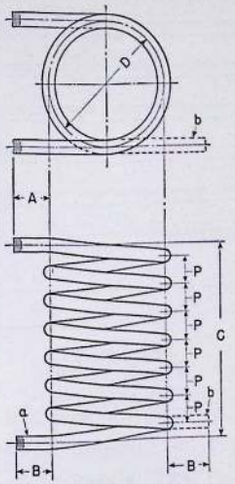


Figure No. C-6
Shown by solid lines.

Figure No. C-7
Outlet shown by dotted lines.

Double Cylindrical

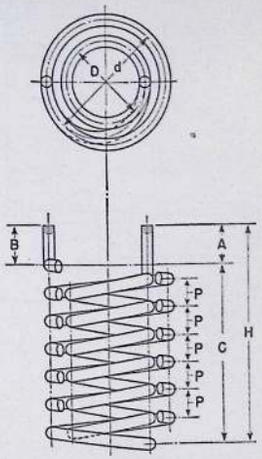


Figure No. DC-1
As shown

Triple Cylindrical Pipe Coils can also be furnished

Inlets and outlets: Inlets and outlets are identified by markings "a" and "b."

The inlet or outlet locations may be in positions other than shown in these illustrations. If required in other positions, provide those details in a sketch.

Tangents: The illustration of Figure No. C-1 shows how required lengths of tangents may be specified by inserting dimensions "F" and "G." If a specific length of tangent must be maintained, include that information in detail.

Flat Spiral

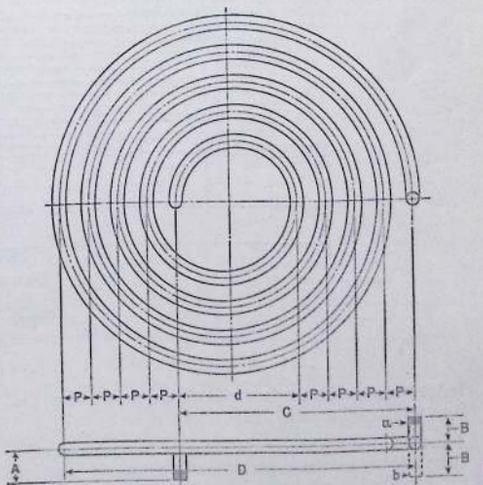


Figure No. FS-1
Shown by solid lines

Figure No. FS-2
Outlet shown by dotted lines

Minimum dimensions..... page 521

41

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Pipe Coils (Cont.)

Flat Type

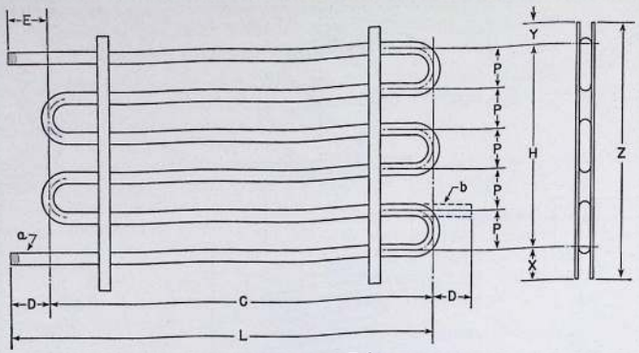


Figure No. F-3
Shown by solid lines

Figure No. F-4
Outlet shown by dotted lines

Oval Type

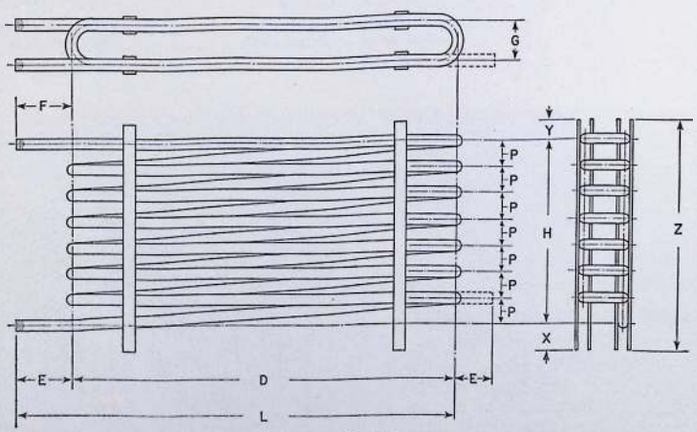


Figure No. O-3
Shown by solid lines

Figure No. O-4
Outlet shown by dotted lines

Inlets and outlets: Inlets and outlets are identified by markings "a" and "b."

The inlet or outlet locations may be in positions other than shown in the illustrations above. If locations are required in other positions, provide the complete details in a sketch.

Tangents: If a specific length of tangent must be maintained for the inlet and outlet of the pipe coils shown above, include that information in detail.

Welding return bends can be used in the fabrication of flat or oval pipe coils. For sizes and centers of welding return bends, refer to pages 280 to 283.

41

Minimum dimensions . . . . page 521

Pipe Coils (Cont.)

Box Type

The inlet or outlet locations may be in positions other than shown in the illustration. If required in other positions, provide those details in a sketch.

Welding return bends can be used in the fabrication of these box pipe coils. For sizes and centers of welding return bends, refer to pages 280 to 283, inclusive.

Minimum dimensions are shown below.

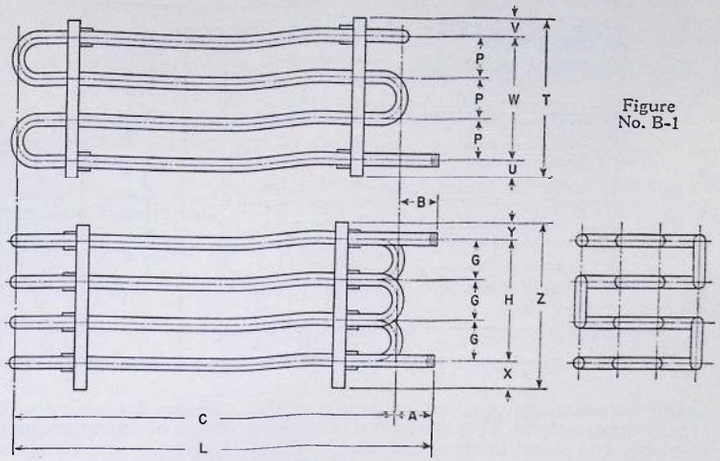


Figure No. B-1

Minimum Dimensions of Pipe Coils

The following table shows two sets of dimensions which can be used in the fabrication of pipe coils. Both are classed as minimum schedules of dimensions.

When it is necessary to resort to a compact design, the "Recommended Minimum Center to Center" dimensions are suggested. For unusually compact designs, the "Shortest Center to Center" dimensions can be used. Both should be avoided whenever greater centers can be employed; refer to the cautionary note below.

For pipe coils bent on short center to center dimensions, the use of seamless pipe is recommended.

"Center to Center" has reference to dimension "D" (diameter) for cylindrical pipe coils, to dimension "P" for flat pipe coils, dimension "G" for oval pipe coils, and dimensions "P" and "G" for box pipe coils.

Type of Pipe Coils	Size of Pipe Inches	Steel Pipe				Genuine Wrought Iron Pipe			
		Recommended Minimum Center to Center Dimensions—Inches		Shortest Center to Center Dimensions—Inches		Recommended Minimum Center to Center Dimensions—Inches		Shortest Center to Center Dimensions—Inches	
		Standard	Extra Strong	Standard	Extra Strong	Standard	Extra Strong	Standard	Extra Strong
For Cylindrical Pipe Coils	½	5	5	3½	3	8	6	6	4
	¾	7½	7	5	4½	10	9	8	6
	1	10	9	7	6	14	12	10	8
	1¼	13	12	9	8	18	16	12	10
	1½	18	15	10	9	24	20	15	12
	2	24	20	14	12	30	26	20	16
For Flat, Oval, and Box Pipe Coils	½	3	2½	3	2	5	4	5	4
	¾	3½	3	3½	2½	6	6	6	5
	1	4	3½	4	3	10	8	8	6
	1¼	5	4	4½	3½	12	10	10	8
	1½	6	5	5	4	15	12	12	10
	2	8	7	6	6	20	16	16	12

Information on smaller and larger sizes of pipe, and on other piping materials, will be furnished on application.

Cautionary Note Regarding the Use of Recommended Minimum or Shortest Center to Center Dimensions

The center to center dimensions and bending radii of pipe coils preferably should exceed the recommended minimum shown above.

By bending to close centers the outside pipe walls are subject to some flattening and thinning, both of which increase as the bending centers are reduced. This is particularly true of the larger sizes, 1½-inch and 2-inch.

In some instances it is possible to obtain shorter center to center dimensions than listed. Detailed information will be furnished upon receipt of specific inquiry.

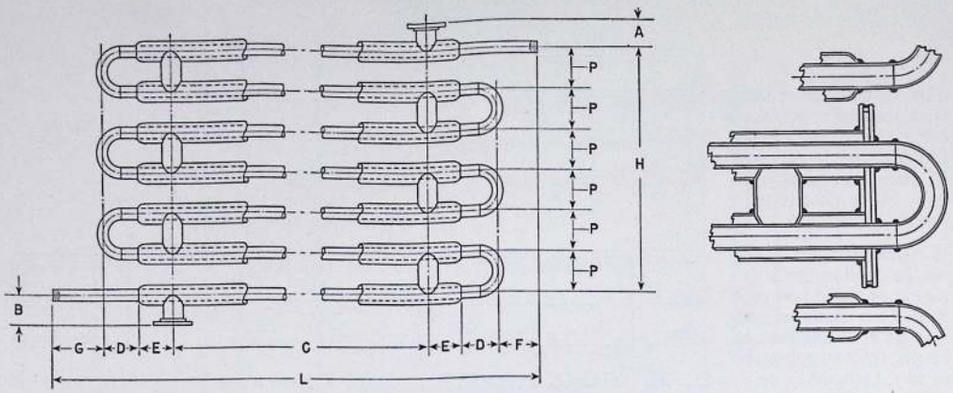
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Theory of Heat Transfer Through Pipe Walls . . . . page 536

Design of Pipe Coils . . . . pages 537 and 538

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Welded Double Pipe Heat Exchangers



Crane shops can fabricate heat exchangers of the type illustrated above. They are formed of two sets of piping, one placed inside of the other, utilizing swedging and welding to complete the assembly.

Application: This type of heat exchanger has a wide range of application in various installations, to serve as a medium for heat transfer between liquids, gases, etc. The usual arrangement is to provide counter flows or directions of travel in the inside of the smaller or inner piping and the annular space between the inner and outer piping.

Pipe sizes: The sizes commonly used are 2 x 1¼, 2½ x 1¼, 3 x 2, and 4 x 3-inch. Other sizes can be made; information will be furnished upon receipt of specific inquiries.

Length and height: These double pipe heat exchangers are regularly made in any length up to 20 feet. Lengths over 20 feet can be fabricated on special orders.

The usual practice limits the height to 12 pipes; however, these heat exchangers can be any number of pipes high, the only limitation being shipping facilities.

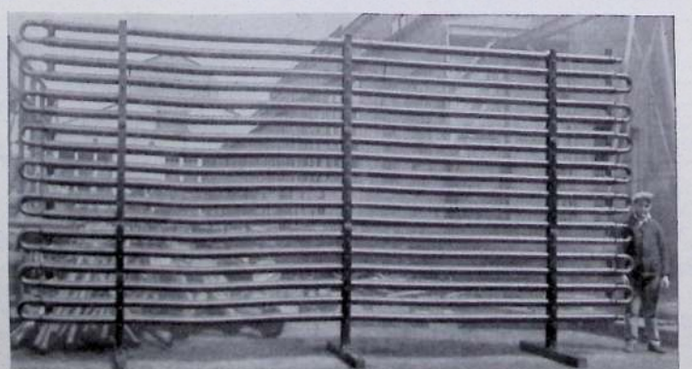
Headers for multiple stands: When two or more stands of double pipe heat exchangers are used in a battery, welded piping headers for connecting the inlets and outlets are recommended.

Note: For information about sizes and centers of welding return bends, see pages 280 to 283.

Special expansion joint: The enlarged detail above shows a design of welded expansion joint which can be adapted to double pipe heat exchangers as an alternate construction. It is suggested for installations involving unusual temperature differentials, when provision for taking care of moderate expansive movement of the connected piping appears desirable.

Inquiries and orders: Inquiries or orders should specify the quantity; sizes, weight, and kind of pipe; service, pressures, and temperatures; over-all length; number of pipes; number of stands; center to center dimensions of stands when headers are wanted; and whether or not valves and any additional connections are wanted on the inlets and outlets.

Prices: Prices will be quoted on application.



Double Pipe Heat Exchanger fabricated by welding—made in the Chicago Shop of Crane

Double Pipe Heat Exchangers can also be made with the Crane Double Pipe Fittings shown on page 415.

Engineering Data

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Discharge of Water Through Pipes, Orifices, and Valves.....pages 527 to 529
Resistance of Valves and Fittings to Flow of Fluids.....pages 530 and 531

Pressure Drop
Of Water Through Schedule 40 Steel Pipe.....page 532
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How to Read Reducing Fittings.....page 577
Location of By-Passes on Flanged Valves.....page 579
Abbreviations Used in This Catalog.....page 580

Years of research, experimenting, and testing have endowed Crane with a wealth of engineering data pertinent to piping systems. A portion of that data is indexed above. Additional data of an engineering nature are included elsewhere in this catalog with products to which they definitely pertain; see pages below. Customers confronted with unusual piping problems or desiring further information are invited to refer to various Crane technical publications or to submit their query direct to Crane.

Selecting Size of Crane Pressure-Seal Bonnet Stop-Check Valves.....pages 216 and 217
Selecting Size of Crane Bolted Bonnet Stop-Check Valves.....pages 306 and 307
Formula for Determining Size of Steam or Oil Separators.....page 354
Normal Engagement Between Male and Female Threads.....page 494
American and British Standard Pipe Threads.....pages 492 to 494
Railing Pipe Threads.....page 192
Expansion of Wrought Iron, Steel, Brass, or Copper Pipe.....page 349
Commercial Wrought Steel Pipe Data.....pages 490 and 491

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Crane Bolting



Machine Bolt
Square Head
With Hexagon Nut



Stud
Threaded Oversize on One End
Other End Threaded for Nut

Definitions

A bolt is threaded on one end only, the other end being upset into the form of a head.

A stud is threaded on both ends, one end being oversize in diameter to fit tightly (wrench fit) in a tapped hole, the other being to the standard diameter for a nut assembly.

A bolt-stud is threaded to the standard diameter, either on both ends or full length, for nut assembly on each end.



Bolt-Stud
Threaded on Both Ends
With Two Hexagon Nuts



Bolt-Stud
Threaded Entire Length
With Two Hexagon Nuts

Materials

Crane furnishes bolts, studs, and bolt-studs of the following materials:

Machine Bolts for use at temperatures up to 500° F. are made from steel complying with A.S.T.M. Specification A 107, open-hearth, free-cutting grade, having the following physical properties:

	Minimum
Tensile Strength, lbs. per sq. in.	60,000
Yield Point, lbs. per sq. in.	35,000
Elongation in 2", per cent	25
Reduction of Area, per cent	50

These bolts are furnished with "Regular" unfinished square heads in accordance with A.S.A. B18.2.

All machine bolts are threaded in accordance with A.S.A. B1.1 Coarse Thread Series, Class 2 fit.

Nuts regularly furnished with machine bolts are made of free-cutting or resulfurized nut stock conforming to A.S.T.M. Specification A 107.

Nuts are made to American Standard Unfinished "Heavy" Hexagon Dimensions, A.S.A. B18.2.

All nuts are tapped in accordance with A.S.A. B1.1 Coarse Thread Series, Class 2 fit.

Studs and Bolt-Studs for use at temperatures up to 500° F. are made from cold rolled steel complying with A.S.T.M. Spec. A 108, open-hearth free-cutting grade, having the following physical properties:

	Minimum
Tensile Strength, lbs. per sq. in.	70,000
Yield Point, lbs. per sq. in.	60,000
Elongation in 2", per cent	18
Reduction of Area, per cent	45

Cold roll steel studs and bolt-studs are threaded in accordance with A.S.A. B1.1 Coarse Thread Series, Class 2 fit (nut ends only).

Nuts regularly furnished are cold made of material in accordance with A.S.T.M. Spec. A 107.

Nuts are semi-finished in accordance with the American Standard "Heavy" Hexagon Dimensions, A.S.A. B18.2.

All nuts are tapped in accordance with A.S.A. B1.1 Coarse Thread Series, Class 2 fit.

Alloy Steel Studs and Bolt-Studs are made of Crane Triplex or Templex Steel. Crane Triplex Steel has been used with uniformly satisfactory results in thousands of steel valve and fitting installations, many of which—particularly in oil refineries—have been operating under extreme pressures and temperatures. Templex Steel, a recent Crane development in bolting materials, is superior to Triplex Steel in creep resistance; on temperatures over 850° F., especially where joints are made up for permanent, long-time service, as in steam power plants, Crane Templex Steel will be found ideal.

Crane Triplex Steel complies with the requirements of A.S.T.M. Specification A 193, Grades BC and B 7 bolting.

Crane Templex Steel complies with the requirements of A.S.T.M. Specification A 193, Grades BC and B 14 bolting.

Both steels have the following physical properties:

	Minimum
Tensile Strength, lbs. per sq. in.	125,000
Yield Point, lbs. per sq. in.	105,000
Elongation in 2", per cent	16
Reduction of Area, per cent	50

Crane Alloy Steel Bolt-Studs, threaded their entire length, and accompanying nuts are threaded in accordance with the American Standard for Screw Threads for High Strength Bolting (ASA B1.4), sizes 1-inch and smaller in diameter with the Coarse-Thread Series, and 1⅛-inch and larger in diameter with the 8-Pitch-Thread Series.

Nuts regularly furnished with alloy steel bolt-studs are medium carbon, oil-quenched, semi-finished, made to the American Standard "Heavy" Hexagon Nut Dimensions, A.S.A. B18.2.

Nuts for alloy steel bolt-studs comply with the requirements of A.S.T.M. Specification A 194, Class 2 H.

Torque Required to Produce Bolt Stress

The torque or turning effort required to produce a certain stress in bolting is dependent upon a number of conditions, some of which are:

1. Diameter of bolt.
2. Type and number of threads on bolt.
3. Material of bolt.
4. Condition of nut bearing surfaces.
5. Lubrication of bolt threads and nut bearing surfaces.

The tables below reflect the results of many Crane tests to determine the relation between torque and bolt stress. Values are based on steel bolting well lubricated with a heavy graphite and oil mixture.

It was found that a non-lubricated bolt has an efficiency of about 50 per cent of a well lubricated bolt and also that different lubricants produce results varying between the limits of 50 and 100 per cent of the tabulated stress figures.

Crane High Temperature Thread Compound

The graphite and oil mixture mentioned above will give satisfactory results; however, for high temperature service, Crane High Temperature Thread Compound should be used; see page 464. Through its use, bolt-studs can be more readily followed up or disassembled after being subject to heat.

Data for Use with Machine Bolts and Cold Rolled Steel Bolt-Studs

Load in Pounds on Bolts and Bolt-Studs when Torque Loads Are Applied

Nominal Diameter of Bolt	No. of Threads	Diameter at Root of Thread	Area at Root of Thread	Stress					
				7,500 Lbs. per Sq. In.		15,000 Lbs. per Sq. In.		30,000 Lbs. per Sq. In.	
Inches	Per Inch	Inches	Sq. Inch	Torque Ft. Lbs.	Compression, Lbs.	Torque Ft. Lbs.	Compression, Lbs.	Torque Ft. Lbs.	Compression, Lbs.
¼	20	.185	.027	1	203	2	405	4	810
5/16	18	.240	.045	2	388	4	675	8	1350
⅜	16	.294	.068	3	510	6	1020	12	2040
7/16	14	.345	.093	5	698	10	1395	20	2790
½	13	.400	.126	8	945	15	1890	30	3780
9/16	12	.454	.162	12	1215	23	2430	45	4860
⅝	11	.507	.202	15	1515	30	3030	60	6060
¾	10	.620	.302	25	2265	50	4530	100	9060
⅞	9	.731	.419	40	3143	80	6285	160	12570
1	8	.838	.551	62	4133	123	8265	245	16530
1⅛	7	.939	.693	98	5190	195	10380	390	20760
1¼	7	1.064	.890	137	6675	273	13350	545	26700
1⅜	6	1.158	1.054	183	7905	365	15810	730	31620
1½	6	1.283	1.294	219	9705	437	19410	875	38820
1⅝	5½	1.389	1.515	300	11363	600	22725	1200	45450
1¾	5	1.490	1.744	390	13080	775	26160	1550	52320
1⅞	5	1.615	2.049	525	15368	1050	30735	2100	61470
2	4½	1.711	2.300	563	17250	1125	34500	2250	69000

Data for Use with Alloy Steel Bolt-Studs

Load in Pounds on Bolt-Studs when Torque Loads Are Applied

Nominal Diameter of Stud	No. of Threads	Diameter at Root of Thread	Area at Root of Thread	Stress					
				30,000 Lbs. per Sq. In.		45,000 Lbs. per Sq. In.		60,000 Lbs. per Sq. In.	
Inches	Per Inch	Inches	Sq. Inch	Torque Ft. Lbs.	Compression, Lbs.	Torque Ft. Lbs.	Compression, Lbs.	Torque Ft. Lbs.	Compression, Lbs.
¼	20	.185	.027	4	810	6	1215	8	1620
5/16	18	.240	.045	8	1350	12	2025	16	2700
⅜	16	.294	.068	12	2040	18	3060	24	4080
7/16	14	.345	.093	20	2790	30	4185	40	5580
½	13	.400	.126	30	3780	45	5670	60	7560
9/16	12	.454	.162	45	4860	68	7290	90	9720
⅝	11	.507	.202	60	6060	90	9090	120	12120
¾	10	.620	.302	100	9060	150	13590	200	18120
⅞	9	.731	.419	160	12570	240	18855	320	25140
1	8	.838	.551	245	16530	368	24795	490	33060
1⅛	8	.963	.728	355	21840	533	32760	710	43680
1¼	8	1.088	.929	500	27870	750	41805	1000	55740
1⅜	8	1.213	1.155	680	34650	1020	51975	1360	69300
1½	8	1.338	1.405	800	42150	1200	63225	1600	84300
1⅝	8	1.463	1.680	1100	50400	1650	75600	2200	100800
1¾	8	1.588	1.980	1500	59400	2250	89100	3000	118800
1⅞	8	1.713	2.304	2000	69120	3000	103680	4000	138240
2	8	1.838	2.652	2200	79560	3300	119340	4400	159120
2¼	8	2.088	3.423	3180	102690	4770	154035	6360	205380
2½	8	2.338	4.292	4400	128760	6600	193140	8800	257520
2¾	8	2.588	5.259	5920	157770	8880	236655	11840	315540
3	8	2.838	6.324	7720	189720	11580	284580	15440	379440

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Assembly and Maintenance of Flanged Joints

As the temperatures and pressures used in the piping industry have increased, the problem of maintaining tight flanged joints has progressively become more severe. Many types of joints have been used; various types of gaskets have been installed in these joints; and different kinds of bolting materials have been recommended — all with a varying amount of success, depending upon the operating conditions. Even with all of these variations in design, certain precautions must be taken to maintain tight flanged joints.

When a flanged joint is assembled, each of the component parts is subjected to tensile or compressive stresses of varying magnitude. Under service conditions, especially where high temperatures are involved, a change in the magnitude of these stresses occurs and a lowering of the bolt stress results.

To compensate for this reduction in bolt stress, the following recommendations are made with regard to the assembly and maintenance of flanged joints.

Assembly: Initial bolt stresses to be applied in the assembly of flanged joints should afford a reasonable factor of safety with reference to the yield point of the bolting material. And yet the initial bolt stress must be high enough to insure a tight joint.

An extensive survey of field erected flanged joints has indicated that the following initial stresses are usually applied when alloy steel bolt-studs are pulled up manually. Experience has shown that these stresses are satisfactory for American Standard Steel Flanges and will comply with the requirements as set forth in the preceding paragraph.

Table I

Size of Alloy Steel Bolt-Stud (Note 1)	Average Stress Applied Manually Lbs. per Sq Inch (Note 2)	Approximate Torque to Obtain Stress, Ft. Lbs. (Note 3)	Elongation in Inches, per Inch of Effective Length (Note 4)
¾	52,000	175	.00173
⅞	48,000	255	.00160
1	45,000	370	.00150
1⅛	42,500	500	.00142
1¼	40,000	665	.00133
1⅜	38,000	860	.00127
1½	36,500	975	.00122
1⅝	35,000	1285	.00117
1¾	34,000	1700	.00113
1⅞	33,000	2200	.00110
2	32,000	2350	.00107

Notes: (1) Coarse thread series, 1" and smaller; 8 pitch thread series, 1⅛" and larger. (2) Average stress applied by maintenance men in assembly, using a lever and wrench or by sledging. (3) Based upon well-lubricated* threads. (4) Based on a modulus of elasticity of 30,000,000. The effective length of bolt-stud equals the distance from center of one nut to center of the other.

The values given in Table I have been graduated according to size — however, if it is possible to apply higher torques, it is recommended that the initial bolt stress be approximately 45,000 pounds per square inch.

The initial bolt stress can be applied by either of two methods: (1) By pulling up the well-lubricated* bolt-studs with the proper torque, or (2) by pulling up the bolt-studs to produce the elongation necessary for the desired bolt stress. When the second method is used the total desired elongation of the bolt-stud should be ascertained by multiplying the value given in the table for elongation in inches per inch by the effective length (distance from center of one nut to center of the other). Figures 1 and 2, respectively, show the design of an instrument which can be used in measuring bolt-stud elongation and the preparation of the ends of a bolt-stud for accurate measurement.

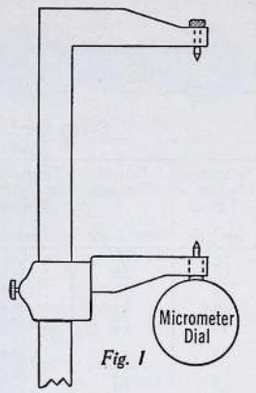


Fig. 1

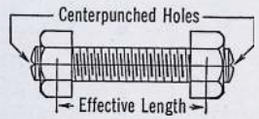


Fig. 2

Maintenance: ***When should bolt-studs be pulled up after being in service?*** It is recommended that the bolting in all flanged joints installed on temperatures above 500° F. be pulled up after the first shutdown. On high temperature service where creep may be expected to occur, it is recommended that the bolting be pulled up at least once during the first 200 hours of service, regardless of whether the line has been shut down or not. Bolt stress should be checked periodically during the life of the installation.

How should the bolt elongation be checked and the bolt-studs pulled up? As a general rule, it is only necessary to check the elongation in two or three diametrically opposite bolt-studs, using the average of the values obtained as the elongation for the remainder. If the bolt elongation is to be determined while the joint is in service, one bolt should be checked and pulled up before another is loosened. Measurements should be taken immediately after releasing the load before the bolt temperature decreases. The following procedure should be used in checking bolt elongation:

(a) Determine the length of the bolt in the assembled joint.
(b) Release the load on the bolt by loosening the nut and re-measure the length.
(c) Subtract second reading from first.
(d) Divide this value by the effective length of the bolt. (Effective length equals distance from center of one nut to center of the other.)

If the residual elongation is less than 70% of the values given in Table I, the bolts should be pulled up so that the final elongation approximates the figures shown.

*Crane High-Temperature Thread Compound or equal; see page 464.

For Pressure-Seal Bonnet and Lip-Seal Bonnet Valves, see pages 205 to 220.

Discharge of Water
Through Pipes, Orifices, and Valves

Table of Nomenclature

A = Area of opening, square feet.
C = Experimental coefficient.
D = Inside diameter of pipe, feet.
f = Coefficient of friction.
g = 32.2 feet per second per second.
h_1, h_2, h_3 = Individual head losses, feet of water.
H = Effective head pressure, feet of water.
L = Length of pipe line, feet.
Q = Flow of water, gallons per minute.
V = Velocity of water, feet per second.

Frequently it is necessary to determine the quantity of water which will be discharged through a valve or orifice, or through a certain length of pipe. This problem is one which occurs often in hydraulic work, particularly with reference to the flow of water through long pipe lines from a high level to a lower one.

The quantity of water which is discharged into the atmosphere through a pipe, orifice, or valve is dependent upon several variable factors which include flow pressure, size of pipe, type of valve or orifice, condition of pipe wall surface, length of pipe line, etc. The discharge of water into the atmosphere in terms of head loss follows the general formula:

$$H = C\frac{V^2}{2g} \qquad \textit{Formula No. 1.}$$

Where the value of "C" is usually determined by experiment.

Discharge of Water Through Pipes

In the case of water flowing through pipes, the quantity discharged is dependent upon three major resistance factors:

A. Entrance loss
B. Loss of head due to friction
C. Loss of head due to velocity

The loss of head at entrance depends upon the condition of the pipe end. A well rounded connection will cause the entrance loss to be decreased appreciably, while a square non-projecting pipe will give a "C" value of approximately .5 in Formula No. 1. This latter condition is realized in the majority of installations and therefore, the formula for entrance effect is as follows:

$$h_1 = .5\frac{V^2}{2g} \qquad \textit{Formula No. 2.}$$

The loss of head due to friction is mainly dependent upon the length and condition of the pipe line and may be expressed as

$$h_2 = \frac{f \times L}{D} \times \frac{V^2}{2g} \qquad \textit{Formula No. 3.}$$

In this equation, the friction factor, "f", must be determined from experimental results. For rough approximations, the value of "f" may be assumed as .015 for brass tubes, .02 for steel pipe, and .04 for cast iron pipe.

The third factor, the loss of head due to velocity, may be expressed by the following formula:

$$h_3 = \frac{V^2}{2g} \qquad \textit{Formula No. 4.}$$

The total loss of head is the sum of the individual losses and may be expressed as follows:

$$H = h_1 + h_2 + h_3 = \left(1.5 + \frac{f \times L}{D}\right)\frac{V^2}{2g}$$

As $Q = VA \times 450$

It follows that $Q = 450A\sqrt{\dfrac{2gH}{1.5 + \dfrac{f \times L}{D}}}$ *Formula No. 5.*

Example: How much water will an 8" steel pipe line (7.981 inside diameter) 3000 feet long discharge per minute at a point which is 300 feet below the inlet?

Given: $D = \dfrac{7.981}{12} = .665$ feet
$A = .3474$ square feet
$H = 300$ feet
$2g = 64.4$ feet per second per second.
$f = .02$ (assumed)
$L = 3000$ feet

Then: $Q = 450 \times .3474\sqrt{\dfrac{64.4 \times 300}{1.5 + \dfrac{.02 \times 3000}{.665}}}$

$Q = 2268$ gallons per minute

Discharge of Water Through Orifices

The coefficient "C" for orifices is dependent upon the condition of the orifice edges, i.e., an orifice having well rounded edges has a "C" value of approximately 1.23, while one having sharp edges gives a "C" value of approximately 2.69.

Discharge of Water Through Globe Valves

The discharge of water through globe valves under a given flow pressure depends primarily upon the type of valve considered. Crane has conducted tests on various types of globe valves in sizes up to and including 2½" and has determined that the flow through a globe valve is, roughly, one-half of the flow through a short pipe of the same size.

For additional data, see pages 528 and 529.

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Discharge of Water (Cont.)

Through Pipes, Orifices, and Valves

The chart on the opposite page gives the discharge of water through pipe sizes from ⅜" to 10", in lengths from 1 foot to 200 feet; through orifices in sizes up to 10"; and through valves in sizes up to 2½" based upon the formulas or tests described previously. For sizes, lengths, or pressures not given on the chart, the respective formulas or ratios may be used.

Note: In all cases, the pressure used to determine the flow through pipes, orifices, or valves, should be the effective head pressure under flow conditions, not the static pressure in the line before flow commences. This statement applies particularly to lines supplied by pumps, etc.

Application of Chart

Example No. 1

What quantity of water will be discharged through 75 feet of 5" standard pipe under a discharge gauge pressure of 50 pounds per square inch?

Enter the upper portion of the chart (page 529) at the intersection of the horizontal line for 75 feet of pipe and the line for the 5" pipe size. Proceed downward to the intersection with the diagonal for 50 pounds gauge pressure and then continue horizontally to the right where the quantity discharged is given as 2600 gallons per minute on the right hand ordinate.

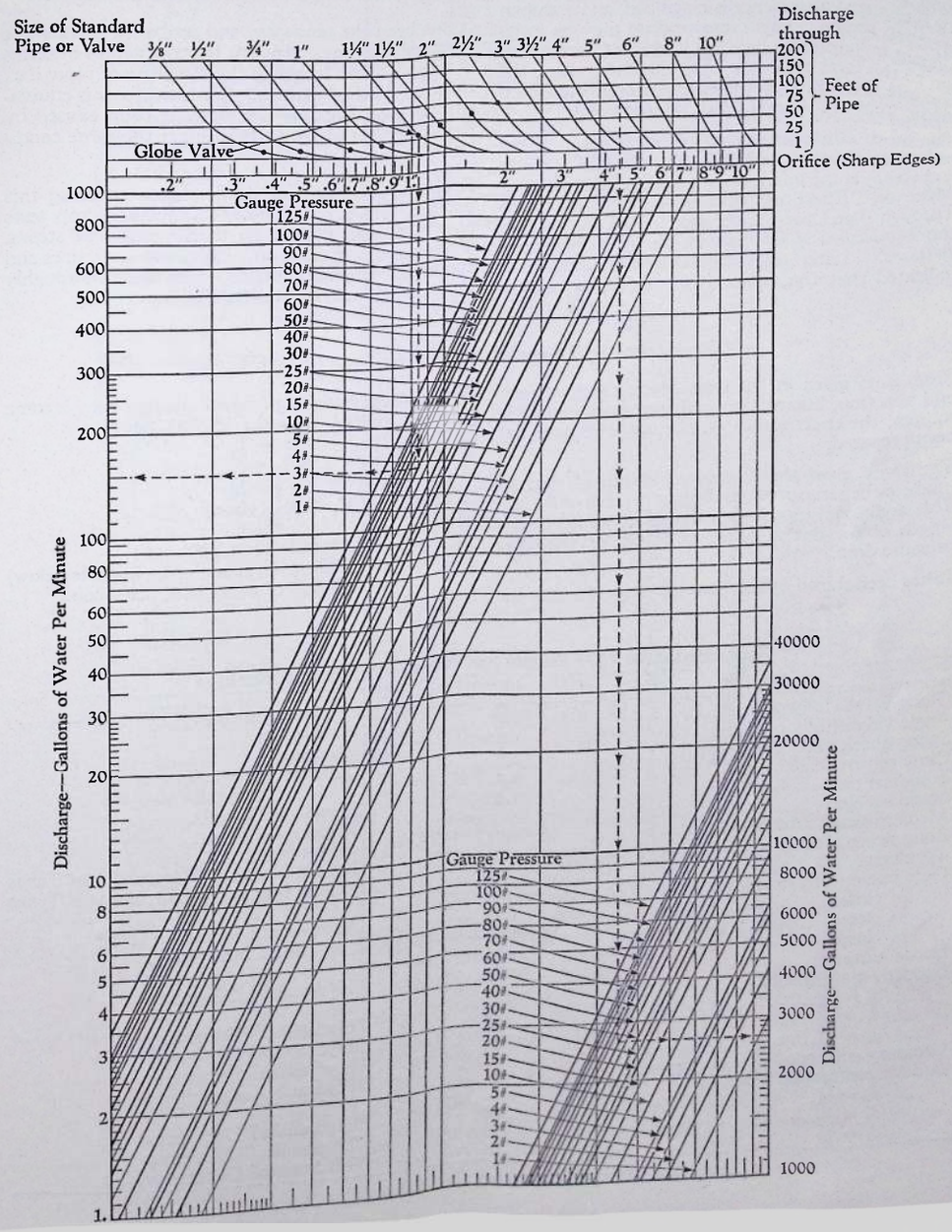
Example No. 2

A 1¼" globe valve is discharging water into the atmosphere under a discharge gauge pressure of 50 pounds per square inch. What quantity is discharged in gallons per minute?

Enter the upper portion of the chart (opposite page) at the black dot on the line for 1¼" valve size. Proceed downward to the intersection with the diagonal for 50 pounds gauge pressure and then continue horizontally to the left where the quantity discharged is given as 150 gallons per minute on the left hand ordinate.

Discharge of Water (Cont.)

Through Smooth Pipes, Orifices, and Valves



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Resistance of Valves and Fittings to Flow of Fluids

When the flow of a fluid in a pipe line is altered by some obstruction such as a valve or fitting, the velocity is changed, turbulence is magnified, and a drop in pressure results. This pressure drop may be insignificant in long lines where it is very small in comparison to the total drop, but when the line is short, the pressure drop through valves and fittings becomes a major item in the total pressure drop value.

The most widely used data on the subject of the resistance of valves and fittings to the flow of water and steam is the information given in Dean Foster's paper on "Effect of Fittings on Flow of Fluids Through Pipe Lines" (published in Vol. 42, 1920, of the *Transactions of the American Society of Mechanical Engineers*). Later tests conducted by others have indicated that the values given by Foster are low for globe valves, angle valves, etc., and that data are needed to establish the correct information to use.

It has been the tendency, and probably is the most practical way, to present the friction values in terms of an equivalent length of the same size of pipe; i. e., the pressure drop caused by a 2-inch elbow is equivalent to approximately the pressure drop caused by five or six feet of 2-inch pipe under the same conditions of flow.

Realizing the need for definite data covering this subject, Crane has conducted pressure drop tests on valves and fittings on both water and steam. These tests were made on 2-inch and 6-inch sizes and conducted under conditions which were thoroughly investigated previous to the tests.

Resistance in Terms of Equivalent Pipe Length

From data given in the tests conducted by Crane and also from information gathered from authentic sources, the chart shown on the opposite page has been prepared.

The chart gives the equivalent length of pipe to produce the same pressure drop as a valve or fitting. This additional pipe length should be added to the length of the line in order to determine the total pressure drop.

It has been shown by previous investigators that the drop in pressure through valves, fittings, etc., is some constant multiplied by the velocity head,

$$\frac{V^2}{2g}$$

Therefore: $H_1 = K\frac{V^2}{2g}$ where

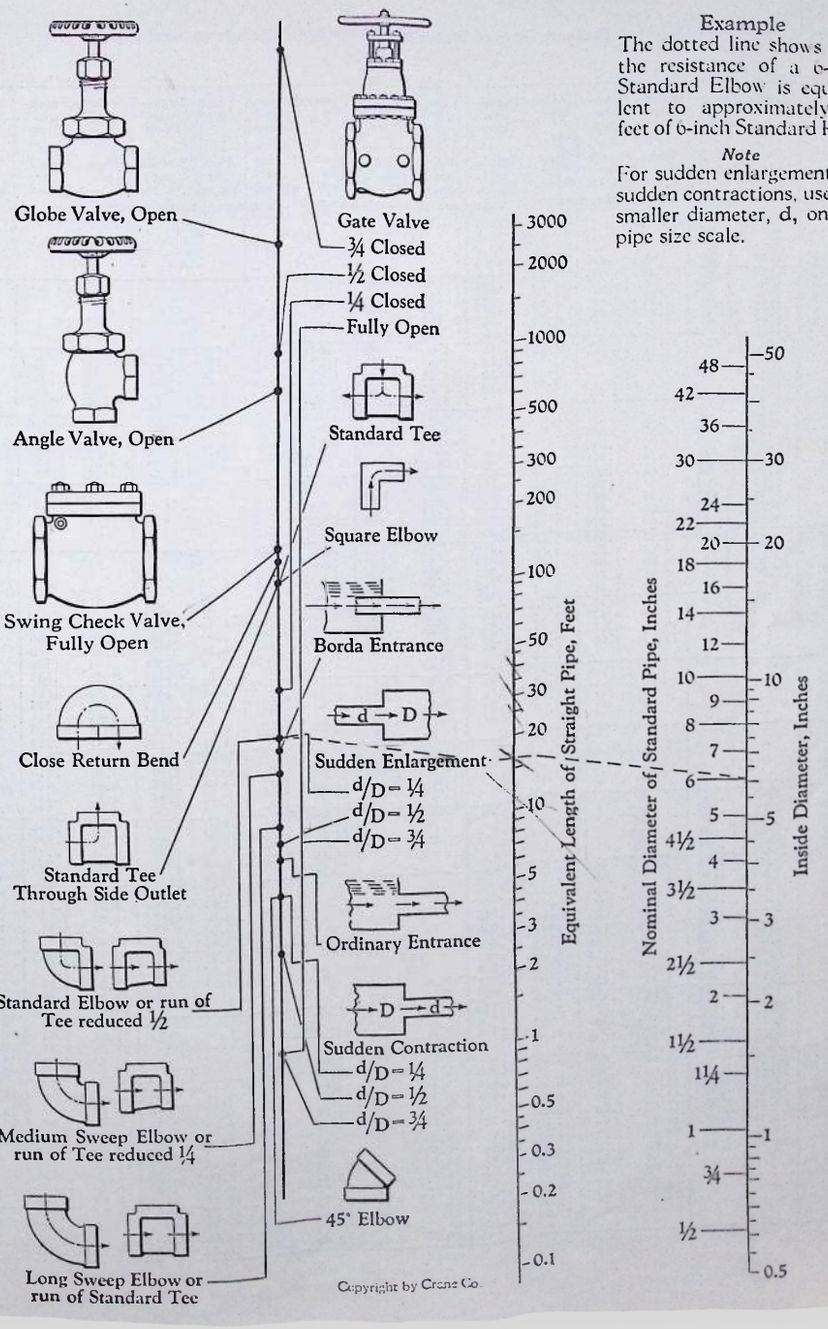
H_1 = Loss of head in feet
K = Coefficient (values given in table below)
V = Velocity of water, feet per second
$2g$ = 64.4

Representative "K" Values for Various Valves and Fittings

Type	"K"	Authority
Globe valve (fully open)	10.0	Crane tests
Angle valve (fully open)	5.0	Crane tests
Swing check valve (fully open)	2.5	Crane tests
Close return bend	2.2	
Standard tee	1.8	Giesecke & Badgett
Standard elbow	.9	Giesecke & Badgett
Medium sweep elbow	.75	Crane tests
Long sweep elbow	.60	Bulletin No. 2712—University of Texas
45° elbow	.42	Bulletin No. 2712—University of Texas
Gate valve (fully open)	.19	
¼ closed	1.15	University of Wisconsin tests* and Crane tests
½ closed	5.6	
¾ closed	24.0	
Borda entrance	.83	"Hydraulics" Daugherty
Sudden enlargement:		
$d_1/d_2 = \frac{1}{4}$	.92	"Hydraulics" Daugherty
$d_1/d_2 = \frac{1}{2}$	.56	"Hydraulics" Daugherty
$d_1/d_2 = \frac{3}{4}$	.19	"Hydraulics" Daugherty
Ordinary entrance	.5	"Hydraulics" Daugherty
Sudden contraction:		
$d_2/d_1 = \frac{1}{4}$	.42	"Hydraulics" Daugherty
$d_2/d_1 = \frac{1}{2}$	.33	"Hydraulics" Daugherty
$d_2/d_1 = \frac{3}{4}$	.19	"Hydraulics" Daugherty

*University of Wisconsin Experimental Station Bulletin Vol. 9, No. 1, 1922

Resistance of Valves and Fittings to Flow of Fluids



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Example

The dotted line shows that the resistance of a 6-inch Standard Elbow is equivalent to approximately 10 feet of 6-inch Standard Pipe.

Note

For sudden enlargements or sudden contractions, use the smaller diameter, d, on the pipe size scale.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Pressure Drop of Water Through Schedule 40 Steel Pipe

Discharge	Pressure Drop of Water per 100 Feet of Schedule 40 Steel Pipe															
	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop	Velocity	Pressure Drop
Gallons per Minute	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.	Feet per Second	Pounds per Sq. In.
	1/8"		1/4"		3/8"		1/2"		3/4"							
.2	1.13	1.52	.62	.420												
.3	1.69	4.20	.92	.925	.50	.199	.32	.065								
.4	2.26	7.70	1.23	1.61	.67	.346	.42	.111								
.5	2.82	11.20	1.54	2.41	.84	.527	.53	.169	.30	.045						
.6	3.38	15.75	1.85	3.32	1.01	.747	.63	.238	.36	.064	1"		1¼"		1½"	
.8	4.52	27.40	2.46	5.77	1.34	1.30	.84	.407	.48	.102						
1			3.08	8.80	1.68	1.98	1.06	.605	.60	.152	.37	.049				
2			6.16	33.60	3.37	7.17	2.11	2.18	1.20	.552	.74	.170	.43	.045		
3					5.05	15.30	3.16	4.67	1.80	1.18	1.12	.353	.64	.094	.47	.044
4		2"			6.73	25.70	4.22	7.60	2.40	1.97	1.49	.594	.86	.155	.63	.074
5							5.27	11.15	3.60	2.90	1.86	.902	1.07	.236	.79	.112
6	.57	.046		2½"			6.33	16.10	4.20	4.05	2.24	1.23	1.28	.330	.95	.153
8	.76	.075					8.42	27.60	4.80	6.97	2.98	2.11	1.72	.552	1.26	.263
10	.96	.114	.67	.048		3"			6.01	10.52	3.72	3.08	2.14	.834	1.57	.386
15	1.43	.233	1.00	.099					9.02	22.00	5.60	6.46	3.21	1.76	2.36	.813
20	1.91	.386	1.34	.164	.87	.059		3½"			7.44	11.05	4.29	2.91	3.15	1.35
25	2.39	.581	1.68	.248	1.08	.087	.81	.042							3.94	2.02
30	2.87	.804	2.01	.343	1.30	.121	.97	.060		4"			5.36	4.37	4.72	2.91
35	3.35	1.10	2.35	.449	1.52	.158	1.14	.079	.88	.042			6.43	6.29	5.51	3.82
40	3.82	1.37	2.68	.588	1.74	.206	1.30	.100	1.01	.053			7.51	8.25	6.30	4.78
45	4.30	1.74	3.00	.714	1.95	.251	1.46	.121	1.13	.067					7.08	6.06
50	4.78	2.06	3.35	.882	2.17	.310	1.62	.144	1.26	.080					7.87	7.47
60	5.74	2.96	4.02	1.22	2.60	.429	1.95	.207	1.51	.110		5"				
70	6.69	3.86	4.69	1.53	3.04	.584	2.27	.271	1.76	.150	1.12	.048				
80	7.65	5.03	5.37	2.17	3.48	.762	2.59	.353	2.01	.187	1.28	.063		6"		
90	8.60	6.36	6.04	2.61	3.91	.922	2.92	.446	2.26	.237	1.44	.080				
100	9.56	7.51	6.71	3.23	4.34	1.14	3.24	.527	2.52	.281	1.60	.095	1.11	.039		
125			8.38	4.82	5.42	1.71	4.05	.786	3.15	.438	2.00	.148	1.39	.056		
150			10.06	6.04	6.51	2.35	4.86	1.13	3.78	.602	2.41	.204	1.67	.078		
175			11.73	9.00	7.59	3.20	5.67	1.47	4.41	.820	2.81	.278	1.94	.106		8"
200					8.68	3.97	6.48	1.92	5.04	1.02	3.21	.346	2.22	.132		
225					9.77	5.02	7.29	2.31	5.67	1.29	3.61	.437	2.50	.166	1.44	.044
250					10.85	6.19	8.10	2.85	6.30	1.59	4.01	.514	2.78	.205	1.60	.055
275					11.94	7.50	8.91	3.44	6.93	1.83	4.41	.622	3.06	.236	1.76	.063
300					13.02	8.47	9.72	4.09	7.56	2.18	4.81	.741	3.33	.280	1.92	.075
325							10.53	4.55	8.18	2.55	5.21	.825	3.61	.329	2.08	.088
350							11.35	5.27	8.82	2.97	5.61	.957	3.89	.362	2.24	.097
375							12.17	6.07	9.45	3.23	6.01	1.10	4.16	.416	2.40	.111
400							12.97	6.89	10.08	3.67	6.41	1.25	4.44	.472	2.56	.127
425		10"					13.78	7.78	10.70	4.15	6.82	1.41	4.72	.534	2.72	.143
450							14.59	8.73	11.33	4.65	7.22	1.50	5.00	.596	2.88	.160
475	1.93	.030							11.96	5.17	7.62	1.67	5.27	.666	3.04	.169
500	2.04	.063							12.59	5.73	8.02	1.85	5.55	.739	3.20	.187
550	2.24	.070							13.84	6.93	8.82	2.24	6.11	.894	3.53	.226
600	2.44	.086		12"					15.10	8.25	9.62	2.67	6.66	1.06	3.85	.270
650	2.65	.101									10.42	3.13	7.21	1.18	4.17	.316
700	2.85	.118	2.01	.048							11.22	3.63	7.77	1.37	4.49	.369
750	3.05	.135	2.15	.055		14"					12.02	4.16	8.32	1.57	4.81	.421
800	3.26	.154	2.29	.062							12.82	4.47	8.88	1.78	5.13	.479
850	3.46	.174	2.44	.070	2.02	.043					13.62	5.05	9.44	2.02	5.45	.511
900	3.66	.194	2.58	.079	2.14	.048					14.42	5.66	10.00	2.26	5.77	.573
950	3.87	.223	2.72	.088	2.25	.053					15.22	6.31	10.55	2.37	6.09	.638
1,000	4.07	.240	2.87	.098	2.38	.059		16"			16.02	7.00	11.10	2.63	6.41	.708
1,100	4.48	.274	3.16	.118	2.61	.068					17.63	8.46	12.22	3.18	7.05	.856
1,200	4.88	.327	3.45	.140	2.85	.081	2.18	.040					13.32	3.78	7.69	1.02
1,300	5.29	.383	3.73	.156	3.09	.095	2.36	.047					14.43	4.44	8.33	1.13
1,400	5.70	.444	4.02	.180	3.32	.110	2.54	.054					15.54	5.15	8.97	1.30
1,500	6.10	.511	4.30	.207	3.55	.119	2.73	.062		18"			16.65	5.55	9.62	1.50
1,600	6.51	.546	4.59	.236	3.80	.135	2.91	.071					17.76	6.31	10.26	1.70
1,800	7.32	.691	5.16	.298	4.27	.171	3.27	.085	2.58	.048			19.98	7.98	11.54	2.16
2,000	8.13	.854	5.73	.347	4.74	.211	3.63	.105	2.88	.056		20"	22.20	9.85	12.83	2.50
2,500	10.18	1.25	7.17	.541	5.92	.309	4.54	.163	3.59	.088					16.03	3.90
3,000	12.21	1.80	8.60	.731	7.12	.445	5.45	.221	4.31	.127	3.45	.073		24"	19.24	5.24
3,500	14.25	2.29	10.03	.995	8.32	.618	6.35	.300	5.03	.152	4.03	.094			22.43	7.14
4,000	16.28	2.99	11.48	1.30	9.49	.792	7.25	.392	5.74	.212	4.61	.122	3.19	.051	25.65	9.33
4,500	18.31	3.78	12.90	1.54	10.67	.936	8.17	.497	6.47	.250	5.19	.155	3.59	.060		
5,000	20.35	4.67	14.34	1.89	11.84	1.16	9.08	.572	7.17	.308	5.76	.178	3.99	.074		
6,000	24.42	6.72	17.21	2.73	14.32	1.54	10.88	.824	8.62	.445	6.92	.257	4.80	.100		
7,000	28.50	8.51	20.08	3.72	16.60	2.10	12.69	1.22	10.04	.606	8.06	.350	5.68	.136		
8,000			22.95	4.51	18.98	2.74	14.52	1.36	11.43	.734	9.23	.457	6.38	.178		
9,000			25.80	5.70	21.35	3.47	16.32	1.72	12.92	.920	10.37	.536	7.19	.225		
10,000			28.63	7.04	23.75	4.29	18.16	2.12	14.37	1.15	11.53	.663	7.96	.278		
12,000			34.38	9.36	28.50	6.18	21.80	3.09	17.23	1.65	13.83	.954	9.57	.371		
14,000					33.20	8.40	25.42	4.16	20.10	2.07	16.14	1.20	11.18	.505		
16,000							29.05	5.44	22.96	2.71	18.43	1.57	12.77	.660		

Pressure Drop of Air Through Schedule 40 Steel Pipe

Cubic Feet per Minute of Free Air At Atmospheric Pressure and Temperature of 60° F.	Equivalent Cubic Feet per Minute of Compressed Air At 100 Pounds Gauge Pressure and Temperature of 60° F.	Pressure Drop of Air Per 100 Feet of Schedule 40 Steel Pipe In Pounds per Square Inch at 100 Pounds Gauge Air Inlet Pressure								
		1/8"	1/4"	3/8"	1/2"					
1	.128	.394	.087	.019						
2	.256	1.51	.311	.068	.021					
3	.384	3.16	.675	.148	.046	3/4"				
4	.513	5.47	1.19	.256	.078					
5	.641	8.60	1.80	.396	.118	.030	1"			
6	.769		2.56	.556	.165	.042				
8	1.025		4.50	.962	.276	.070	.020			
10	1.282		6.85	1.42	.407	.100	.031	1¼"		
15	1.922			2.93	.890	.211	.063	.028	1½"	
20	2.563			5.03	1.53	.361	.105			
25	3.204			7.85	2.31	.546	.158	.043	.020	
30	3.845				3.22	.785	.227	.060	.027	
35	4.486				4.21	1.03	.297	.075	.035	
40	5.126				5.52	1.35	.388	.105	.046	2"
45	5.767				6.72	1.64	.492	.129	.056	
50	6.408				8.27	2.02	.580	.154	.069	.020
60	7.690	2½"				2.92	.835	.221	.099	.028
70	8.971					3.82	1.14	.290	.134	.037
80	10.25	.020				4.98	1.43	.375	.168	.048
90	11.53	.025				6.07	1.81	.476	.213	.058
100	12.82	.031	3"			7.47	2.14	.587	.253	.068
125	16.02	.046					3.34	.887	.397	.108
150	19.22	.067	.023				4.82	1.22	.542	.155
175	22.43	.088	.031	3½"			6.28	1.66	.738	.201
200	25.36	.110	.038				8.02	2.03	.900	.257
225	28.84	.137	.049	.023				2.63	1.17	.333
250	32.04	.169	.057	.029				3.24	1.44	.392
275	35.24	.204	.069	.033				3.76	1.66	.475
300	38.45	.243	.082	.040	4"			4.47	1.98	.565
325	41.65	.272	.096	.047				5.27	2.31	.662
350	44.86	.316	.112	.052	.027			5.77	2.68	.767
375	48.06	.362	.128	.059	.032			6.65	3.08	.840
400	51.26	.413	.140	.068	.036			7.55	3.51	.955
425	54.47	.466	.157	.076	.041			8.55	3.76	1.08
450	57.67	.507	.176	.086	.045				4.22	1.14
475	60.88	.552	.197	.095	.051				4.70	1.28
500	64.08	.611	.218	.100	.056				5.20	1.41
550	70.49	.740	.263	.122	.064				5.95	1.71
600	76.90	.880	.298	.144	.077	5"			7.10	2.03
650	83.30	.980	.350	.169	.090					2.38
700	89.71	1.04	.405	.185	.099	.034				2.77
750	96.12	1.31	.441	.213	.113	.039				3.18
800	102.5	1.49	.500	.242	.129	.044				3.42
850	108.9	1.68	.565	.273	.146	.047	6"			3.87
900	115.3	1.88	.633	.306	.154	.053				4.32
950	121.8	1.98	.707	.341	.172	.059	.023			4.82
1000	128.2	2.19	.782	.357	.190	.065	.026			5.33
1100	141.0	2.65	.895	.432	.231	.079	.031			6.10
1200	153.8	3.16	1.07	.515	.275	.094	.035			7.27
1300	166.6	3.70	1.25	.603	.322	.110	.042			8.52
1400	179.4	4.30	1.45	.700	.376	.127	.048			
1500	192.2	4.65	1.66	.803	.428	.139	.055	8"		
1600	205.1	5.27	1.92	.915	.487	.158	.063			
1800	230.7	6.67	2.40	1.11	.580	.199	.080	.021		
2000	256.3	8.25	2.79	1.35	.717	.246	.093	.025	10"	
2500	320.4		4.35	2.11	1.12	.385	.145	.037		
3000	384.5		6.27	3.02	1.51	.522	.208	.053	.017	
3500	448.6		8.52	4.11	2.06	.710	.265	.071	.023	
4000	512.6			5.37	2.69	.927	.347	.088	.030	12"
4500	576.7			6.40	3.41	1.10	.438	.111	.036	
5000	640.8			7.90	4.20	1.36	.540	.137	.044	.020
6000	769.0				5.63	1.94	.726	.197	.063	.026
7000	897.1				7.70	2.48	.990	.268	.086	.036
8000	1025					3.24	1.29	.324	.113	.047
9000	1153					4.10	1.52	.410	.142	.059
10000	1282					5.05	1.87	.505	.164	.074
11000	1410					6.13	2.27	.574	.199	.089
12000	1538					6.77	2.70	.683	.237	.099
13000	1666					7.95	3.17	.802	.278	.115
14000	1794					9.20	3.67	.928	.299	.134
15000	1922						4.22	1.07	.343	.154
16000	2051						4.78	1.21	.390	.162
18000	2307						5.60	1.53	.493	.205
20000	2563						6.92	1.89	.610	.253
22000	2820						8.37	2.29	.737	.307
24000	3076							2.52	.827	.365
26000	3332							2.96	1.03	.428
28000	3588							3.44	1.11	.498
30000	3845							3.61	1.27	.572

For lengths of pipe other than 100 feet, the pressure drop is proportional to the length. Thus, for 50 feet of pipe, the pressure drop is approximately one-half the value given in the table; for 300 feet, three times the given value, etc.

For inlet pressures other than 100 pounds gauge, the pressure drop is inversely proportional to the absolute pressure. Thus, for 100 feet of Schedule 40 steel pipe, multiply the values given in the table by the ratio:

$$\frac{100 + 14.7}{P_1 + 14.7}$$

Where P_1 is the gauge pressure under consideration.

The equivalent cubic feet per minute of compressed air at any pressure is inversely proportional to the absolute pressure. To determine, multiply the value of the cubic feet per minute of free air at atmospheric pressure by the ratio:

$$\frac{14.7}{14.7 + P_1}$$

Where P_1 is the gauge pressure under consideration.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Simplified Steam Flow Formula for Pressure Drop, Rate of Flow, and Pipe Size

The Fanning formula for the flow of steam can be written in the form:

$$\Delta P_{100} = C_1 C_2 C_3 \overline{V}$$

C_1 = discharge factor—obtain from chart below.
C_2 = size factor—obtain from table on opposite page.
C_3 = viscosity factor—obtain from chart on opposite page.
ΔP_{100} = pressure drop per 100 feet of pipe, in pounds per square inch.
$\overline{V}$ = average specific volume of steam—obtain from steam tables, pages 570 to 576.

Example 1: Find the pressure drop in 100 feet of 8-inch Standard (Schedule 40) pipe if the steam pressure and temperature are 360 pounds per square inch absolute and 500° Fahrenheit, respectively. The discharge is 240,000 pounds per hour.

Solution: From the tables and figures, the following values are found: $C_1 = 26.7$, $C_2 = 0.263$, $C_3 = 0.996$, and $\overline{V} = 1.45$. If we put these values in the steam flow formula and solve for ΔP_{100}, we find: $\Delta P_{100} = 10.14$ pounds per square inch per 100 feet.

Example 2: Find the rate of flow, in pounds per hour, in a 4-inch Schedule 40 pipe if the pressure drop is 8 pounds per square inch per 100 feet. Saturated steam at 150 pounds absolute pressure is flowing in the pipe.

Solution: From the given conditions and the tables and figures we find $\Delta P_{100} = 8.0$, $C_2 = 7.73$, $C_3 = 0.972$, and $\overline{V} = 3.0$. If we substitute these values into the steam flow formula and solve for C_1, we get $C_1 = 0.355$. By referring to the chart at the right, the discharge for this value of C_1 is found to be 23,600 pounds per hour.

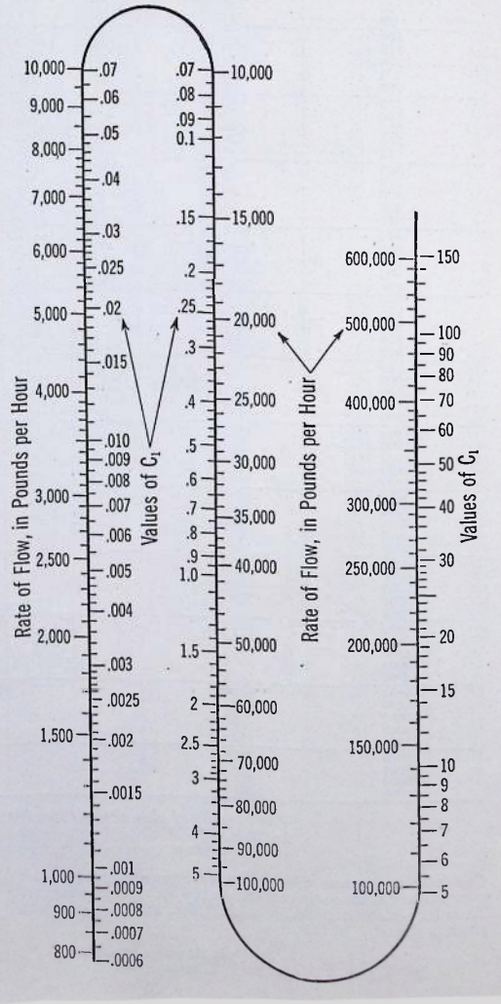
Example 3: Find the smallest size of Schedule 40 (Standard) pipe that can be used for a process requiring 20,000 pounds of saturated steam per hour, if the initial steam pressure is 100 psi absolute and the maximum allowable pressure drop is 10 pounds per square inch per 100 feet of pipe.

Solution: From the given conditions and the tables and figures:

$\Delta P_{100} = 10$, $C_1 = 0.257$, $C_3 = 0.96$, and $\overline{V} = 4.432$.

Substituting these values in the steam flow formula, and solving for C_2, it is found that $C_2 = 9.2$. From the table, 4-inch Schedule 40 pipe is the smallest size that will provide a value of C_2 less than the calculated value. The actual pressure drop per 100 feet of 4-inch Schedule 40 pipe may now be calculated as 8.5 psi by solving the steam flow formula using the table value of 7.73 for C_2.

Values of C_1



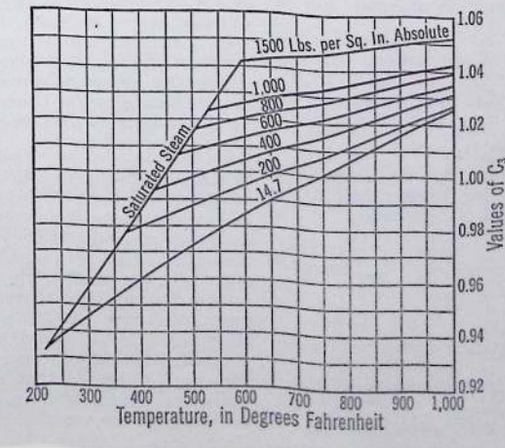
Simplified Steam Flow Formula for Pressure Drop, Rate of Flow, and Pipe Size

(Continued)

Values of C_2

Nominal Pipe Size Inches	Schedule Number of Pipe	Internal Diameter of Pipe Inches	Value of C_2	Nominal Pipe Size Inches	Schedule Number of Pipe	Internal Diameter of Pipe Inches	Value of C_2
1	40	1.049	6420.	6	40	6.065	1.00
	80	0.957	10050.		80	5.761	1.28
	160	0.815	21950.		120	5.501	1.62
1¼	40	1.380	1687.		160	5.189	2.16
	80	1.278	2455.	8	30	8.071	0.249
	160	1.160	3935.		40	7.981	0.263
1½	40	1.610	755.		60	7.813	0.291
	80	1.500	1067.		80	7.625	0.328
	160	1.338	1860.		100	7.439	0.369
2	40	2.067	213.		120	7.189	0.435
	80	1.939	291.		160	6.813	0.568
	160	1.689	570.	10	30	10.136	0.0819
2½	40	2.469	80.1		40	10.020	0.0866
	80	2.323	121.		60	9.750	0.0980
	160	2.125	188.		80	9.564	0.109
3	40	3.068	31.2		100	9.314	0.1235
	80	2.900	40.9		120	9.064	0.141
	160	2.626	66.7		140	8.750	0.168
3½	40	3.548	15.0		160	8.500	0.193
	80	3.364	19.5	12	30	12.090	0.0344
4	40	4.026	7.73		40	11.938	0.0366
	80	3.826	9.91		60	11.626	0.0420
	120	3.626	12.8		80	11.376	0.0467
	160	3.438	17.5		100	11.064	0.0534
5	40	5.047	2.57		120	10.750	0.0615
	80	4.813	3.18		140	10.500	0.0690
	120	4.563	4.22		160	10.126	0.0823
	160	4.313	5.52				

Values of C_3

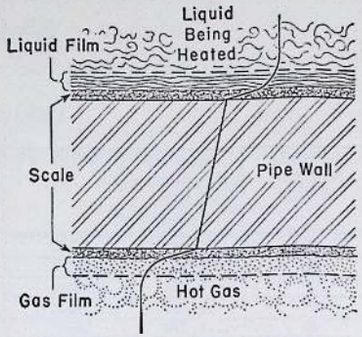


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Theory of Heat Transfer Through Pipe Walls

The conduction of heat through a pipe wall is shown diagrammatically in the illustration at the right. It shows the transfer of heat from a hot gas (such as steam) to a liquid (such as water).

The heat is conducted first from the hot gas through the gas film, then through the corrosion scale on the pipe wall due to the gas, through the pipe wall itself, then through the corrosion scale on the pipe wall due to the liquid, and finally through the liquid film to the liquid.



The general formula for the transfer of heat through pipes is given as

$$Q = U\,A\,T \qquad \textit{Formula 1}$$

Where:
Q = Total heat to be transmitted in Btu per hour.
U = Over-all coefficient of heat transfer in Btu per hour per square feet per degree F.
A = Amount of heating surface in the pipe coil expressed in square feet.
T = The logarithmic mean temperature difference between the hot and cold fluids in degrees F.

Determination of Q

The total heat to be transmitted "Q" is determined by multiplying the weight of the fluid per unit of time (pounds per hour), the specific heat of the fluid at the average fluid temperature, and the fluid change in temperature in degrees F. If the fluid alters its phase, that is, if the fluid changes from a liquid to a gas or from a gas to a liquid, then the heat of vaporization must be considered in this calculation. If the fluid is to give up heat through radiation, emission, or surface convection, such heat losses also must be considered.

Determination of A

Since "A" is the unknown to be solved, Formula 1 becomes $A = \frac{Q}{UT}$. The number of square feet of heating surface, "A", can be converted readily into the number of feet of pipe of any particular size and wall thickness by dividing the value of "A" by the external surface area in square feet per foot as given in the table of Pipe Data, pages 490 and 491.

Determination of T

A true average temperature difference between the hot and cold fluids "T" is called the logarithmic mean temperature difference and is determined by the following formula:

$$T = \frac{GTD - LTD}{2.3\ Log\ \frac{GTD}{LTD}} \qquad \textit{Formula 2}$$

Where:
GTD = Greatest temperature difference between the fluids.
LTD = Least temperature difference between the fluids.

(See pages 566 and 567 for table of Common Logarithms).

Determination of U

The over-all coefficient of heat transfer "U" is dependent upon a large number of variables, including the conductivity and thickness of the metal in the pipe wall, the fluid velocity, specific heat, conductivity, density and viscosity, and the oxidation or scaling effect of the fluid on the pipe wall, as well as other physical characteristics such as the quantity of entrapped gases in the fluid, etc. The value of "U" may, therefore, be determined accurately only by experiment.

Generally accepted approximations of over-all heat transfer coefficients are listed in the table on the opposite page.

If a scale of rust or oxide builds up on either the inner or outer pipe walls, the value of "U" will be greatly reduced. In some cases, therefore, the substitution of a copper or alloy pipe coil for steel pipe will greatly improve the over-all rate of heat transfer, not because of the change in conductivity of the metal but because the pipe surface stays bright and practically rust free.

Selection of a value for "U" should be based upon a consideration of the conditions under which the coil will be operated. The maximum values should be used only when the velocity of the cooling and the cooled fluids is high and when corrosion or scaling of the pipe is negligible. The coefficients given in the column headed "Free Convections" are those obtained with pipe coils and pipe immersed in liquids under normally static conditions. The column headed "Forced Convections" covers pipe coils and pipe immersed in liquids that are agitated either by mechanical means or by a continuous flow of the fluid through the vessel.

Design of Pipe Coils for Heat Transfer

The following practical hints and recommendations are presented to aid the designer of pipe coils for heat transfer.

1. "Overdesign" rather than "underdesign". It is a simple matter to cut down the conductivity of a pipe coil but more difficult to increase it.

2. Have adequate means for removal of condensate.

3. Remove entrapped gases from liquids.

4. It is important that pressure drop be considered in designing a pipe coil, to determine the limitations on length of a given pipe size. If excessively long lines are used, they may not be capable of transmitting the required quantity of fluid at the available initial pressure. Keeping this limitation in mind, it is desirable to use fluid velocities as high as possible, so that the resistance to heat transfer due to the film is lowered.

Data for calculating the pressure drop in steam lines is given on page 534, water lines on page 532, and air lines on page 533. In a coil using smooth pipe bends, the actual pipe length should be converted to an equivalent pipe length, for purposes of calculating pressure drop on the basis of the chart on page 540 showing the resistance of 90° bends. If other fittings such as return bends or elbows are used, equivalent length may be based on data shown on page 531.

For steam condensing in a pipe coil, the quantity of steam passing through the coil varies from total input at the inlet to zero pounds per hour at the outlet, and the amount of condensate varies from zero pounds per hour at the inlet to total weight per hour at the outlet. Obviously, the total pressure drop in the coil will be equal to the sum of the losses due to the flow of the steam and the water. However, due to the high ratio of the specific volumes of the two fluids, the percentage of pipe cross-section that is occupied by the water is negligible and the pressure drop due to the flow of condensate may therefore be neglected in the calculation of practical problems. The pressure drop due to the flow of steam will be high near the inlet, and will decrease approximately as the square of the velocity as the steam passes through the coil. From this relationship, combined with the effect of increased specific volume of the steam due to pressure drop, it can be shown that the average velocity of the steam in the coil is approximately three-fourths of the maximum or initial velocity, and for the purpose of calculating pressure drop, the same ratio may be used to determine the average quantity of steam flowing within the coil.

5. Give careful consideration to the installation of those accessories which are necessary adjuncts for the successful use of pipe coils, such as pressure and temperature indicators and regulators, safety and relief valves, traps, vent valves, and sediment separators.

6. The shape and dimensions of the vessel determine the dimensional limits and design of the pipe coil which is to be installed. The illustrations of pipe coils given on pages 518 to 521 will aid in the selection of the most applicable design.

The sample problem on the page following shows the procedure for determining the pipe size and lineal feet of pipe required in a pipe coil containing steam at a given pressure and specified allowable pressure drop, to raise the temperature of a given quantity of water per unit of time a specified amount.

(*Continued on the next page*)

Ordinary Ranges of U*[1]

Over-all Coefficients "U" Expressed in Btu per Hour per Square Foot per Degree F.
(See preceding page for explanation—"Determination of U")

Fluid Giving Up Heat	Fluid Receiving Heat	State of Controlling Resistance: Free Convections U	State of Controlling Resistance: Forced Convections U	Typical Fluid	Typical Apparatus
Liquid	Liquid	25-60	150-300	Water	Liquid Heat Exchangers, etc.
		5-10	20-50	Oil	
	Gas	1-3	2-10	Water to Air	Hot Water Radiators, Cooling Tower Surfaces
	Boiling Liquid	20-60	50-150	Water	Brine Coolers
		5-20	25-60	Oil	
Gas	Liquid	1-3	2-10	Air to Water	Air Coolers, Economizers
	Gas	0.6-2	2-6	Gas to Steam	Steam Superheaters
	Boiling Liquid	1-3	2-10	Gas to Boiling Water	Steam Boilers
Condensing Vapor	Liquid	50-200	150-800	Steam to Water	Condensers, Feed Water Heaters
		10-30	20-60	Steam to Oil	
	Gas	1-2	2-10	Steam to Air	Steam Pipes in Air, Air Heaters
	Boiling Liquid	300-800		Steam to Water	Vacuum Evaporators
		50-150		Steam to Oil	

*Under special conditions higher or lower values may be realized.

[1]W. H. McAdams, "Heat Transmission" (McGraw-Hill Book Co., Inc.) from data given by A. P. Colburn (Copyright 1942).

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Design of Pipe Coils for Heat Transfer (Cont.)

Sample Problem

1000 gallons of hot water per hour is required. The water is to be heated from 50° to 180° F. with 25 lb. gauge steam in a single cylindrical steel pipe coil (Standard or Schedule 40 pipe) immersed in water. The coil is to be 3'-0" center to center in diameter. The pressure drop through the coil shall not exceed 5 psi. *Determine the size of pipe from which the coil should be made and the number of turns required in the coil.*

Solution

Refer to the steam tables, pages 570 to 573, and determine the properties of the steam, as follows:

Average pressure $= \frac{25 + (25 - 5)}{2} = 22.5$ psi

Average specific volume = 11.29 cu. ft./lb.

Latent Heat of Steam at avg. press. = 936 BTU/lb.

Temp. of 25 lb. steam = 267° F.

Temp. of 20 lb. steam = 259° F. (minimum allowable downstream pressure)

Fluid change in temp. = 180° F. − 50° F. = 130° F.

Refer to table of thermal properties of water, page 539 and determine the weight per gallon of 180° F. water equals 8.098 pounds.

Determination of Q

$Q = 8.098 \times 1000 \times 130$
$= 1{,}053{,}000$ BTU/hr. required.

Determination of U

From the conditions given, water flows through the heat exchanger at the rate of 1000 GPH, giving continuous flow. Therefore, a value of "U" will be selected from the column headed "Forced Convections." The velocity of the water as it passes the coil will obviously be low, and since steel pipe is used, some rusting may be expected. The minimum value of "U" for forced convections, i. e., $U = 150$, is therefore used.

Determination of T (*Use Formula 2*)

$GTD = 267 - 50 = 217°$ F.

$LTD = 259 - 180 = 79°$ F.

$$T = \frac{217 - 79}{2.3 \log \frac{217}{79}} = \frac{138}{2.3 \log 2.75} =$$

$$\frac{138}{2.3 \times .4393} = 136° \text{ F.}$$

Determination of A (*Use Formula 1*)

$$A = \frac{1{,}053{,}000}{150 \times 136} = 51.5 \text{ sq. ft.}$$

Determination of Pipe Size and Length of Pipe

Refer to the table of Pipe Data, pages 490 and 491, to determine the inside diameter and external area per foot of the probable pipe sizes.

Size	Inside Diameter	External Surface (Square Feet per Foot)
1¼	1.380	.435
1½	1.610	.497
2	2.067	.622

Calculate the length of pipe required to give the required area of heating surface:

$$(1\tfrac{1}{4}'') = \frac{51.5}{.435} = 118 \text{ feet}$$

$$(1\tfrac{1}{2}'') = \frac{51.5}{.497} = 104 \text{ feet}$$

$$(2'') = \frac{51.5}{.622} = 83 \text{ feet}$$

To determine the equivalent length of the coil for purposes of calculating pressure drop, calculate the relative radius R/D by dividing the radius of the coil by the ID of the pipe, and refer to the Chart for resistance of 90° bends to determine the total resistance and resistance due to the length of the bends.

Size	R/D	Pipe Diameter	
		Total Resistance	Resistance Due to Length
1¼	13.0	37	21
1½	11.2	32	18
2	8.7	26	14

The equivalent length of the circular coil, then, is equal to the lineal length of the pipe times the ratio of the total resistance to the resistance due to length.

Equivalent Length:

$$(1\tfrac{1}{4}'') = \frac{37}{21} \times 118 = 208 \text{ feet of straight pipe}$$

$$(1\tfrac{1}{2}'') = \frac{32}{18} \times 104 = 185 \text{ feet of straight pipe}$$

$$(2'') = \frac{26}{14} \times 83 = 154 \text{ feet of straight pipe}$$

Amount of steam that must be condensed to provide 1,053,000 BTU $= \frac{1{,}053{,}000}{936} = 1130$ lbs./hr.

For the purpose of calculating pressure drop, the average quantity of steam flowing within the coil may be assumed as, $= .75 \times 1130 = 850$ pounds per hour. Refer to pages 534 and 535 to determine pressure drops as follows:

Size	C_1	C_2	C_3	ΔP_{100}
1¼	.0007	1687	.95	12.67
1½	.0007	755	.95	5.67
2	.0007	213	.95	1.6

By inspection, the conditions of the problem i. e., 5 psi maximum pressure drop, cannot be met with either 1¼" or 1½" pipe, and 2" pipe must be used.

Total pressure drop in the 2" coil will be:

$\frac{154}{100} \times 1.6$, or 2.46 psi

Number of coils required will be:

$\frac{83}{\pi D} = 8.8$, or 9 coils.

Thermal Properties of Water

Temperature of Water, Degrees Fahr.	Saturation Pressure, Pounds per Square Inch Absolute	Specific Volume, Cubic Feet per Pound	Density, Pounds per Cubic Foot	Weight, Pounds per Gallon	Specific Heat	Specific Gravity
32	.08854	.01602	62.42	8.345	1.0093	1.001
40	.12170	.01602	62.42	8.345	1.0048	1.001
50	.17811	.01603	62.38	8.340	1.0015	1.000
60	.2563	.01604	62.34	8.334	.9995	1.000
70	.3631	.01606	62.27	8.325	.9982	.998
80	.5069	.01608	62.19	8.314	.9975	.997
90	.6982	.01610	62.11	8.303	.9971	.996
100	.9492	.01613	62.00	8.289	.9970	.994
110	1.2748	.01617	61.84	8.267	.9971	.991
120	1.6924	.01620	61.73	8.253	.9974	.990
130	2.2225	.01625	61.54	8.227	.9978	.987
140	2.8886	.01629	61.39	8.207	.9984	.984
150	3.718	.01634	61.20	8.182	.9990	.981
160	4.741	.01639	61.01	8.156	.9998	.978
170	5.992	.01645	60.79	8.127	1.0007	.975
180	7.510	.01651	60.57	8.098	1.0017	.971
190	9.339	.01657	60.35	8.068	1.0028	.968
200	11.526	.01663	60.13	8.039	1.0039	.964
210	14.123	.01670	59.88	8.005	1.0052	.960
212	14.696	.01672	59.81	7.996	1.0055	.959
220	17.186	.01677	59.63	7.972	1.0068	.956
240	24.969	.01692	59.10	7.901	1.0104	.947
260	35.429	.01709	58.51	7.822	1.0148	.938
280	49.203	.01726	57.94	7.746	1.020	.929
300	67.013	.01745	57.31	7.662	1.026	.919
350	134.63	.01799	55.59	7.432	1.044	.891
400	247.31	.01864	53.65	7.172	1.067	.860
450	422.6	.0194	51.55	6.892	1.095	.826
500	680.8	.0204	49.02	6.553	1.130	.786
550	1045.2	.0218	45.87	6.132	1.200	.735
600	1542.9	.0236	42.37	5.664	1.362	.679
700	3093.7	.0369	27.10	3.623		.434

Weight per Gallon based on 7.48 Gallons per Cubic Foot.

Weight of Air at Various Pressures and Temperatures[1]

Temp. of Air, Deg. Fahr.	Gauge Pressure, in Pounds per Square Inch (Based on an Atmospheric Pressure of 14.7 Pounds per Square Inch Absolute at Sea Level) — Weight (Density), in Pounds per Cubic Foot																				
	0	5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	175	200	225	250	300
−20	.0900	.1205	.1515	.2125	.2744	.3360	.3970	.4580	.5190	.5800	.6410	.702	.7635	.825	.886	.948	1.010	1.165	1.318	1.465	1.625	1.930
−10	.0882	.1184	.1485	.2090	.2685	.3283	.3880	.4478	.5076	.5674	.6272	.687	.747	.807	.868	.928	.989	1.139	1.288	1.438	1.588	1.890
0	.0864	.1160	.1455	.2040	.2630	.3215	.3800	.4385	.4970	.5555	.6140	.672	.731	.790	.849	.908	.968	1.114	1.260	1.406	1.553	1.850
10	.0846	.1136	.1425	.1995	.2568	.3145	.3720	.4292	.4863	.5433	.6006	.658	.716	.774	.832	.889	.947	1.090	1.233	1.376	1.520	1.810
20	.0828	.1112	.1395	.1955	.2516	.3071	.3645	.4205	.4770	.5330	.5890	.645	.701	.757	.813	.869	.927	1.067	1.208	1.348	1.489	1.770
30	.0811	.1088	.1366	.1916	.2465	.3015	.3570	.4121	.4672	.5221	.5771	.632	.687	.742	.797	.852	.908	1.046	1.184	1.322	1.460	1.735
40	.0795	.1067	.1338	.1876	.2415	.2954	.3503	.4038	.4576	.5114	.5652	.619	.673	.727	.781	.835	.890	1.025	1.161	1.296	1.431	1.701
50	.0780	.1045	.1310	.1839	.2367	.2905	.3432	.3960	.4487	.5014	.5541	.607	.660	.713	.766	.819	.873	1.006	1.139	1.271	1.403	1.668
60	.0764	.1025	.1283	.1803	.2323	.2840	.3362	.3882	.4402	.4927	.5447	.596	.649	.700	.752	.804	.856	.988	1.116	1.245	1.376	1.636
70	.0750	.1005	.1260	.1770	.2280	.2791	.3302	.3808	.4316	.4824	.5332	.584	.635	.686	.737	.788	.839	.967	1.095	1.223	1.350	1.604
80	.0736	.0988	.1239	.1738	.2237	.2739	.3242	.3738	.4234	.4729	.5224	.572	.622	.673	.723	.774	.824	.949	1.074	1.199	1.325	1.573
90	.0723	.0970	.1218	.1707	.2195	.2688	.3182	.3670	.4154	.4639	.5122	.561	.611	.660	.709	.759	.809	.932	1.054	1.177	1.300	1.544
100	.0710	.0954	.1197	.1676	.2155	.2638	.3122	.3602	.4079	.4555	.5033	.551	.599	.648	.696	.745	.794	.914	1.035	1.155	1.276	1.517
110	.0698	.0937	.1176	.1645	.2115	.2593	.3070	.3542	.4011	.4481	.4950	.542	.589	.637	.685	.732	.780	.899	1.017	1.135	1.254	1.491
120	.0686	.0921	.1155	.1618	.2080	.2549	.3018	.3481	.3944	.4403	.4866	.533	.579	.626	.673	.720	.767	.884	1.001	1.118	1.234	1.465
130	.0674	.0905	.1135	.1590	.2045	.2505	.2966	.3446	.3924	.4296	.4770	.524	.570	.616	.662	.708	.754	.869	.984	1.099	1.214	1.440
140	.0663	.0889	.1115	.1565	.2015	.2465	.2915	.3364	.3813	.4262	.4711	.516	.561	.606	.651	.696	.742	.855	.968	1.081	1.194	1.416
150	.0652	.0874	.1096	.1541	.1985	.2425	.2865	.3308	.3751	.4193	.4636	.508	.552	.596	.640	.685	.730	.841	.953	1.064	1.175	1.392
175	.0626	.0840	.1054	.1482	.1910	.2335	.2755	.3181	.3607	.4033	.4450	.488	.531	.573	.616	.658	.701	.808	.914	1.021	1.128	1.337
200	.0603	.0809	.1014	.1427	.1840	.2248	.2655	.3054	.3473	.3882	.4291	.470	.511	.552	.592	.633	.674	.776	.879	.982	1.084	1.287
225	.0581	.0779	.0976	.1373	.1770	.2163	.2555	.2949	.3344	.3738	.4129	.452	.491	.531	.570	.609	.649	.747	.846	.944	1.043	1.240
250	.0560	.0751	.0941	.1323	.1705	.2085	.2466	.2845	.3223	.3602	.3981	.436	.474	.513	.551	.589	.627	.722	.817	.912	1.007	1.197
275	.0541	.0726	.0910	.1278	.1645	.2011	.2378	.2745	.3111	.3478	.3844	.421	.458	.494	.531	.568	.605	.697	.789	.881	.972	1.155
300	.0523	.0707	.0881	.1237	.1592	.1945	.2300	.2654	.3008	.3362	.3716	.407	.442	.478	.513	.549	.585	.673	.762	.852	.940	1.118
350	.0491	.0658	.0825	.1160	.1495	.1828	.2160	.2492	.2824	.3156	.3488	.382	.415	.449	.482	.516	.549	.632	.715	.799	.883	1.048
400	.0463	.0621	.0779	.1090	.1405	.1720	.2035	.2348	.2661	.2974	.3287	.360	.391	.423	.454	.486	.517	.596	.674	.753	.831	.987
450	.0437	.0586	.0735	.1033	.1330	.1628	.1925	.2220	.2515	.2810	.3105	.340	.369	.399	.429	.458	.488	.562	.637	.711	.786	.934
500	.0414	.0555	.0696	.0978	.1260	.1540	.1820	.2100	.2380	.2660	.2940	.322	.351	.379	.407	.435	.463	.534	.604	.675	.746	.885
550	.0394	.0528	.0661	.0930	.1198	.1464	.1730	.1996	.2262	.2528	.2794	.306	.333	.359	.386	.413	.440	.507	.573	.641	.709	.841
600	.0376	.0504	.0631	.0885	.1140	.1395	.1650	.1904	.2158	.2412	.2668	.292	.317	.343	.368	.393	.419	.483	.547	.611	.675	.801

[1]Reprinted from "Compressed Air Data" Fifth Edition. Courtesy of Ingersoll-Rand Company.

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Pressure Drop in Bends and Elbows

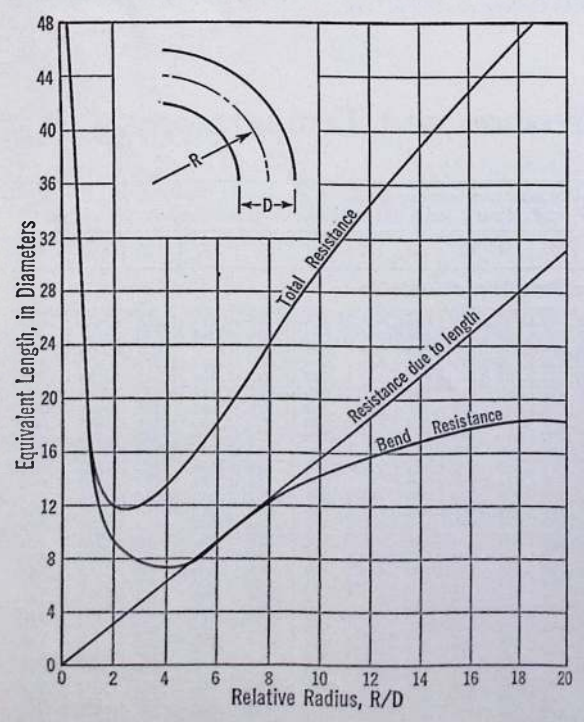
Resistance of Bends to Flow

The relationship between the equivalent length of pipe bends and the ratio of the radius of the bend axis to the internal diameter, i.e. R/D, is not well defined and considerable variation is found in the results based on the work of various investigators. The chart below, showing the resistance of 90° bends in terms of equivalent length of straight pipe, represents average flow conditions and is based on the work of K. H. Biej, in his paper on "Pressure Losses for Fluid Flow in 90° Pipe Bends," Journal of Research of the National Bureau of Standards, Vol. 21, July, 1938.

The chart showing the Resistance of Miter Bends to the Flow of Fluids represents average flow conditions and is based on resistance coefficients for Miter Bends determined by H. Kirchbach, "Loss of Energy in Miter Bends," Transactions of the Munich Hydraulic Institute, Bulletin No. 3, American Society of Mechanical Engineers, New York, 1935.

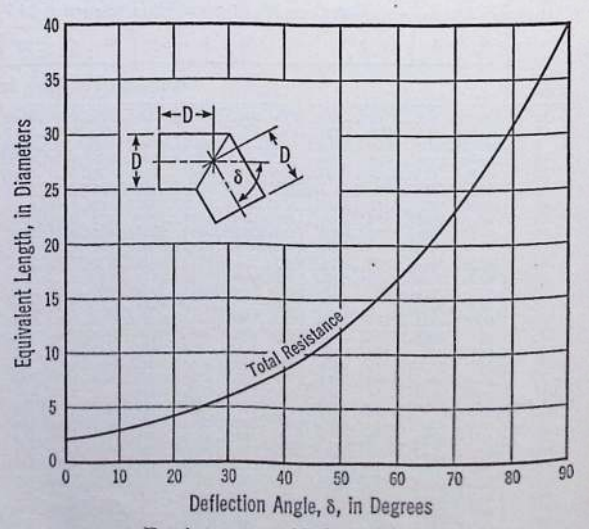
Resistance of Elbows to Flow

For the common 90° cast or malleable iron screwed elbow, the total resistance is roughly equivalent to 30 diameters of straight pipe. Flanged elbows offer approximately 25% less resistance than screwed elbows.



Resistance of 90° Bends (Biej)

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Resistance of Miter Bends to the Flow of Fluids (Kirchbach)

Excerpts from the Code for Pressure Piping

Shown on this and the following page are excerpts from the Code for Pressure Piping, American Standard B31. 1-1942, with 1944 Supplement No. 1 and 1947 Supplement No. 2. The excerpts cover the Scope and Classification of the five piping sections and set forth limitations of threaded end pipe.

Section 1, Power Piping Systems

"**101 Scope.** Section 1 of this Code covers the design, manufacture, test and installation of power piping systems, as defined below, for steam generating plants, central heating plants, and industrial plants.

102 Classification. (a) Power piping systems and the component parts of such piping including, for example, the pipe, flanges, bolting, gaskets, valves, and fittings, shall be understood to embrace all steam, water, and oil piping (not including oil piping covered by Section 3 of this code) within or forming a part of the above-mentioned plants. Gas, air, refrigerating piping, central and district heating steam or hot water distribution piping away from the plant, building heating piping when the pressure does not exceed 15 p.s.i. gage, roof and floor drains, plumbing, sprinkler systems, piping for hydraulic pressure tools or equipment, sewers, and industrial process piping for fluids not mentioned above, are excluded.

(b) Valves, fittings, and piping for boilers, as prescribed in the A.S.M.E. Code for Power Boilers are within the scope of this code except that provisions of the A.S.M.E. Code for Power Boilers shall govern insofar as they exceed corresponding requirements of this code.

(c) Economizers, heaters, tanks, and other pressure vessels are outside the scope of this code, but connecting piping shall conform to the requirements herein specified.

122 Thickness of Pipe. (f) Steel.....pipe lighter than Schedule 40.....shall not be threaded. The value of P in formula 1 (pipe design formula)..... shall not be taken at less than 100 psi gage for any conditions or material.

(g) (1) While the thickness given by ..... (the pipe design formula).....is theoretically ample to take care of both bursting pressure and material removed in the threading, it is mandatory that where steel pipe is threaded and used for steam pressures of 250 psi and over, or for piping under pressure in excess of 100 psi with water temperature of 220° F and over, it shall be seamless of a quality at least equal to A.S.T.M. Specifications A-106 or A-53 and of a weight at least equal to Schedule 80..... in order to furnish added mechanical strength."

Section 2, Gas and Air Piping Systems

"**201 Scope.** This section covers the design, manufacture, installation, and tests of piping systems and the component parts of such piping including, for example, the pipe, flanges, bolting, gaskets, valves, and fittings, intended for conveying air, fuel gas, illuminating gas, and other substantially non-corrosive gases.

202 Classification. (a) This section includes city gas distribution systems, cross-country transportation systems, piping in gas manufacturing plants, in gas or air compressing stations, and in processive plants.

(b) This section does not contemplate gas or air temperatures above 450°F. The requirements of Section 3 of this code for temperatures above 450°F. shall apply to all gas or air piping systems where the temperature exceeds 450°F.

(c) This section *does not* apply to:

(1) Air piping under pressures 30 psi and below,
(2) Equipment or apparatus, or pipe connections which are a part of apparatus,
(3) Piping lined with fire brick or other refractory material used for conveying hot gases,
(4) Piping used for conveying refinery process gas in oil refineries or gasoline recovery plants, and for sewer gas; or ducts for waste gases and ventilation.
(5) Casing, tubing, and pipe when used in gas or oil wells, and material gas and oil field producing and gathering systems outside the boundaries of city or villages. The gathering system is defined as a piping system which carries gas from wells to a common point in the producing field where the transportation systems begin,
(6) Residential and commercial building gas piping systems.

220 Thickness of Pipe. Div. 1. (d)..... The value of P allowed.....shall not exceed two-thirds of the mill test pressure for service temperatures not in excess of 100°F and five-ninths of the mill test pressure for a service temperature of 450°F, P values for intermediate temperatures to be obtained by interpolation.

(e) Threaded pipe thinner than listed in any of the specifications for threaded pipe enumerated..... (in the code) shall not be used.

(f) The value of P shall not be taken at less than 180 psi for pipe diameters up to and including 24 in., and 100 psi for pipe diameters greater than 24 in....."

Section 3, Oil Piping Systems Including Oil Vapor, Refinery Gas, and Gasoline Recovery Plants

"**301 Scope.** Section 3 of this Code covers mandatory requirements and recommended practices for the design, manufacture, test, and installation of oil piping systems and the component parts of such piping including, for example, the pipe, flanges, bolting, gaskets, valves, and fittings, used in the production, transmission, and refining of petroleum. It is not intended to include casing, tubing or pipe used in gas or oil wells."

(continued on the next page)

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Excerpts from the Code for Pressure Piping

(Section 3—*continued from the preceding page*)

"302 Classification. (a) The requirements specified herein shall apply particularly to oil piping, refinery gas piping, and piping for gasoline recovery plants. They may also be used for corresponding pressure and temperature conditions for all piping other than oil; such as steam, air, water, gas, etc., used in the distribution systems and process areas of the plants devoted principally to the processing and handling of oils, but they shall not be used for steam piping in such plants within the limits of the boiler house or boiler plant areas, nor for boiler feed water piping between feed pumps and boilers; piping for these services and in these locations shall conform to the requirements of Section 1.

The requirements do not apply to heater coils, economizers, or pipe exchangers except surface coolers or exchangers ordinarily known as condenser box coils; nor to the design of piping for conveying fluids such as acids or caustics (or solutions thereof), or other special fluids of a dangerous nature.

(b) This section of the code includes piping, valves, and fittings up to the connections of drums, pressure vessels, and apparatus, and up to the tube sheets of furnaces, interstage piping between compressors or duplex pumping equipment, etc., but does not include (1) The connections themselves, which are ordinarily furnished with and as a part of the equipment; (2) piping exposed to flame in furnaces; (3) internal piping or its parts integral with the equipment or apparatus.

(c) Oil lines are classified according to pressure and temperature. Oil vapor lines shall follow the same classifications and specifications as oil lines. (Refinery gas lines are dealt with specifically.)

325 Thickness of Pipe. (e) For pipes both inside and outside of refinery limits it is recommended that no pipe lighter than A.P.I. standard threaded line pipe (see A.P.I. Standard 5 L) shall be threaded (where two or more standard weights of pipe are obtainable the heavier or heaviest is referred to in this case).

(f) Regardless of the actual pressure, the minimum thickness of the pipe used shall not be less than that determined by.....(the pipe design formula).....and in addition shall not be less than the thickness required for mechanical strength as determined by the best engineering data available. For temperatures above 750°F, only seamless steel pipe or a high temperature resisting seamless alloy pipe is permitted where....."

Section 4, District Heating Piping Systems

"401 Scope. (a) This section covers the design, manufacture, test, and installation of district heating and central heating piping systems and the component parts of such piping including, for example, the pipe, flanges, bolting, gaskets, valves, and fittings (away from the plant) for the distribution of steam or hot water, for pressures not exceeding 600 psi or temperatures in excess of 750°F.

(b) Piping in the district heating and central heating generating plants is covered by Section 1 of this Code. Piping for pressures in excess of 600 psi, or temperatures in excess of 750°F, shall conform to requirements of Section 1.

402 Classification. (a) District and central heating piping systems shall include all distributing piping for steam or hot water produced in district heating and central heating plants whether the piping is installed underground or elsewhere and distributed at pressures in excess of 15 p.s.i. gage.

(b) This section shall not apply to equipment, apparatus, or pipe connections which are a part of apparatus, nor does it apply to low pressure heating piping within buildings, roof, and floor drains, or plumbing and sewers. This section shall not apply to heating systems aboard ship.

(c) Outdoor steam or hot water distribution piping on the premises of an industrial establishment shall conform to the requirements of this section. Such distribution piping constructed within the buildings of such establishment shall conform to Section 1 of this code.

423 Thickness of Pipe. (f) Steel.....pipe lighter than Schedule 40.....shall not be threaded. In .....(the pipe design formula).....the value P shall be taken at not less than 100 psi gage for any conditions or material.

(g) (1) While the thickness given by ..... (the pipe design formula).....is theoretically ample to take care of both bursting pressure and material removed in the threading, it is mandatory that where steel pipe is threaded and used for steam pressures of 250 psi and over, or for piping under pressure in excess of 100 psi with water temperature of 220° F and over, it shall be seamless of a quality at least equal to A.S.T.M. Specifications A-106 or A-53 and of a weight at least equal to Schedule 80..... in order to furnish added mechanical strength."

Section 5, Refrigeration Piping Systems

"501 Scope. Section 5 of this Code covers the design, manufacture, installation, and tests of piping systems and the component parts of such piping including, for example, the pipe, flanges, bolting, gaskets, valves, and fittings for refrigerants and brines, as defined below.

503 Classification. (a) Refrigeration piping shall be understood to comprise all refrigerant and brine piping, wheresoever used and whether erected on the premises or factory assembled. It does not include shell apparatus, compressors, nor pumps, but does include all connecting refrigerant or brine piping, starting at the first joint adjacent to such apparatus. Requirements apply to both refrigerant and brine piping unless specifically restricted by the wording to one or the other class.

(b) Water piping in connection with refrigerating systems shall be designed in accordance with the provisions for Service Water and Condensing Water Systems in Section 1 of this code,.....

519 Specific Minimum Thickness Requirements for Refrigerant Pipe and Tubing. (a) Standard weight (Schedule 40) steel.....pipe may be used for design working pressures not exceeding 250 psi, provided lap welded or seamless pipe is used for sizes larger than 2" (iron pipe size) and extra heavy (Schedule 80) pipe is used for liquid lines for 1½" (iron pipe size) and smaller."

Welded and Seamless Steel Pipe

Calculating Working Pressure, Stress, or Wall Thickness

Based on the Code for Pressure Piping

It is the generally accepted practice among designers today, when computing thickness of pipe for a given service condition, to use formulas provided by the Code for Pressure Piping, the A.S.M.E. Boiler Construction Code, or other applicable codes.

Of these codes, the Code for Pressure Piping, American Standard B31.1-1942, with 1944 Supplement No. 1 and 1947 Supplement No. 2, serves the widest general purpose. It presents minimum safety requirements for the design, manufacture, and erection of pressure piping systems, and is divided into five major sections, as follows:

Section 1.....covering Power Piping
Section 2.....covering Gas and Air Piping
Section 3.....covering Oil Piping
Section 4.....covering District Heating Piping
Section 5.....covering Refrigeration Piping

Pipe Design Formula

The Code for Pressure Piping includes the following formulas for determining pipe wall thickness:

$$t = \frac{PD}{2S + .8P} + c, \text{ for Sections 1, 4, and 5}$$

and: $$t = \frac{PD}{2S} + c, \text{ for Sections 2 and 3.}$$

Where: *t = minimum pipe wall thickness for inspection, in inches
P = maximum internal working pressure, in lbs. per sq. in. (gauge)
D = outside diameter of pipe, in inches
S = allowable stress in material, in lbs. per sq. in.
c = allowance for threading, mechanical strength, and for corrosion, in inches

*Since all pipe furnished by the mill is subject to a 12½% variation in wall thickness, the thickness calculated by the above formula should be multiplied by 8/7 to obtain the nominal wall thickness.

The value of P shall not be taken at less than allowed by the various Sections of the Code.

Table 1
"c" Values for Steel Pipe, Code for Pressure Piping

Nominal Pipe Size Inches	Plain End			**Threaded
	Sections 1, 4, & 5	Section 3	Section 2	Sections 1, 3, 4, & 5
⅛	0.05"	0.00"	Depend	0.05"
¼ and ⅜	0.05	0.00	on	0.05
½ and ¾	0.05	0.05	corrosive	0.0571
1	0.05	0.05	condi-	0.0696
1¼ to 2	0.065	0.05	tions.	0.0696
Larger than 2	0.065	0.05	See Code.	0.1000

**Values are for American Standard Pipe Threads for nominal pipe sizes of ½-inch and larger.

Simplified Method for Calculating Working Pressure, Stress, or Wall Thickness

Although the formulas given above enable the determination of pipe wall thicknesses, their extensive use for practical purposes involves many laborious calculations. By establishing the ratio of the working pressure to the allowable stress as a coefficient, Crane engineers have developed an exceedingly easy, simple, and accurate method for figuring not only the pipe wall thickness but also the stress in the pipe or the working pressure of the pipe, based on the Code for Pressure Piping. Three typical problems and complete data for making calculations are shown on the following two pages.

* * * * * * * * * * * * * * * *

Coefficients for calculating; P/S values: The coefficients for calculating, which are the values of the ratio of the working pressure to allowable stress (P/S) are shown in Table 3, page 545. This table covers various thicknesses and sizes of steel pipe, including not only all scheduled pipe shown in the American Standard for Wrought-Iron and Wrought-Steel Pipe (A.S.A. B36.10) but also other thicknesses which are at present commercially available.

The table has been based upon the design formulas given in the Code for Pressure Piping, the formulas being rearranged in the following manner in order to calculate these values:

$$P/S = \frac{2\ (.875T - c)}{D - .8\ (.875T - c)} \text{ for Sections 1, 4, and 5.}$$

and: $$P/S = \frac{2(.875T - c)}{D} \text{ for Section 3}$$

Where: T = nominal wall thickness, in inches

The P/S values vary for the different sections of the Code due to the fact that the formulas and the value of "c" are not the same in all sections. The use of any particular value, therefore, depends upon the service for which the pipe is to be used.

Allowable stress for pipe: Each section of the Code for Pressure Piping tabulates the allowable stress, "S", for piping materials at various temperatures. Table 2, page 544, shows these allowable stresses for steel pipe made in accordance with A.S.T.M. Specifications A 53 and A 106, and for carbon molybdenum steel pipe made in accordance with A.S.T.M. Specification A 206.

The allowable stresses for Section 2 of the Code for Pressure Piping have not been included in Table 2, because information for solution of the pipe design formula must be obtained from the Code since "c" values for Section 2 depend upon corrosive conditions.

Calculated pressure-temperature ratings: For the convenience of users, Crane engineers have also calculated the actual pressure-temperature ratings for Standard and Extra Strong Grade A Seamless Steel Pipe for the Power Piping and the Oil Piping (Within Refinery Limits) Sections of the Code for Pressure Piping. See pages 288 and 289. As explained above, other ratings, stresses, or pipe wall thicknesses can be easily calculated from the data shown on the following two pages.

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Working Pressure, Stress, or Thickness Calculated Quickly and Accurately

Determining Working Pressure

Multiply P/S value by allowable stress. Determination of maximum allowable working pressure when material, thickness, and temperature are known.

What is the maximum allowable working pressure at 100° F. for 1″ Schedule 40, Grade A seamless steel plain end pipe per A.S.T.M. Specification A 106 to comply with Section 1 of the Code for Pressure Piping?

The P/S value for 1″ Schedule 40 pipe for Section 1 is .105; see Table 3. The allowable stress for Grade A pipe at 100° F. for Section 1 is 12,240 pounds; see Table 2. Multiply these values to obtain the maximum working pressure, thus:

Working pressure = .105 x 12240 = 1285 lbs. per sq. in.

Determining Stress

Divide working pressure by P/S value. Determination of stress in pipe when the material, the working pressure, and the thickness are known.

What is the stress in 4″ Schedule 80, Grade A seamless steel plain end pipe per A.S.T.M. Spec. A 106 when the working pressure is 1000 pounds per square inch and the temperature is 550° F.? The stress should not exceed that allowed at 550° F. by Section 1 of the Code for Pressure Piping.

The P/S value for 4″ Schedule 80 pipe for Section 1 is .107; see Table 3. Divide the known working pressure by the P/S value, thus:

$$\text{Stress} = \frac{1000}{.107} = 9346 \text{ lbs. per sq. in.}$$

The allowable stress for this Grade A seamless steel pipe at 550° F. per Section 1 is 10,080 pounds per square inch; see Table 2. Since the calculated stress is less than the allowable, the pipe is satisfactory for the service conditions.

Determining Pipe Wall Thickness

Divide working pressure by allowable stress to get P/S value.

Refer to Table 3 for equivalent.

Determination of pipe wall thickness when the material, working pressure, and temperature are known.

What thickness of 12″ Grade B seamless steel plain end pipe per A.S.T.M. Specification A 106 can be used for 950 pounds per square inch oil working pressure at 450° F.? This pipe is to comply with Section 3 (Within Refinery Limits) of the Code for Pressure Piping.

The allowable stress for 12″ Grade B pipe at 450° F. for Section 3 is 17,200 pounds; see Table 2. Divide the known working pressure by the allowable stress, thus:

$$\text{P/S value} = \frac{950}{17200} = .055$$

Compare this P/S value with those of the established thicknesses of 12″ pipe to find its equivalent or the next heavier weight; see Table 3. In the column for Section 3, it will be found that 12″ pipe with a .500″ thickness has a P/S value of .061. Since the calculated value is .055 and the next lighter weight pipe (.406″ thickness) has a lower P/S value (.048), pipe .500″ thick should be used.

Table 2—Allowable Stresses for Steel Pipe (psi) From Code for Pressure Piping

Temperature Degrees Fahr.	Seamless: Grade A *†‡ ASTM A 106	Seamless: Grade B †‡ ASTM A 106	Seamless: Carbon Molybdenum ASTM A 206	Lap-Weld ‡ ASTM A 53 or A 106	Butt-Weld ‡ ASTM A 53
Section 1, Power Piping or Section 4, District Heating					
100	12240	15300		9600	6875
150	12000	15000		9400	6750
200	11760	14700		9200	6625
250	11520	14400		9000	6500
300	11280	14100		8775	6350
350	11040	13800		8550	6200
400	10800	13400		8350	6050
450	10560	13200		8150	5950
500	10320	12900		7950	5800
550	10080	12600		7750	5650
600	9840	12300		7550	5550
650	9600	12000	11000	7300	5400
700	9250	11400	11000	6800	5100
750	8700	10400	11000	6250	4700
800	8000	9100	10750		
850	6850	7400	10500		
900	5600	5600	10000		
950	3800	3800	8000		
1000	2000	2000	5000		
Section 3, Oil Piping					
Outside of Refinery Limits					
100	25500	29750		15950	15300
Within Refinery Limits					
100	18000	21000	18000	11250	10800
150	17450	20450	17650	11000	10500
200	16900	19900	17350	10750	10200
250	16350	19350	17000	10500	9900
300	15800	18800	16700	10250	9600
350	15300	18250	16350	10000	9300
400	14700	17700	16050	9700	9000
450	14150	17200	15700	9450	8700
500	13600	16600	15400	9200	8400
550	13100	16100	15050	8950	8100
600	12550	15550	14750	8700	7800
650	12000	15000	14400	8450	7500
700	11550	14250	14100	8200	7200
750	10900	13000	13800	7850	6700
800	10000	11400	13500		
850	8550	9250	13150		
900	7000	7000	12250		
950	4750	4750	10000		
1000	2500	2500	6250		
1050			3000		
1100			1500		
Section 5, Refrigeration Piping					
....	12000	15000		9000	6800

*Silicon killed, 0.10 to 0.25 per cent silicon.

†Within the following temperature limitations, the values are also applicable to Seamless Pipe per ASTM Specification A 53:
For Section 1 or 4, Grade A Pipe not exceeding 650° F.
Grade B Pipe not exceeding 700° F.
For Section 3, Grade A or B Pipe not exceeding 750° F.

‡For Section 3 only, values are also applicable to A.P.I. 5L.

For allowable stresses for steel pipe for Section 2, Division 1, Gas and Air Piping, see Code for Pressure Piping.

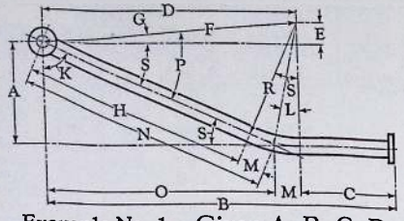
Table 3—P/S Values for Steel Pipe; Coefficients, Based on Code for Pressure Piping

Nominal Pipe Size	O.D. of Pipe Inches	[1]Nominal Wall Thickness Inches	[2]Values for P/S: Plain End Pipe Sec. 1, 4, or 5	Plain End Pipe Sec. 3	[3]Thd'd. Pipe Sec. 1, 4, or 5	[3]Thd'd. Pipe Sec. 3
1/8″	.405	.068 (40) s	.048	.294	.048	.047
		.095 (80) x	.175	.410	.175	.164
1/4	.540	.088 (40) s	.104	.285	.104	.100
		.119 (80) x	.218	.386	.218	.200
3/8	.675	.091 (40) s	.091	.236	.091	.088
		.126 (80) x	.192	.327	.192	.179
1/2	.840	.109 (40) s	.113	.108	.095	.091
		.147 (80) x	.202	.187	.183	.170
		.187 (160)	.303	.271	.282	.254
		.294 xx	.615	.493	.589	.477
3/4	1.050	.113 (40) s	.097	.093	.082	.080
		.154 (80) x	.173	.161	.157	.148
		.218 (160)	.300	.268	.283	.255
		.308 xx	.502	.418	.482	.405
1	1.315	.133 (40) s	.105	.101	.073	.071
		.179 (80) x	.173	.162	.140	.132
		.250 (160)	.286	.257	.249	.227
		.358 xx	.477	.400	.435	.371
1 1/4	1.660	.140 (40) s	.071	.087	.065	.064
		.191 (80) x	.129	.141	.123	.118
		.250 (160)	.200	.203	.194	.180
		.382 xx	.373	.342	.365	.319
1 1/2	1.900	.145 (40) s	.067	.081	.062	.060
		.200 (80) x	.121	.132	.116	.111
		.281 (160)	.206	.206	.200	.186
		.400 xx	.341	.316	.335	.295
2	2.375	.154 (40) s	.060	.071	.056	.055
		.218 (80) x	.111	.119	.106	.102
		.343 (160)	.215	.211	.210	.194
		.436 xx	.298	.279	.293	.263
2 1/2	2.875	.203 (40) s	.081	.089	.055	.054
		.276 (80) x	.129	.133	.102	.098
		.375 (160)	.198	.193	.169	.159
		.552 xx	.329	.301	.298	.266
3	3.500	.216 (40) s	.073	.079	.052	.051
		.300 (80) x	.118	.121	.096	.093
		.437 (160)	.196	.190	.172	.161
		.600 xx	.294	.271	.269	.243
3 1/2	4.000	.226 (40) s	.068	.074	.050	.049
		.318 (80) x	.111	.114	.092	.089
4	4.500	.237 (40) s	.065	.070	.049	.048
		.337 (80) x	.107	.109	.090	.087
		.437 (120)	.149	.148	.132	.126
		.531 (160)	.191	.184	.173	.162
		.674 xx	.257	.240	.238	.218
5	5.563	.258 (40) s	.059	.063	.046	.045
		.375 (80) x	.098	.100	.085	.082
		.500 (120)	.142	.139	.128	.121
		.625 (160)	.186	.179	.172	.161
		.750 xx	.232	.218	.217	.200
6	6.625	.280 (40) s	.056	.059	.045	.044
		.432 (80) x	.098	.099	.087	.084
		.562 (120)	.136	.133	.124	.118
		.718 (160)	.182	.175	.170	.159
		.864 xx	.228	.213	.215	.198
8	8.625	.250 (20)	.036	.039	.028	.028
		.277 (30)	.042	.045	.033	.033
		.322 (40) s	.051	.054	.043	.042
		.406 (60)	.069	.071	.061	.059
		.500 (80) x	.089	.090	.081	.078
		.593 (100)	.110	.109	.101	.097
		.718 (120)	.138	.134	.129	.122
		.812 (140)	.159	.153	.150	.142
		.875 xx	.174	.166	.165	.154
		.906 (160)	.181	.172	.172	.161
10″	10.75	.250 (20)	.029	.031	.022	.022
		.307 (30)	.038	.041	.032	.031
		.365 (40) s	.048	.050	.041	.041
		.500 (60) x	.071	.072	.064	.063
		.593 (80)	.087	.087	.080	.078
		.718 (100)	.109	.108	.102	.098
		.843 (120)	.132	.128	.125	.119
		1.000 (140)	.160	.153	.153	.144
		1.125 (160)	.184	.174	.176	.165
12	12.75	.250 (20)	.024	.026	.019	.019
		.330 (30)	.036	.037	.030	.030
		.375 s	.042	.044	.036	.036
		.406 (40)	.046	.048	.041	.040
		.500 x	.060	.061	.054	.053
		.562 (60)	.069	.069	.063	.061
		.687 (80)	.087	.086	.081	.079
		.843 (100)	.110	.108	.104	.100
		1.000 (120)	.134	.129	.128	.122
		1.125 (140)	.153	.147	.147	.139
		1.312 (160)	.182	.172	.176	.164
14 OD	14.00	.250 (10)	.022	.024	.017	.017
		.312 (20)	.030	.032	.025	.025
		.375 (30) s	.038	.040	.033	.033
		.437 (40)	.046	.047	.041	.040
		.500 x	.054	.055	.049	.048
		.593 (60)	.067	.067	.061	.060
		.750 (80)	.087	.087	.082	.079
		.937 (100)	.113	.110	.107	.103
		1.093 (120)	.134	.129	.129	.122
		1.250 (140)	.156	.149	.151	.142
		1.406 (160)	.178	.169	.173	.161
16 OD	16.00	.250 (10)	.019	.021	.015	.015
		.312 (20)	.026	.028	.022	.022
		.375 (30) s	.033	.035	.029	.029
		.500 (40) x	.047	.048	.043	.042
		.656 (60)	.065	.066	.061	.059
		.843 (80)	.087	.086	.082	.080
		1.031 (100)	.109	.107	.104	.100
		1.218 (120)	.132	.127	.127	.121
		1.437 (140)	.158	.151	.154	.145
		1.593 (160)	.178	.168	.173	.162
18 OD	18.00	.250 (10)	.017	.019	.013	.013
		.312 (20)	.023	.025	.019	.019
		.375 s	.030	.031	.026	.025
		.437 (30)	.036	.037	.032	.031
		.500 x	.042	.043	.038	.038
		.562 (40)	.048	.049	.044	.044
		.750 (60)	.067	.067	.063	.062
		.937 (80)	.087	.086	.083	.080
		1.156 (100)	.110	.107	.106	.101
		1.375 (120)	.133	.128	.129	.123
		1.562 (140)	.154	.146	.149	.141
		1.781 (160)	.178	.168	.173	.162
20 OD	20.00	.250 (10)	.015	.017	.012	.012
		.375 (20) s	.027	.028	.023	.023
		.500 (30) x	.038	.038	.034	.034
		.593 (40)	.046	.047	.043	.042
		.812 (60)	.066	.066	.063	.061
		1.031 (80)	.087	.085	.083	.080
		1.281 (100)	.110	.107	.106	.102
		1.500 (120)	.131	.126	.127	.121
		1.750 (140)	.156	.148	.152	.143
		1.968 (160)	.177	.167	.173	.162
24 OD	24.00	.250 (10)	.013	.014	.010	.010
		.375 (20) s	.022	.023	.019	.019
		.500 x	.031	.032	.028	.028
		.562 (30)	.036	.037	.033	.033
		.687 (40)	.045	.046	.042	.042
		.968 (60)	.067	.066	.064	.062
		1.218 (80)	.086	.085	.083	.080
		1.531 (100)	.111	.107	.108	.103
		1.812 (120)	.133	.128	.130	.124
		2.062 (140)	.154	.146	.151	.142
		2.343 (160)	.177	.166	.174	.162

[1] Figures in parentheses indicate A.S.A. B-36 Schedule Numbers. Letters "s", "x", and "xx" indicate Standard, Extra Strong, and Double Extra Strong Pipe.
[2] P/S Values for Section 2 are not listed because the "c" values (page 543) vary, depending upon corrosive conditions.
[3] See pages 541 and 542 for limitations of threaded ends.

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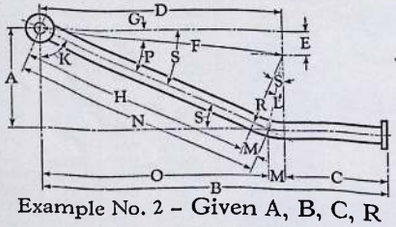
Calculation of Pipe Bends



Example No. 1 – Given A, B, C, R

$D = B - C$
$E = R - A$
$F = \sqrt{D^2 + E^2}$
$\frac{E}{F} = \sin \angle G$
$H = \sqrt{F^2 - R^2}$

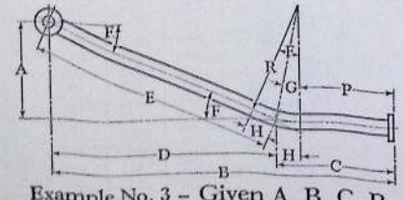
$\frac{R}{F} = \sin \angle P$
$\angle S = \angle P - \angle G$
$\angle K = 90° - \angle S$
$\angle L = \frac{1}{2} \angle S$
$M = \tan \angle L \times R$
$N = H + M$
$O = B - C - M$



Example No. 2 – Given A, B, C, R

$D = B - C$
$E = A - R$
$F = \sqrt{D^2 + E^2}$
$\frac{E}{F} = \sin \angle G$
$H = \sqrt{F^2 - R^2}$

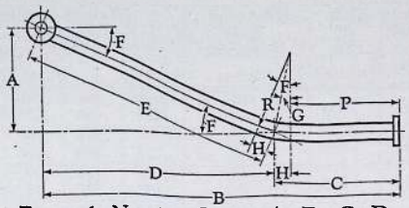
$\frac{R}{F} = \sin \angle P$
$\angle S = \angle P + \angle G$
$\angle K = 90° - \angle S$
$\angle L = \frac{1}{2} \angle S$
$M = \tan \angle L \times R$
$N = H + M$
$O = B - C - M$



Example No. 3 – Given A, B, C, R

$D = B - C$
$E = \sqrt{A^2 + D^2}$
$\frac{A}{E} = \sin \angle F$

$\angle G = \frac{1}{2} \angle F$
$H = \tan \angle G \times R$
$P = C - H$

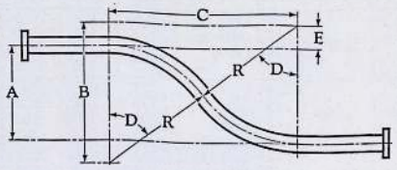


Example No. 4 – Given A, B, C, R

$D = B - C$
$E = \sqrt{A^2 + D^2}$

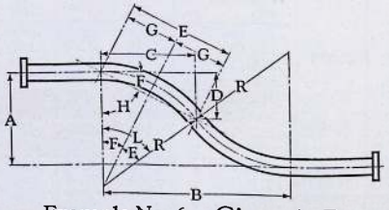
$\frac{A}{E} = \sin \angle F$
$\angle G = \frac{1}{2} \angle F$

$H = \tan \angle G \times R$
$P = C - H$



Example No. 5 – Given A, R

$B = 2R - A$
$C = \sqrt{(2R)^2 - B^2}$
$\frac{C}{2R} = \sin \angle D$

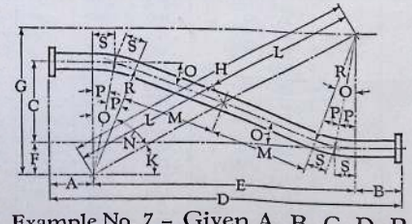


Example No. 6 – Given A, B

$C = \frac{1}{2} B$
$D = \frac{1}{2} A$
$E = \sqrt{C^2 + D^2}$

$\frac{D}{E} = \sin \angle F$
$G = \frac{1}{2} E$

$\angle H = 90° - \angle F$
$R = \frac{A^2 + B^2}{4A}$
$L = 2F$



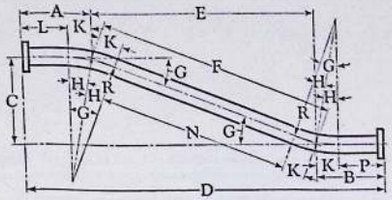
Example No. 7 – Given A, B, C, D, R

$E = D - A - B$
$F = R - C$
$G = R + F$
$H = \sqrt{E^2 + G^2}$

$G/H = \sin \angle K$
$L = \frac{1}{2} H$
$M = \sqrt{L^2 - R^2}$

$M/L = \sin \angle N$
$\angle O = 90° - \angle K - \angle N$
$\angle P = \frac{1}{2} \angle O$
$S = \tan \angle P \times R$

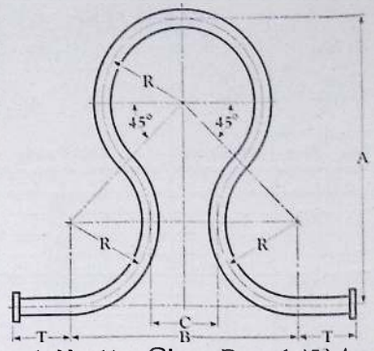
Calculation of Pipe Bends (Cont.)



Example No. 8 – Given A, B, C, D, R

$E = D - A - B$
$F = \sqrt{E^2 + C^2}$
$\frac{C}{F} = \sin \angle G$

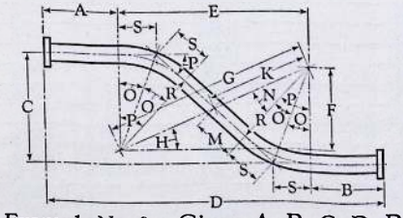
$\angle H = \frac{1}{2} \angle G$
$K = \tan \angle H \times R$
$L = A - K$
$P = B - K$
$N = F - 2K$



Example No. 11 – Given R and 45° Angles

$A = 3.414 \times R$
$B = 2.828 \times R$
$C = 0.828 \times R$

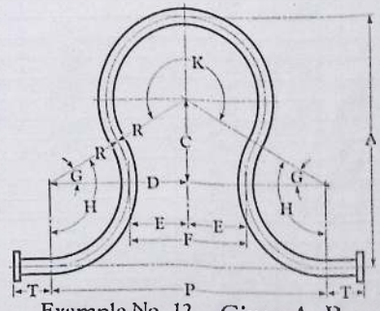
T = Tangent
Length of Pipe in Bend = $9.425 \times R + 2T$



Example No. 9 – Given A, B, C, D, R

$E = D - A - B$
$F = 2R - C$
$G = \sqrt{E^2 + F^2}$
$\frac{F}{E} = \tan \angle H$
$K = \frac{1}{2} G$

$M = \sqrt{K^2 - R^2}$
$\frac{M}{K} = \sin \angle N$
$\angle P = 90° - \angle H - \angle N$
$\angle O = \frac{1}{2} \angle P$
$S = \tan \angle O \times R$

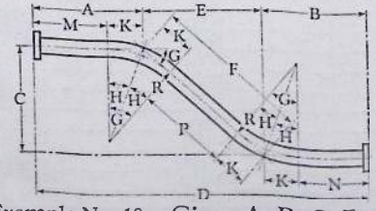


Example No. 12 – Given A, R

$C = A - 2R$
$D = \sqrt{(2R)^2 - C^2}$

$P = 2D$
$E = D - R$
$F = 2E$

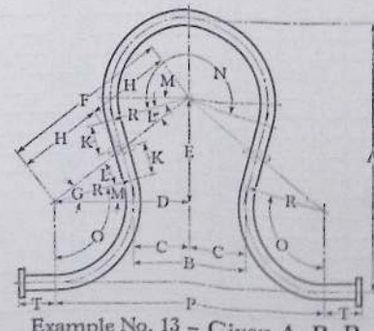
$C/2R = \sin \angle G$
$\angle H = 90° + \angle G$
$\angle K = 180° + 2 \angle G$



Example No. 10 – Given A, B, C, D, R

$E = D - A - B$
$F = \sqrt{C^2 + E^2}$
$\frac{C}{F} = \sin \angle G$

$\angle H = \frac{1}{2} \angle G$
$K = \tan \angle H \times R$
$M = A - K$
$N = B - K$
$P = F - 2K$



Example No. 13 – Given A, B, R

$C = \frac{1}{2} B$
$D = R + C$
$E = A - 2R$
$F = \sqrt{D^2 + E^2}$

$E/F = \sin \angle G$
$H = \frac{1}{2} F$
$K = \sqrt{H^2 - R^2}$
$K/H = \sin \angle L$

$\angle M = \angle G - \angle L$
$\angle N = 180° + 2 \angle M$
$\angle O = 90° + \angle M$
$P = 2D$

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Length of Pipe in Bends

Radius of Pipe Bends		90° Bends	180° Bends	270° Bends	360° Bends	540° Bends
Inches	Feet					
1		1½″	3″	4¾″	6¼″	9½″
2		3	6¼	9½	12½	18¾
3	¼	4¾	9½	14¼	18¾	28¼
4		6¼	12½	18¾	25¼	37¾
5		7¾	15¾	23½	31½	47¼
6	½	9½	18¾	28¼	37¾	56½
7		11	22	33	44	66
8		12½	25¼	37¾	50¼	75½
9	¾	14¼	28¼	42½	56½	84¾
10		15¾	31½	47¼	62¾	94¼
11		17¼	34½	51¾	69	103¾
12	1	18¾	37¾	56½	75½	113
12.5		19¾	39¼	59	78½	117¾
14		22	44	66	88	132
15	1¼	23½	47	70¾	94¼	141¼
16		25¼	50¼	75½	100½	150¾
17.5		27½	55	82½	110	165
18	1½	28¼	56½	84¾	113	169¾
20		31½	62¾	94¼	125¾	188½
21	1¾	33	66	99	132	198
24	2	37¾	75½	113	150¾	226¼
25		39¼	78½	117¾	157	235½
30	2½	47¼	94¼	141¼	188½	282¾
32		50¼	100½	150¾	201	301½
36	3	56½	113	169½	226¼	339¼
40		62¾	125¾	188½	251¼	377
48	4	75½	150¾	226¼	301½	452½
50		78½	157	235½	314¼	471¼
56		88	176	264	351¾	527¾
60	5	94¼	188½	282¾	377	565½
64		100½	201	301½	402	603¼
70		110	220	329¾	439¾	659¾
72	6	113	226¼	339¼	452½	678½
80		125¾	251¼	377	502¾	754
84	7	132	263¾	395¾	527¾	791½
90	7½	141¼	282¾	424	565½	848¼
96	8	150¾	301½	452½	603	904¾
100		157	314¼	471¼	628¼	942½
108	9	169½	339¼	509	678½	1017¾
120	10	188½	377	565½	754	1131
132	11	207¼	414¾	622	829½	1244
144	12	226¼	452½	678½	904¾	1357¼
156	13	245	490	735¼	980¼	1470¼
168	14	263¾	527¾	791½	1055½	1583½
180	15	282¾	565½	848¼	1131	1696½
192	16	301½	603	904¾	1206¼	1809½
204	17	320½	640¾	961¼	1281¾	1922½
216	18	339¼	678½	1017¾	1357¼	2035¾
228	19	358	716¼	1074½	1432½	2148¾
240	20	377	754	1131	1508	2262

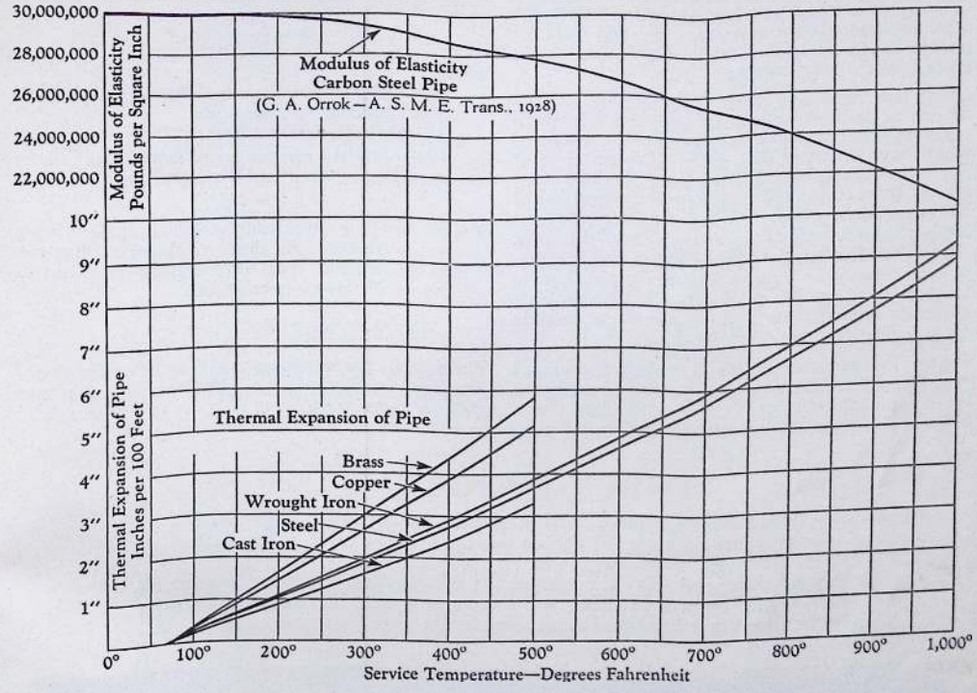
To find the length of pipe in a bend having a radius not given above, add together the length of pipe in bends whose combined radii equal the required radius.

Example: Find length of pipe in 90° bend of 5′ 9″ radius.
Length of pipe in 90° bend of 5′ radius = 94¼″
Length of pipe in 90° bend of 9″ radius = 14¼″
Then, length of pipe in 90° bend of 5′ 9″ radius = 108½″

Standard Types of Pipe Bends....pages 502 and 503

Minimum permissible radii of pipe bends....page 503

Thermal Expansion and Modulus of Elasticity of Pipe



References

Pipe.....pages 477 to 484
American Standard for Pipe.....pages 486 to 489
Commercial Wrought Steel Pipe Data.....pages 490 and 491

Calculating Working Pressures, Stress, or Wall Thickness of Pipe.....pages 543 to 545

Calculations of Pipe Bends.....pages 546 and 547
Length of Pipe in Bends.....page 548

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Spacing of Pipe Supports

When a horizontal pipe line is supported at intermediate points, sagging of the pipe occurs between these supports, the amount of sag being dependent upon the weight of the pipe, fluid, insulation, and valves or fittings which may be included in the line. If the pipe line is installed with no downward pitch, pockets will be formed in each span in which case condensation may collect if the line is transporting steam. In order to eliminate these pockets, the line must be pitched downward so that the outlet of each span is lower than the maximum sag.

Crane has conducted tests to determine the deflection of horizontal standard pipe lines filled with water, in pipe sizes ¾″ to 4″ inclusive, the results of which have indicated that for pipes larger than 2″ and with supports having center to center dimensions greater than 10 feet, the resultant deflection is less than that determined by the use of the formula for a uniformly loaded pipe fixed at both ends. For pipe sizes 2″ and smaller, the test deflection was in excess of that determined by the formula for pipe having fixed ends and approached, for the shorter spans, the deflection as determined by the use of the formula for pipe lines having unrestrained ends.

Page 551 gives the deflection of horizontal standard pipe lines filled with water, for varying spans, based upon the results obtained from tests for sizes 2″ and smaller, and upon the formula for fixed ends for the larger sizes of pipe. The deflection values given on the chart are twice those obtained from test or calculated, to compensate for any variables including weight of insulation, etc.

The formula given below indicates the vertical distance that the span must be pitched so that the outlet is lower than the maximum sag of the pipe.

$$h = \frac{144\,S^2\,y}{36\,S^2 - y^2}$$

where:

h = Difference in elevation of span ends, inches
S = Length of one span, feet
y = Deflection of one span, inches

By eliminating the unconsequential term "$-y^2$" from the denominator, the formula reduces to:

$$h = 4\,y$$

The pitch of pipe spans, called the Average Gradient, is a ratio between the drop in elevation and the length of the span. This is expressed as so many inches in a certain number of feet.

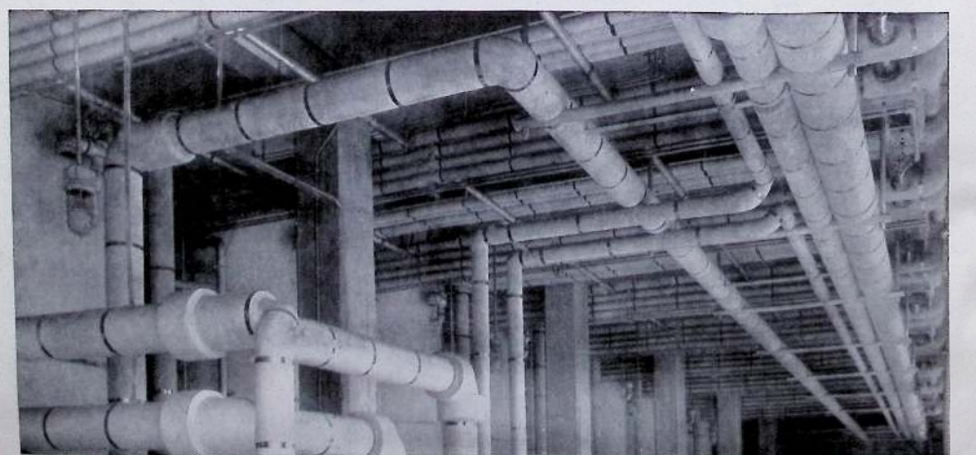
$$\text{Average Gradient} = \frac{4\,y}{S}$$

The dotted lines as shown on the chart on the opposite page are plotted from the above formula and indicate average gradients of 1″ in 10′, 1″ in 15′, 1″ in 20′, 1″ in 30′, and 1″ in 40′.

EXAMPLE

What is the maximum distance between supports for a 4″ Standard pipe line assuming a pitch or average gradient of 1″ in 30 feet?

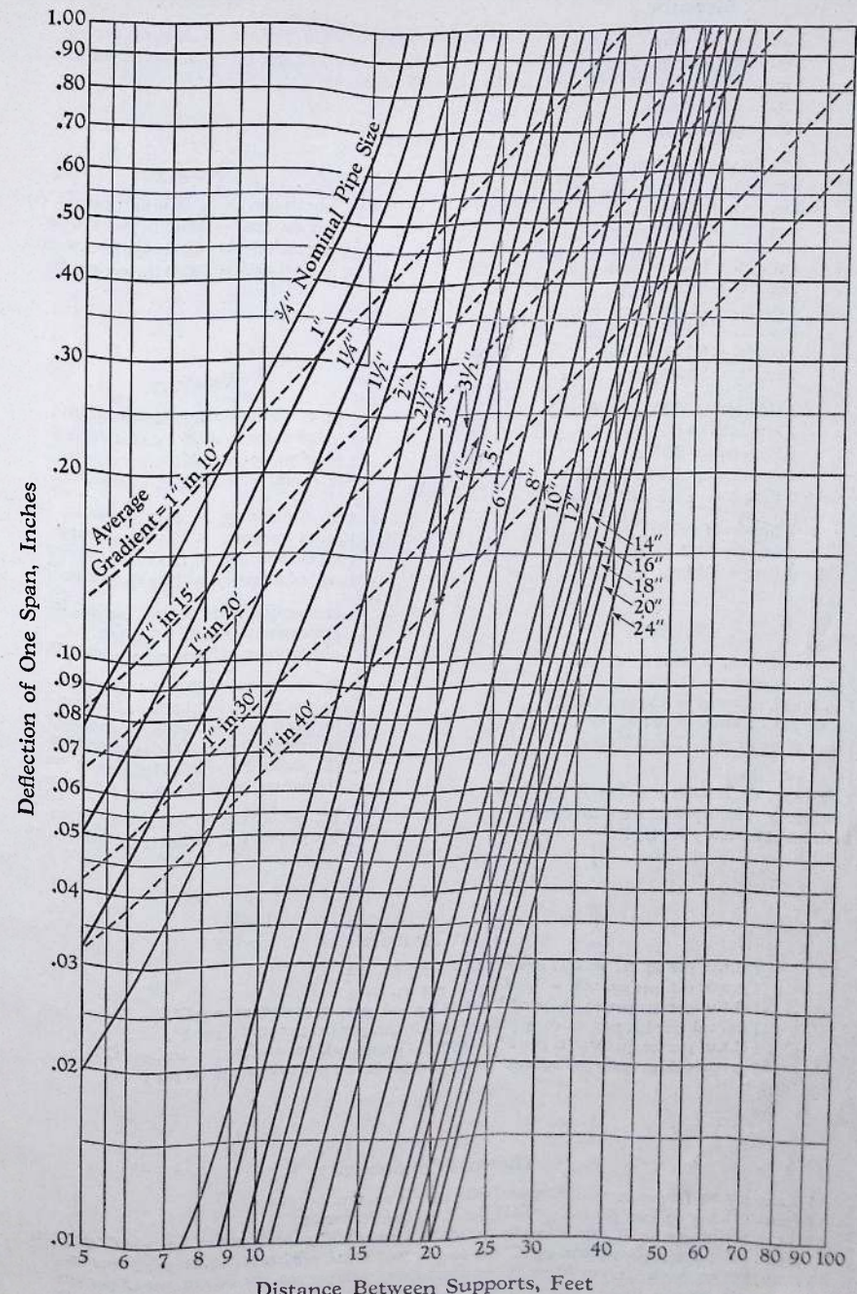
Proceed downward from the intersection of the diagonal dotted line for an average gradient of 1″ in 30 feet and the diagonal solid line for 4″ pipe to the bottom line where it is noted that the maximum span is approximately 22 feet.



Pipe Hangers and Pipe Supports....pages 429 to 442

Deflection of Horizontal Pipe Lines

(Based on Standard Pipe Filled with Water)



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Conversion Table

Measure

1 in. = 25.4 mm.
1 mm. = .03937 in.
1 mm. = .00328 ft.
1 ft. = 304.8 mm.
1 ft. = 30.48 cm.

1 sq. in. = 6.4516 sq. cm.
1 sq. cm. = 0.155 sq. in.
1 sq. cm. = .00108 sq. ft.
1 sq. ft. = 929.03 sq. cm.

1 cu. in. = 16.39 cu. cm.
1 cu. ft. = 1728 cu. in.
1 cu. ft. = 28,316.83 cu. cm.
1 cu. ft. = 7.4805 U. S. gals.
1 cu. ft. = 6.23 imp. gals.
1 cu. ft. = 28.375 liters

1 U. S. gal. = 0.1337 cu. ft.
1 imp. gal. = 277.27 cu. in.
1 imp. gal. = 0.16 cu. ft.
1 imp. gal. = 1.2 U. S. gals.
1 imp. gal. = 4.537 liters

1 liter = 61 cu. in.
1 liter = .0353 cu. ft.
1 liter = .22 imp. gal.

Weight

1 cu. in. of water = .0361 lb. (15° C)
1 cu. ft. of water = 62.4 lbs. (15° C)
1 U. S. gal. of water = 8.33 lbs. (15° C)
1 imp. gal. of water = 10 lbs. (15° C)
1 liter of water = 2.2 lbs. (15° C)

1 kg. = 2.2 lbs.
1 cu. in. of water = .0735 cu. in. of mercury
1 cu. in. of mercury = 13.6 cu. in. of water
1 cu. in. of mercury = .491 lb.

Velocity

1 ft. per sec. = .3048 m. per sec.
1 m. per sec. = 3.2808 ft. per sec.

Density

1 lb. per cu. in. = 27.68 gram. per cu. cm.
1 gr. per cu. cm. = .03613 lb. per cu. in.
1 lb. per cu. ft. = 16.0184 kg. per cu. m.
1 kg. per cu. m. = .06243 lb. per cu. ft.

Pressure

1 in. of water = .0361 lb. per sq. in.
1 in. of water = .0735 in. of mercury
1 ft. of water = .4332 lb. per sq. in.
1 ft. of water = .8824 in. of mercury

1 in. of mercury = .4912 lb. per sq. in.
1 in. of mercury = 13.6 in. of water
1 in. of mercury = 1.133 ft. of water
1 cm. of mercury = .1934 lb. per sq. in.

1 atmosphere = 14.696 lbs. per sq. in.
1 atmosphere = 34 ft. of water
1 atmosphere = 760 mm. of mercury

1 lb. per sq. in. = 27.71 in. of water
1 lb. per sq. in. = 2.312 ft. of water
1 lb. per sq. in. = 2.04 in. of mercury
1 lb. per sq. in. = .06804 atmosphere
1 lb. per sq. in. = .0703 kg. per sq. cm.
1 lb. per sq. in. = 703.08 kg. per sq. m.

1 kg. per sq. cm. = 14.223 lbs. per sq. in.
1 kg. per sq. m. = .00142 lb. per sq. in.

Heat Transfer

1 B.t.u. per sq. ft. = .2712 gram. calorie per sq. cm.
1 gram. cal. per sq. cm. = 3.687 B.t.u. per sq. ft.
1 B.t.u. per hr. per sq. ft. per F° = 4.88 kg. cal. per hr. per sq. m. per C°.
1 kg. cal. per hr. per sq. m. per C° = .205 B.t.u. per hr. per sq. ft. per F°.
1 B.t.u. per hr. per sq. ft. per F° = .0001355 gram. cal. per sec. per sq. cm. per C°.
1 gram. cal. per sec. per sq. cm. per C° = 7380 B.t.u. per hr. per sq. ft. per F°.

Thermal Conductivity

1 B.t.u. per sq. ft. per in. = .6892 gram. calories per sq. cm. per cm.
1 gram. cal. per sq. cm. per cm. = 1.451 B.t.u. per sq. ft. per in.
1 B.t.u. per hr. per sq. ft. per F° per in. = .0003445 gram. cal. per sec. per sq. cm. per C° per cm.
1 gram. cal. per sec. per sq. cm. per C° per cm. = 2903 B.t.u. per hr. per sq. ft. per F° per in.
1 B.t.u. per hr. per sq. ft. per F° per ft. = .00413 gram. cal. per sec. per sq. cm. per C° per cm.
1 gram. cal. per sec. per sq. cm. per C° per cm. = 242.13 B.t.u. per hr. per sq. ft. per F° per ft.

Linear Conversion

Fractions of an Inch To Decimals of an Inch and to Millimeters

Fraction	Decimal	Millimeter
1/64	.015625	0.39688
1/32	.03125	0.79375
3/64	.046875	1.19063
1/16	.0625	1.58750
5/64	.078125	1.98438
3/32	.09375	2.38125
7/64	.109375	2.77813
1/8	.125	3.17501
9/64	.140625	3.57188
5/32	.15625	3.96876
11/64	.171875	4.36563
3/16	.1875	4.76251
13/64	.203125	5.15939
7/32	.21875	5.55626
15/64	.234375	5.95314
1/4	.25	6.35001
17/64	.265625	6.74689
9/32	.28125	7.14376
19/64	.296875	7.54064
5/16	.3125	7.93752
21/64	.328125	8.33439
11/32	.34375	8.73127
23/64	.359375	9.12814
3/8	.375	9.52502
25/64	.390625	9.92189
13/32	.40625	10.31877
27/64	.421875	10.71565
7/16	.4375	11.11252
29/64	.453125	11.50940
15/32	.46875	11.90627
31/64	.484375	12.30315
1/2	.5	12.70002
33/64	.515625	13.09690
17/32	.53125	13.49378
35/64	.546875	13.89065
9/16	.5625	14.28753
37/64	.578125	14.68440
19/32	.59375	15.08128
39/64	.609375	15.47816
5/8	.625	15.87503
41/64	.640625	16.27191
21/32	.65625	16.66878
43/64	.671875	17.06566
11/16	.6875	17.46253
45/64	.703125	17.85941
23/32	.71875	18.25629
47/64	.734375	18.65316
3/4	.75	19.05004
49/64	.765625	19.44691
25/32	.78125	19.84379
51/64	.796875	20.24066
13/16	.8125	20.63754
53/64	.828125	21.03442
27/32	.84375	21.43129
55/64	.859375	21.82817
7/8	.875	22.22504
57/64	.890625	22.62192
29/32	.90625	23.01880
59/64	.921875	23.41567
15/16	.9375	23.81255
61/64	.953125	24.20942
31/32	.96875	24.60630
63/64	.984375	25.00317
1	1.0	25.40005

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Linear Conversion

Decimals of an Inch to Millimeters

(0.10 inch = 2.54 millimeters)

Inches	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	Inches
0.00	0.00	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.29	0.00
.10	2.54	2.79	3.05	3.30	3.56	3.81	4.06	4.32	4.57	4.83	.10
.20	5.08	5.33	5.59	5.84	6.10	6.35	6.60	6.86	7.11	7.37	.20
.30	7.62	7.87	8.13	8.38	8.64	8.89	9.14	9.40	9.65	9.91	.30
.40	10.16	10.41	10.67	10.92	11.18	11.43	11.68	11.94	12.19	12.45	.40
.50	12.70	12.95	13.21	13.46	13.72	13.97	14.22	14.48	14.73	14.99	.50
.60	15.24	15.49	15.75	16.00	16.26	16.51	16.76	17.02	17.27	17.53	.60
.70	17.78	18.03	18.29	18.54	18.80	19.05	19.30	19.56	19.81	20.07	.70
.80	20.32	20.57	20.83	21.08	21.34	21.59	21.84	22.10	22.35	22.61	.80
.90	22.86	23.11	23.37	23.62	23.88	24.13	24.38	24.64	24.89	25.15	.90

Millimeters to Inches

(1 millimeter = .03937 inch)

Millimeters	0	1	2	3	4	5	6	7	8	9	Millimeters
0	0.00	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354	0
10	0.39	0.43	0.47	0.51	0.55	0.59	0.63	0.67	0.71	0.75	10
20	0.79	0.83	0.87	0.91	0.94	0.98	1.02	1.06	1.10	1.14	20
30	1.18	1.22	1.26	1.30	1.34	1.38	1.42	1.46	1.50	1.54	30
40	1.57	1.61	1.65	1.69	1.73	1.77	1.81	1.85	1.89	1.93	40
50	1.97	2.01	2.05	2.09	2.13	2.17	2.20	2.24	2.28	2.32	50
60	2.36	2.40	2.44	2.48	2.52	2.56	2.60	2.64	2.68	2.72	60
70	2.76	2.80	2.83	2.87	2.91	2.95	2.99	3.03	3.07	3.11	70
80	3.15	3.19	3.23	3.27	3.31	3.35	3.39	3.43	3.46	3.50	80
90	3.54	3.58	3.62	3.66	3.70	3.74	3.78	3.82	3.86	3.90	90
100	3.94	3.98	4.02	4.06	4.09	4.13	4.17	4.21	4.25	4.29	100
110	4.33	4.37	4.41	4.45	4.49	4.53	4.57	4.61	4.65	4.69	110
120	4.72	4.76	4.80	4.84	4.88	4.92	4.96	5.00	5.04	5.08	120
130	5.12	5.16	5.20	5.24	5.28	5.31	5.35	5.39	5.43	5.47	130
140	5.51	5.55	5.59	5.63	5.67	5.71	5.75	5.79	5.83	5.87	140
150	5.91	5.94	5.98	6.02	6.06	6.10	6.14	6.18	6.22	6.26	150
160	6.30	6.34	6.38	6.42	6.46	6.50	6.54	6.57	6.61	6.65	160
170	6.69	6.73	6.77	6.81	6.85	6.89	6.93	6.97	7.01	7.05	170
180	7.09	7.13	7.17	7.20	7.24	7.28	7.32	7.36	7.40	7.44	180
190	7.48	7.52	7.56	7.60	7.64	7.68	7.72	7.76	7.80	7.83	190
200	7.87	7.91	7.95	7.99	8.03	8.07	8.11	8.15	8.19	8.23	200
210	8.27	8.31	8.35	8.39	8.43	8.46	8.50	8.54	8.58	8.62	210
220	8.66	8.70	8.74	8.78	8.82	8.86	8.90	8.94	8.98	9.02	220
230	9.06	9.09	9.13	9.17	9.21	9.25	9.29	9.33	9.37	9.41	230
240	9.45	9.49	9.53	9.57	9.61	9.65	9.69	9.72	9.76	9.80	240
250	9.84	9.88	9.92	9.96	10.00	10.04	10.08	10.12	10.16	10.20	250
260	10.24	10.28	10.31	10.35	10.39	10.43	10.47	10.51	10.55	10.59	260
270	10.63	10.67	10.71	10.75	10.79	10.83	10.87	10.91	10.94	10.98	270
280	11.02	11.06	11.10	11.14	11.18	11.22	11.26	11.30	11.34	11.38	280
290	11.42	11.46	11.50	11.54	11.57	11.61	11.65	11.69	11.73	11.77	290
300	11.81	11.85	11.89	11.93	11.97	12.01	12.05	12.09	12.13	12.17	300
310	12.20	12.24	12.28	12.32	12.36	12.40	12.44	12.48	12.52	12.56	310
320	12.60	12.64	12.68	12.72	12.76	12.80	12.83	12.87	12.91	12.95	320
330	12.99	13.03	13.07	13.11	13.15	13.19	13.23	13.27	13.31	13.35	330
340	13.39	13.43	13.46	13.50	13.54	13.58	13.62	13.66	13.70	13.74	340
350	13.78	13.82	13.86	13.90	13.94	13.98	14.02	14.06	14.09	14.13	350
360	14.17	14.21	14.25	14.29	14.33	14.37	14.41	14.45	14.49	14.53	360
370	14.57	14.61	14.65	14.69	14.72	14.76	14.80	14.84	14.88	14.92	370
380	14.96	15.00	15.04	15.08	15.12	15.16	15.20	15.24	15.28	15.31	380
390	15.35	15.39	15.43	15.47	15.51	15.55	15.59	15.63	15.67	15.71	390

(Continued on next page)

Millimeters to Inches (Cont.)

Millimeters	0	1	2	3	4	5	6	7	8	9	Millimeters
400	15.75	15.79	15.83	15.87	15.91	15.94	15.98	16.02	16.06	16.10	400
410	16.14	16.18	16.22	16.26	16.30	16.34	16.38	16.42	16.46	16.50	410
420	16.54	16.57	16.61	16.65	16.69	16.73	16.77	16.81	16.85	16.89	420
430	16.93	16.97	17.01	17.05	17.09	17.13	17.17	17.20	17.24	17.28	430
440	17.32	17.36	17.40	17.44	17.48	17.52	17.56	17.60	17.64	17.68	440
450	17.72	17.76	17.80	17.83	17.87	17.91	17.95	17.99	18.03	18.07	450
460	18.11	18.15	18.19	18.23	18.27	18.31	18.35	18.39	18.43	18.46	460
470	18.50	18.54	18.58	18.62	18.66	18.70	18.74	18.78	18.82	18.86	470
480	18.90	18.94	18.98	19.02	19.06	19.09	19.13	19.17	19.21	19.25	480
490	19.29	19.33	19.37	19.41	19.45	19.49	19.53	19.57	19.61	19.65	490
500	19.69	19.72	19.76	19.80	19.84	19.88	19.92	19.96	20.00	20.04	500
510	20.08	20.12	20.16	20.20	20.24	20.28	20.31	20.35	20.39	20.43	510
520	20.47	20.51	20.55	20.59	20.63	20.67	20.71	20.75	20.79	20.83	520
530	20.87	20.91	20.94	20.98	21.02	21.06	21.10	21.14	21.18	21.22	530
540	21.26	21.30	21.34	21.38	21.42	21.46	21.50	21.54	21.58	21.61	540
550	21.65	21.69	21.73	21.77	21.81	21.85	21.89	21.93	21.97	22.01	550
560	22.05	22.09	22.13	22.17	22.20	22.24	22.28	22.32	22.36	22.40	560
570	22.44	22.48	22.52	22.56	22.60	22.64	22.68	22.72	22.76	22.80	570
580	22.83	22.87	22.91	22.95	22.99	23.03	23.07	23.11	23.15	23.19	580
590	23.23	23.27	23.31	23.35	23.39	23.43	23.46	23.50	23.54	23.58	590
600	23.62	23.66	23.70	23.74	23.78	23.82	23.86	23.90	23.94	23.98	600
610	24.02	24.06	24.09	24.13	24.17	24.21	24.25	24.29	24.33	24.37	610
620	24.41	24.45	24.49	24.53	24.57	24.61	24.65	24.68	24.72	24.76	620
630	24.80	24.84	24.88	24.92	24.96	25.00	25.04	25.08	25.12	25.16	630
640	25.20	25.24	25.28	25.31	25.35	25.39	25.43	25.47	25.51	25.55	640
650	25.59	25.63	25.67	25.71	25.75	25.79	25.83	25.87	25.91	25.94	650
660	25.98	26.02	26.06	26.10	26.14	26.18	26.22	26.26	26.30	26.34	660
670	26.38	26.42	26.46	26.50	26.54	26.57	26.61	26.65	26.69	26.73	670
680	26.77	26.81	26.85	26.89	26.93	26.97	27.01	27.05	27.09	27.13	680
690	27.17	27.20	27.24	27.28	27.32	27.36	27.40	27.44	27.48	27.52	690
700	27.56	27.60	27.64	27.68	27.72	27.76	27.80	27.83	27.87	27.91	700
710	27.95	27.99	28.03	28.07	28.11	28.15	28.19	28.23	28.27	28.31	710
720	28.35	28.39	28.43	28.46	28.50	28.54	28.58	28.62	28.66	28.70	720
730	28.74	28.78	28.82	28.86	28.90	28.94	28.98	29.02	29.06	29.09	730
740	29.13	29.17	29.21	29.25	29.29	29.33	29.37	29.41	29.45	29.49	740
750	29.53	29.57	29.61	29.65	29.68	29.72	29.76	29.80	29.84	29.88	750
760	29.92	29.96	30.00	30.04	30.08	30.12	30.16	30.20	30.24	30.28	760
770	30.31	30.35	30.39	30.43	30.47	30.51	30.55	30.59	30.63	30.67	770
780	30.71	30.75	30.79	30.83	30.87	30.91	30.94	30.98	31.02	31.06	780
790	31.10	31.14	31.18	31.22	31.26	31.30	31.34	31.38	31.42	31.46	790
800	31.50	31.54	31.57	31.61	31.65	31.69	31.73	31.77	31.81	31.85	800
810	31.89	31.93	31.97	32.01	32.05	32.09	32.13	32.17	32.20	32.24	810
820	32.28	32.32	32.36	32.40	32.44	32.48	32.52	32.56	32.60	32.64	820
830	32.68	32.72	32.76	32.80	32.83	32.87	32.91	32.95	32.99	33.03	830
840	33.07	33.11	33.15	33.19	33.23	33.27	33.31	33.35	33.39	33.43	840
850	33.46	33.50	33.54	33.58	33.62	33.66	33.70	33.74	33.78	33.82	850
860	33.86	33.90	33.94	33.98	34.02	34.06	34.09	34.13	34.17	34.21	860
870	34.25	34.29	34.33	34.37	34.41	34.45	34.49	34.53	34.57	34.61	870
880	34.65	34.68	34.72	34.76	34.80	34.84	34.88	34.92	34.96	35.00	880
890	35.04	35.08	35.12	35.16	35.20	35.24	35.28	35.31	35.35	35.39	890
900	35.43	35.47	35.51	35.55	35.59	35.63	35.67	35.71	35.75	35.79	900
910	35.83	35.87	35.91	35.94	35.98	36.02	36.06	36.10	36.14	36.18	910
920	36.22	36.26	36.30	36.34	36.38	36.42	36.46	36.50	36.54	36.57	920
930	36.61	36.65	36.69	36.73	36.77	36.81	36.85	36.89	36.93	36.97	930
940	37.01	37.05	37.09	37.13	37.17	37.20	37.24	37.28	37.32	37.36	940
950	37.40	37.44	37.48	37.52	37.56	37.60	37.64	37.68	37.72	37.76	950
960	37.80	37.83	37.87	37.91	37.95	37.99	38.03	38.07	38.11	38.15	960
970	38.19	38.23	38.27	38.31	38.35	38.39	38.43	38.46	38.50	38.54	970
980	38.58	38.62	38.66	38.70	38.74	38.78	38.82	38.86	38.90	38.94	980
990	38.98	39.02	39.06	39.09	39.13	39.17	39.21	39.25	39.29	39.33	990
1000	39.37	39.41	39.45	39.49	39.53	39.57	39.61	39.65	39.68	39.72	1000

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Linear Conversion

Inches to Millimeters

(1 inch = 25.4 millimeters)

In.	0	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16
0	0.0	1.6	3.2	4.8	6.4	7.9	9.5	11.1	12.7	14.3	15.9	17.5	19.1	20.6	22.2	23.8
1	25.4	27.0	28.6	30.2	31.8	33.3	34.9	36.5	38.1	39.7	41.3	42.9	44.5	46.0	47.6	49.2
2	50.8	52.4	54.0	55.6	57.2	58.7	60.3	61.9	63.5	65.1	66.7	68.3	69.9	71.4	73.0	74.6
3	76.2	77.8	79.4	81.0	82.6	84.1	85.7	87.3	88.9	90.5	92.1	93.7	95.3	96.8	98.4	100.0
4	101.6	103.2	104.8	106.4	108.0	109.5	111.1	112.7	114.3	115.9	117.5	119.1	120.7	122.2	123.8	125.4
5	127.0	128.6	130.2	131.8	133.4	134.9	136.5	138.1	139.7	141.3	142.9	144.5	146.1	147.6	149.2	150.8
6	152.4	154.0	155.6	157.2	158.8	160.3	161.9	163.5	165.1	166.7	168.3	169.9	171.5	173.0	174.6	176.2
7	177.8	179.4	181.0	182.6	184.2	185.7	187.3	188.9	190.5	192.1	193.7	195.3	196.9	198.4	200.0	201.6
8	203.2	204.8	206.4	208.0	209.6	211.1	212.7	214.3	215.9	217.5	219.1	220.7	222.3	223.8	225.4	227.0
9	228.6	230.2	231.8	233.4	235.0	236.5	238.1	239.7	241.3	242.9	244.5	246.1	247.7	249.2	250.8	252.4
10	254.0	255.6	257.2	258.8	260.4	261.9	263.5	265.1	266.7	268.3	269.9	271.5	273.1	274.6	276.2	277.8
11	279.4	281.0	282.6	284.2	285.8	287.3	288.9	290.5	292.1	293.7	295.3	296.9	298.5	300.0	301.6	303.2
12	304.8	306.4	308.0	309.6	311.2	312.7	314.3	315.9	317.5	319.1	320.7	322.3	323.9	325.4	327.0	328.6
13	330.2	331.8	333.4	335.0	336.6	338.1	339.7	341.3	342.9	344.5	346.1	347.7	349.3	350.8	352.4	354.0
14	355.6	357.2	358.8	360.4	362.0	363.5	365.1	366.7	368.3	369.9	371.5	373.1	374.7	376.2	377.8	379.4
15	381.0	382.6	384.2	385.8	387.4	388.9	390.5	392.1	393.7	395.3	396.9	398.5	400.1	401.6	403.2	404.8
16	406.4	408.0	409.6	411.2	412.8	414.3	415.9	417.5	419.1	420.7	422.3	423.9	425.5	427.0	428.6	430.2
17	431.8	433.4	435.0	436.6	438.2	439.7	441.3	442.9	444.5	446.1	447.7	449.3	450.9	452.4	454.0	455.6
18	457.2	458.8	460.4	462.0	463.6	465.1	466.7	468.3	469.9	471.5	473.1	474.7	476.3	477.8	479.4	481.0
19	482.6	484.2	485.8	487.4	489.0	490.5	492.1	493.7	495.3	496.9	498.5	500.1	501.7	503.2	504.8	506.4
20	508.0	509.6	511.2	512.8	514.4	515.9	517.5	519.1	520.7	522.3	523.9	525.5	527.1	528.6	530.2	531.8
21	533.4	535.0	536.6	538.2	539.8	541.3	542.9	544.5	546.1	547.7	549.3	550.9	552.5	554.0	555.6	557.2
22	558.8	560.4	562.0	563.6	565.2	566.7	568.3	569.9	571.5	573.1	574.7	576.3	577.9	579.4	581.0	582.6
23	584.2	585.8	587.4	589.0	590.6	592.1	593.7	595.3	596.9	598.5	600.1	601.7	603.3	604.8	606.4	608.0
24	609.6	611.2	612.8	614.4	616.0	617.5	619.1	620.7	622.3	623.9	625.5	627.1	628.7	630.2	631.8	633.4
25	635.0	636.6	638.2	639.8	641.4	642.9	644.5	646.1	647.7	649.3	650.9	652.5	654.1	655.6	657.2	658.8
26	660.4	662.0	663.6	665.2	666.8	668.3	669.9	671.5	673.1	674.7	676.3	677.9	679.5	681.0	682.6	684.2
27	685.8	687.4	689.0	690.6	692.2	693.7	695.3	696.9	698.5	700.1	701.7	703.3	704.9	706.4	708.0	709.6
28	711.2	712.8	714.4	716.0	717.6	719.1	720.7	722.3	723.9	725.5	727.1	728.7	730.3	731.8	733.4	735.0
29	736.6	738.2	739.8	714.4	743.0	744.5	746.1	747.7	749.3	750.9	752.5	754.1	755.7	757.2	758.8	760.4
30	762.0	763.6	765.2	766.8	768.4	769.9	771.5	773.1	774.7	776.3	777.9	779.5	781.1	782.6	784.2	785.8
31	787.4	789.0	790.6	792.2	793.8	795.3	796.9	798.5	800.1	801.7	803.3	804.9	806.5	808.0	809.6	811.2
32	812.8	814.4	816.0	817.6	819.2	820.7	822.3	823.9	825.5	827.1	828.7	830.3	831.9	833.4	835.0	836.6
33	838.2	839.8	841.4	843.0	844.6	846.1	847.7	849.3	850.9	852.5	854.1	855.7	857.3	858.8	860.4	862.0
34	863.6	865.2	866.8	868.4	870.0	871.5	873.1	874.7	876.3	877.9	879.5	881.1	882.7	884.2	885.8	887.4
35	889.0	890.6	892.2	893.8	895.4	896.9	898.5	900.1	901.7	903.3	904.9	906.5	908.1	909.6	911.2	912.8
36	914.4	916.0	917.6	919.2	920.8	922.3	923.9	925.5	927.1	928.7	930.3	931.9	933.5	935.0	936.6	938.2
37	939.8	941.4	943.0	944.6	946.2	947.7	949.3	950.9	952.5	954.1	955.7	957.3	958.9	960.4	962.0	963.6
38	965.2	966.8	968.4	970.0	971.6	973.1	974.7	976.3	977.9	979.5	981.1	982.7	984.3	985.8	987.4	989.0
39	990.6	992.2	993.8	995.4	997.0	998.5	1000.1	1001.7	1003.3	1004.9	1006.5	1008.1	1009.7	1011.2	1012.8	1014.4
40	1016.0	1017.6	1019.2	1020.8	1022.4	1023.9	1025.5	1027.1	1028.7	1030.3	1031.9	1033.5	1035.1	1036.6	1038.2	1039.8
41	1041.4	1043.0	1044.6	1046.2	1047.8	1049.3	1050.9	1052.5	1054.1	1055.7	1057.3	1058.9	1060.5	1062.0	1063.6	1065.2
42	1066.8	1068.4	1070.0	1071.6	1073.2	1074.7	1076.3	1077.9	1079.5	1081.1	1082.7	1084.3	1085.9	1087.4	1089.0	1090.6
43	1092.2	1093.8	1095.4	1097.0	1098.6	1100.1	1101.7	1103.3	1104.9	1106.5	1108.1	1109.7	1111.3	1112.8	1114.4	1116.0
44	1117.6	1119.2	1120.8	1122.4	1124.0	1125.5	1127.1	1128.7	1130.3	1131.9	1133.5	1135.1	1136.7	1138.2	1139.8	1141.4
45	1143.0	1144.6	1146.2	1147.8	1149.4	1150.9	1152.5	1154.1	1155.7	1157.3	1158.9	1160.5	1162.1	1163.6	1165.2	1166.8
46	1168.4	1170.0	1171.6	1173.2	1174.8	1176.3	1177.9	1179.5	1181.1	1182.7	1184.3	1185.9	1187.5	1189.0	1190.6	1192.2
47	1193.8	1195.4	1197.0	1198.6	1200.2	1201.7	1203.3	1204.9	1206.5	1208.1	1209.7	1211.3	1212.9	1214.4	1216.0	1217.6
48	1219.2	1220.8	1222.4	1224.0	1225.6	1227.1	1228.7	1230.3	1231.9	1233.5	1235.1	1236.7	1238.3	1239.8	1241.4	1243.0
49	1244.6	1246.2	1247.8	1249.4	1251.0	1252.5	1254.1	1255.7	1257.3	1258.9	1260.5	1262.1	1263.7	1265.2	1266.8	1268.4
50	1270.0	1271.6	1273.2	1274.8	1276.4	1277.9	1279.5	1281.1	1282.7	1284.3	1285.9	1287.5	1289.1	1290.6	1292.2	1293.8

Temperature Conversion

—459.4° to 0°			1° to 60°			61° to 290°			300° to 890°			900° to 3000°		
C	C / F	F	C	C / F	F	C	C / F	F	C	C / F	F	C	C / F	F
−273	−459.4		−17.2	1	33.8	16.1	61	141.8	149	300	572	482	900	1652
−268	−450		−16.7	2	35.6	16.7	62	143.6	154	310	590	488	910	1670
−262	−440		−16.1	3	37.4	17.2	63	145.4	160	320	608	493	920	1688
−257	−430		−15.6	4	39.2	17.8	64	147.2	166	330	626	499	930	1706
−251	−420		−15.0	5	41.0	18.3	65	149.0	171	340	644	504	940	1724
−246	−410		−14.4	6	42.8	18.9	66	150.8	177	350	662	510	950	1742
−240	−400		−13.9	7	44.6	19.4	67	152.6	182	360	680	516	960	1760
−234	−390		−13.3	8	46.4	20.0	68	154.4	188	370	698	521	970	1778
−229	−380		−12.8	9	48.2	20.6	69	156.2	193	380	716	527	980	1796
−223	−370		−12.2	10	50.0	21.1	70	158.0	199	390	734	532	990	1814
−218	−360		−11.7	11	51.8	21.7	71	159.8	204	400	752	538	1000	1832
−212	−350		−11.1	12	53.6	22.2	72	161.6	210	410	770	549	1020	1868
−207	−340		−10.6	13	55.4	22.8	73	163.4	216	420	788	560	1040	1904
−201	−330		−10.0	14	57.2	23.3	74	165.2	221	430	806	571	1060	1940
−196	−320		− 9.4	15	59.0	23.9	75	167.0	227	440	824	582	1080	1976
−190	−310		− 8.9	16	60.8	24.4	76	168.8	232	450	842	593	1100	2012
−184	−300		− 8.3	17	62.6	25.0	77	170.6	238	460	860	604	1120	2048
−179	−290		− 7.8	18	64.4	25.6	78	172.4	243	470	878	616	1140	2084
−173	−280		− 7.2	19	66.2	26.1	79	174.2	249	480	896	627	1160	2120
−169	−273	−459.4	− 6.7	20	68.0	26.7	80	176.0	254	490	914	638	1180	2156
−168	−270	−454	− 6.1	21	69.8	27.2	81	177.8	260	500	932	649	1200	2192
−162	−260	−436	− 5.6	22	71.6	27.8	82	179.6	266	510	950	660	1220	2228
−157	−250	−418	− 5.0	23	73.4	28.3	83	181.4	271	520	968	671	1240	2264
−151	−240	−400	− 4.4	24	75.2	28.9	84	183.2	277	530	986	682	1260	2300
−146	−230	−382	− 3.9	25	77.0	29.4	85	185.0	282	540	1004	693	1280	2336
−140	−220	−364	− 3.3	26	78.8	30.0	86	186.8	288	550	1022	704	1300	2372
−134	−210	−346	− 2.8	27	80.6	30.6	87	188.6	293	560	1040	732	1350	2462
−129	−200	−328	− 2.2	28	82.4	31.1	88	190.4	299	570	1058	760	1400	2552
−123	−190	−310	− 1.7	29	84.2	31.7	89	192.2	304	580	1076	788	1450	2642
−118	−180	−292	− 1.1	30	86.0	32.2	90	194.0	310	590	1094	816	1500	2732
−112	−170	−274	− 0.6	31	87.8	32.8	91	195.8	316	600	1112	843	1550	2822
−107	−160	−256	0.0	32	89.6	33.3	92	197.6	321	610	1130	871	1600	2912
−101	−150	−238	0.6	33	91.4	33.9	93	199.4	327	620	1148	899	1650	3002
− 96	−140	−220	1.1	34	93.2	34.4	94	201.2	332	630	1166	927	1700	3092
− 90	−130	−202	1.7	35	95.0	35.0	95	203.0	338	640	1184	954	1750	3182
− 84	−120	−184	2.2	36	96.8	35.6	96	204.8	343	650	1202	982	1800	3272
− 79	−110	−166	2.8	37	98.6	36.1	97	206.6	349	660	1220	1010	1850	3362
− 73	−100	−148	3.3	38	100.4	36.7	98	208.4	354	670	1238	1038	1900	3452
− 68	− 90	−130	3.9	39	102.2	37.2	99	210.2	360	680	1256	1066	1950	3542
− 62	− 80	−112	4.4	40	104.0	37.8	100	212.0	366	690	1274	1093	2000	3632
− 57	− 70	− 94	5.0	41	105.8	43	110	230	371	700	1292	1121	2050	3722
− 51	− 60	− 76	5.6	42	107.6	49	120	248	377	710	1310	1149	2100	3812
− 46	− 50	− 58	6.1	43	109.4	54	130	266	382	720	1328	1177	2150	3902
− 40	− 40	− 40	6.7	44	111.2	60	140	284	388	730	1346	1204	2200	3992
− 34	− 30	− 22	7.2	45	113.0	66	150	302	393	740	1364	1232	2250	4082
− 29	− 20	− 4	7.8	46	114.8	71	160	320	399	750	1382	1260	2300	4172
− 23	− 10	14	8.3	47	116.6	77	170	338	404	760	1400	1288	2350	4262
− 17.8	0	32	8.9	48	118.4	82	180	356	410	770	1418	1316	2400	4352
			9.4	49	120.2	88	190	374	416	780	1436	1343	2450	4442
			10.0	50	122.0	93	200	392	421	790	1454	1371	2500	4532
			10.6	51	123.8	99	210	410	427	800	1472	1399	2550	4622
			11.1	52	125.6	100	212	413.6	432	810	1490	1427	2600	4712
			11.7	53	127.4	104	220	428	438	820	1508	1454	2650	4802
			12.2	54	129.2	110	230	446	443	830	1526	1482	2700	4892
			12.8	55	131.0	116	240	464	449	840	1544	1510	2750	4982
			13.3	56	132.8	121	250	482	454	850	1562	1538	2800	5072
			13.9	57	134.6	127	260	500	460	860	1580	1566	2850	5162
			14.4	58	136.4	132	270	518	466	870	1598	1593	2900	5252
			15.0	59	138.2	138	280	536	471	880	1616	1621	2950	5342
			15.6	60	140.0	143	290	554	477	890	1634	1649	3000	5432

Locate temperature in middle column. If in degrees Centigrade, read Fahrenheit equivalent in right hand column; if in degrees Fahrenheit, read Centigrade equivalent in left hand column.

Abstracted from "Bethlehem Alloy Steels". (Albert Sauveur type of table. Values revised.) Courtesy Bethlehem Steel Company.

Crane Co.: Valves, Fittings, Pipe, Fabricated Piping, Catalog No. 53 (1952)
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Weight Conversion

Pounds to Kilograms

(1 pound = 0.4536 kilogram)

Pounds	0	1	2	3	4	5	6	7	8	9
0	0.00	0.45	0.91	1.36	1.81	2.27	2.72	3.18	3.63	4.08
10	4.54	4.99	5.44	5.90	6.35	6.80	7.26	7.71	8.16	8.62
20	9.07	9.53	9.98	10.43	10.89	11.34	11.79	12.25	12.70	13.15
30	13.61	14.06	14.52	14.97	15.42	15.88	16.33	16.78	17.24	17.69
40	18.14	18.60	19.05	19.50	19.96	20.41	20.87	21.32	21.77	22.23
50	22.68	23.13	23.59	24.04	24.49	24.95	25.40	25.86	26.31	26.76
60	27.22	27.67	28.12	28.58	29.03	29.48	29.94	30.39	30.84	31.30
70	31.75	32.21	32.66	33.11	33.57	34.02	34.47	34.93	35.38	35.83
80	36.29	36.74	37.20	37.65	38.10	38.56	39.01	39.46	39.92	40.37
90	40.82	41.28	41.73	42.18	42.64	43.09	43.55	44.00	44.45	44.91

Kilograms to Pounds

(1 kilogram = 2.2046 pounds)

Kilograms	0	1	2	3	4	5	6	7	8	9
0	0.00	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	52.91	55.12	57.32	59.52	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.77	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.43	114.64	116.84	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.09	143.30	145.50	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.75	171.96	174.16
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.00	196.21
90	198.41	200.62	202.82	205.03	207.23	209.44	211.64	213.85	216.05	218.26

Pressure Conversion

Pounds per Square Inch to Kilograms per Square Centimeter

(1 pound per square inch = .0703066 kilogram per square centimeter)

1 to 30		31 to 60		61 to 90		91 to 200		205 to 400		410 to 700		710 to 1000		1010 to 1500	
Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.	Lbs. per Sq. Inch	Kg. per Sq. Cm.
1	.07	31	2.18	61	4.29	91	6.40	205	14.41	410	28.83	710	49.92	1010	71.01
2	.14	32	2.25	62	4.36	92	6.47	210	14.76	420	29.53	720	50.62	1020	71.71
3	.21	33	2.32	63	4.43	93	6.54	215	15.12	430	30.23	730	51.32	1030	72.42
4	.28	34	2.39	64	4.50	94	6.61	220	15.47	440	30.93	740	52.03	1040	73.12
5	.35	35	2.46	65	4.57	95	6.68	225	15.82	450	31.64	750	52.73	1050	73.82
6	.42	36	2.53	66	4.64	96	6.75	230	16.17	460	32.34	760	53.43	1060	74.52
7	.49	37	2.60	67	4.71	97	6.82	235	16.52	470	33.04	770	54.14	1070	75.23
8	.56	38	2.67	68	4.78	98	6.89	240	16.87	480	33.75	780	54.84	1080	75.93
9	.63	39	2.74	69	4.85	99	6.96	245	17.23	490	34.45	790	55.54	1090	76.63
10	.70	40	2.81	70	4.92	100	7.03	250	17.58	500	35.15	800	56.25	1100	77.34
11	.77	41	2.88	71	4.99	105	7.38	255	17.93	510	35.86	810	56.95	1120	78.74
12	.84	42	2.95	72	5.06	110	7.73	260	18.28	520	36.56	820	57.65	1140	80.15
13	.91	43	3.02	73	5.13	115	8.09	265	18.63	530	37.26	830	58.35	1160	81.56
14	.98	44	3.09	74	5.20	120	8.44	270	18.98	540	37.97	840	59.06	1180	82.96
15	1.05	45	3.16	75	5.27	125	8.79	275	19.33	550	38.67	850	59.76	1200	84.37
16	1.12	46	3.23	76	5.34	130	9.14	280	19.69	560	39.37	860	60.46	1220	85.77
17	1.20	47	3.30	77	5.41	135	9.49	285	20.04	570	40.07	870	61.17	1240	87.18
18	1.27	48	3.37	78	5.48	140	9.84	290	20.39	580	40.78	880	61.87	1260	88.59
19	1.34	49	3.45	79	5.55	145	10.19	295	20.74	590	41.48	890	62.57	1280	89.99
20	1.41	50	3.52	80	5.62	150	10.55	300	21.09	600	42.18	900	63.28	1300	91.40
21	1.48	51	3.59	81	5.69	155	10.90	310	21.80	610	42.89	910	63.98	1320	92.80
22	1.55	52	3.66	82	5.77	160	11.25	320	22.50	620	43.59	920	64.68	1340	94.21
23	1.62	53	3.73	83	5.84	165	11.60	330	23.20	630	44.29	930	65.39	1360	95.62
24	1.69	54	3.80	84	5.91	170	11.95	340	23.90	640	45.00	940	66.09	1380	97.02
25	1.76	55	3.87	85	5.98	175	12.30	350	24.61	650	45.70	950	66.79	1400	98.43
26	1.83	56	3.94	86	6.05	180	12.66	360	25.31	660	46.40	960	67.49	1420	99.84
27	1.90	57	4.01	87	6.12	185	13.01	370	26.01	670	47.11	970	68.20	1440	101.24
28	1.97	58	4.08	88	6.19	190	13.36	380	26.72	680	47.81	980	68.90	1460	102.65
29	2.04	59	4.15	89	6.26	195	13.71	390	27.42	690	48.51	990	69.60	1480	104.05
30	2.11	60	4.22	90	6.33	200	14.06	400	28.12	700	49.21	1000	70.31	1500	105.46

Circumferences and Areas of Circles

Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area
1/64	.04909	.00019	2	6.2832	3.1416	6	18.850	28.274	14	43.982	153.94	22	69.115	380.13
1/32	.09818	.00077	1/16	6.4795	3.3410	1/8	19.242	29.465	1/8	44.375	156.70	1/8	69.508	384.46
3/64	.14726	.00173	1/8	6.6759	3.5466	1/4	19.635	30.680	1/4	44.768	159.48	1/4	69.900	388.82
1/16	.19635	.00307	3/16	6.8722	3.7583	3/8	20.028	31.919	3/8	45.160	162.30	3/8	70.293	393.20
3/32	.29452	.00690	1/4	7.0686	3.9761	1/2	20.420	33.183	1/2	45.553	165.13	1/2	70.686	397.61
			5/16	7.2649	4.2000	5/8	20.813	34.472	5/8	45.946	167.99	5/8	71.079	402.04
1/8	.39270	.01227	3/8	7.4613	4.4301	3/4	21.206	35.785	3/4	46.338	170.87	3/4	71.471	406.49
5/32	.49087	.01917	7/16	7.6576	4.6664	7/8	21.598	37.122	7/8	46.731	173.78	7/8	71.864	410.97
3/16	.58905	.02761												
7/32	.68722	.03758	1/2	7.8540	4.9087	7	21.991	38.485	15	47.124	176.71	23	72.257	415.48
			9/16	8.0503	5.1572	1/8	22.384	39.871	1/8	47.517	179.67	1/8	72.649	420.00
1/4	.78540	.04909	5/8	8.2467	5.4119	1/4	22.776	41.282	1/4	47.909	182.65	1/4	73.042	424.56
9/32	.88357	.06213	11/16	8.4430	5.6727	3/8	23.169	42.718	3/8	48.302	185.66	3/8	73.435	429.13
5/16	.98175	.07670	3/4	8.6394	5.9396	1/2	23.562	44.179	1/2	48.695	188.69	1/2	73.827	433.74
11/32	1.0799	.09281	13/16	8.8357	6.2126	5/8	23.955	45.664	5/8	49.087	191.75	5/8	74.220	438.36
			7/8	9.0321	6.4918	3/4	24.347	47.173	3/4	49.480	194.83	3/4	74.613	443.01
3/8	1.1781	.11045	15/16	9.2284	6.7771	7/8	24.740	48.707	7/8	49.873	197.93	7/8	75.006	447.69
13/32	1.2763	.12962												
7/16	1.3744	.15033	3	9.4248	7.0686	8	25.133	50.265	16	50.265	201.06	24	75.398	452.39
15/32	1.4726	.17257	1/16	9.6211	7.3662	1/8	25.525	51.849	1/8	50.658	204.22	1/8	75.791	457.11
			1/8	9.8175	7.6699	1/4	25.918	53.456	1/4	51.051	207.39	1/4	76.184	461.86
1/2	1.5708	.19635	3/16	10.014	7.9798	3/8	26.311	55.088	3/8	51.444	210.60	3/8	76.576	466.64
17/32	1.6690	.22166	1/4	10.210	8.2958	1/2	26.704	56.745	1/2	51.836	213.82	1/2	76.969	471.44
9/16	1.7671	.24850	5/16	10.407	8.6179	5/8	27.096	58.426	5/8	52.229	217.08	5/8	77.362	476.26
19/32	1.8653	.27688	3/8	10.603	8.9462	3/4	27.489	60.132	3/4	52.622	220.35	3/4	77.754	481.11
			7/16	10.799	9.2806	7/8	27.882	61.862	7/8	53.014	223.65	7/8	78.147	485.98
5/8	1.9635	.30680												
21/32	2.0617	.33824	1/2	10.996	9.6211	9	28.274	63.617	17	53.407	226.98	25	78.540	490.87
11/16	2.1598	.37122	9/16	11.192	9.9678	1/8	28.667	65.397	1/8	53.800	230.33	1/8	78.933	495.79
23/32	2.2580	.40574	5/8	11.388	10.321	1/4	29.060	67.201	1/4	54.192	233.71	1/4	79.325	500.74
			11/16	11.585	10.680	3/8	29.452	69.029	3/8	54.585	237.10	3/8	79.718	505.71
3/4	2.3562	.44179	3/4	11.781	11.045	1/2	29.845	70.882	1/2	54.978	240.53	1/2	80.111	510.71
25/32	2.4544	.47937	13/16	11.977	11.416	5/8	30.238	72.760	5/8	55.371	243.98	5/8	80.503	515.72
13/16	2.5525	.51849	7/8	12.174	11.793	3/4	30.631	74.662	3/4	55.763	247.45	3/4	80.896	520.77
27/32	2.6507	.55914	15/16	12.370	12.177	7/8	31.023	76.589	7/8	56.156	250.95	7/8	81.289	525.84
7/8	2.7489	.60132	4	12.566	12.566	10	31.416	78.540	18	56.549	254.47	26	81.681	530.93
29/32	2.8471	.64504	1/16	12.763	12.962	1/8	31.809	80.516	1/8	56.941	258.02	1/8	82.074	536.05
15/16	2.9452	.69029	1/8	12.959	13.364	1/4	32.201	82.516	1/4	57.334	261.59	1/4	82.467	541.19
31/32	3.0434	.73708	3/16	13.155	13.772	3/8	32.594	84.541	3/8	57.727	265.18	3/8	82.860	546.35
			1/4	13.352	14.186	1/2	32.987	86.590	1/2	58.119	268.80	1/2	83.252	551.55
			5/16	13.548	14.607	5/8	33.379	88.664	5/8	58.512	272.45	5/8	83.645	556.76
			3/8	13.744	15.033	3/4	33.772	90.763	3/4	58.905	276.12	3/4	84.038	562.00
			7/16	13.941	15.466	7/8	34.165	92.886	7/8	59.298	279.81	7/8	84.430	567.27
	3.1416	.7854	1/2	14.137	15.904	11	34.558	95.033	19	59.690	283.53	27	84.823	572.56
1	3.3379	.8866	9/16	14.334	16.349	1/8	34.950	97.205	1/8	60.083	287.27	1/8	85.216	577.87
1/16	3.5343	.9940	5/8	14.530	16.800	1/4	35.343	99.402	1/4	60.476	291.04	1/4	85.608	583.21
1/8	3.7306	1.1075	11/16	14.726	17.257	3/8	35.736	101.62	3/8	60.868	294.83	3/8	86.001	588.57
3/16	3.9270	1.2272	3/4	14.923	17.721	1/2	36.128	103.87	1/2	61.261	298.65	1/2	86.394	593.96
1/4	4.1233	1.3530	13/16	15.119	18.190	5/8	36.521	106.14	5/8	61.654	302.49	5/8	86.786	599.37
5/16	4.3197	1.4849	7/8	15.315	18.665	3/4	36.914	108.43	3/4	62.046	306.35	3/4	87.179	604.81
3/8	4.5160	1.6230	15/16	15.512	19.147	7/8	37.306	110.75	7/8	62.439	310.24	7/8	87.572	610.27
1/2	4.7124	1.7671	5	15.708	19.635	12	37.699	113.10	20	62.832	314.16	28	87.965	615.75
9/16	4.9087	1.9175	1/16	15.904	20.129	1/8	38.092	115.47	1/8	63.225	318.10	1/8	88.357	621.26
5/8	5.1051	2.0739	1/8	16.101	20.629	1/4	38.485	117.86	1/4	63.617	322.06	1/4	88.750	626.80
11/16	5.3014	2.2365	3/16	16.297	21.135	3/8	38.877	120.28	3/8	64.010	326.05	3/8	89.143	632.36
3/4	5.4978	2.4053	1/4	16.493	21.648	1/2	39.270	122.72	1/2	64.403	330.06	1/2	89.535	637.94
13/16	5.6941	2.5802	5/16	16.690	22.166	5/8	39.663	125.19	5/8	64.795	334.10	5/8	89.928	643.55
7/8	5.8905	2.7612	3/8	16.886	22.691	3/4	40.055	127.68	3/4	65.188	338.16	3/4	90.321	649.18
15/16	6.0868	2.9483	7/16	17.082	23.221	7/8	40.448	130.19	7/8	65.581	342.25	7/8	90.713	654.84
			1/2	17.279	23.758	13	40.841	132.73	21	65.973	346.36	29	91.106	660.52
			9/16	17.475	24.301	1/8	41.233	135.30	1/8	66.366	350.50	1/8	91.499	666.23
			5/8	17.671	24.850	1/4	41.626	137.89	1/4	66.759	354.66	1/4	91.892	671.96
			11/16	17.868	25.406	3/8	42.019	140.50	3/8	67.152	358.84	3/8	92.284	677.71
			3/4	18.064	25.967	1/2	42.412	143.14	1/2	67.544	363.05	1/2	92.677	683.49
			13/16	18.261	26.535	5/8	42.804	145.80	5/8	67.937	367.28	5/8	93.070	689.30
			7/8	18.457	27.109	3/4	43.197	148.49	3/4	68.330	371.54	3/4	93.462	695.13
			15/16	18.653	27.688	7/8	43.590	151.20	7/8	68.722	375.83	7/8	93.855	700.98

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Circumferences and Areas of Circles

(continued)

Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area
30	94.248	706.86	37	116.239	1075.2	44	138.230	1520.5	51	160.221	2042.8	58	182.212	2642.1
1/8	94.640	712.76	1/8	116.632	1082.5	1/8	138.623	1529.2	1/8	160.614	2052.8	1/8	182.605	2653.5
1/4	95.033	718.69	1/4	117.024	1089.8	1/4	139.015	1537.9	1/4	161.007	2062.9	1/4	182.998	2664.9
3/8	95.426	724.64	3/8	117.417	1097.1	3/8	139.408	1546.6	3/8	161.399	2073.0	3/8	183.390	2676.4
1/2	95.819	730.62	1/2	117.810	1104.5	1/2	139.801	1555.3	1/2	161.792	2083.1	1/2	183.783	2687.8
5/8	96.211	736.62	5/8	118.202	1111.8	5/8	140.194	1564.0	5/8	162.185	2093.2	5/8	184.176	2699.3
3/4	96.604	742.64	3/4	118.596	1119.2	3/4	140.586	1572.8	3/4	162.577	2103.3	3/4	184.569	2710.9
7/8	96.997	748.69	7/8	118.988	1126.7	7/8	140.979	1581.6	7/8	162.970	2113.5	7/8	184.961	2722.4
31	97.389	754.77	38	119.381	1134.1	45	141.372	1590.4	52	163.363	2123.7	59	185.354	2734.0
1/8	97.782	760.87	1/8	119.773	1141.6	1/8	141.764	1599.3	1/8	163.756	2133.9	1/8	185.747	2745.6
1/4	98.175	766.99	1/4	120.166	1149.1	1/4	142.157	1608.2	1/4	164.148	2144.2	1/4	186.139	2757.2
3/8	98.567	773.14	3/8	120.559	1156.6	3/8	142.550	1617.0	3/8	164.541	2154.5	3/8	186.532	2768.8
1/2	98.960	779.31	1/2	120.951	1164.2	1/2	142.942	1626.0	1/2	164.934	2164.8	1/2	186.925	2780.5
5/8	99.353	785.51	5/8	121.344	1171.7	5/8	143.335	1634.9	5/8	165.326	2175.1	5/8	187.317	2792.2
3/4	99.746	791.73	3/4	121.737	1179.3	3/4	143.728	1643.9	3/4	165.719	2185.4	3/4	187.710	2803.9
7/8	100.138	797.98	7/8	122.129	1186.9	7/8	144.121	1652.9	7/8	166.112	2195.8	7/8	188.103	2815.7
32	100.531	804.25	39	122.522	1194.6	46	144.513	1661.9	53	166.504	2206.2	60	188.496	2827.4
1/8	100.924	810.54	1/8	122.915	1202.3	1/8	144.906	1670.9	1/8	166.897	2216.6	1/8	188.888	2839.2
1/4	101.316	816.86	1/4	123.308	1210.0	1/4	145.299	1680.0	1/4	167.290	2227.0	1/4	189.281	2851.0
3/8	101.709	823.21	3/8	123.700	1217.7	3/8	145.691	1689.1	3/8	167.683	2237.5	3/8	189.674	2862.9
1/2	102.102	829.58	1/2	124.093	1225.4	1/2	146.084	1698.2	1/2	168.075	2248.0	1/2	190.066	2874.8
5/8	102.494	835.97	5/8	124.486	1233.2	5/8	146.477	1707.4	5/8	168.468	2258.5	5/8	190.459	2886.6
3/4	102.887	842.39	3/4	124.878	1241.0	3/4	146.869	1716.5	3/4	168.861	2269.1	3/4	190.852	2898.6
7/8	103.280	848.83	7/8	125.271	1248.8	7/8	147.262	1725.7	7/8	169.253	2279.6	7/8	191.244	2910.5
33	103.673	855.30	40	125.664	1256.6	47	147.655	1734.9	54	169.646	2290.2	61	191.637	2922.5
1/8	104.065	861.79	1/8	126.056	1264.5	1/8	148.048	1744.2	1/8	170.039	2300.8	1/8	192.030	2934.5
1/4	104.458	868.31	1/4	126.449	1272.4	1/4	148.440	1753.5	1/4	170.431	2311.5	1/4	192.423	2946.5
3/8	104.851	874.85	3/8	126.842	1280.3	3/8	148.833	1762.7	3/8	170.824	2322.1	3/8	192.815	2958.5
1/2	105.243	881.41	1/2	127.235	1288.2	1/2	149.226	1772.1	1/2	171.217	2332.8	1/2	193.208	2970.6
5/8	105.636	888.00	5/8	127.627	1296.2	5/8	149.618	1781.4	5/8	171.609	2343.5	5/8	193.601	2982.7
3/4	106.029	894.62	3/4	128.020	1304.2	3/4	150.011	1790.8	3/4	172.002	2354.3	3/4	193.993	2994.8
7/8	106.421	901.26	7/8	128.413	1312.2	7/8	150.404	1800.1	7/8	172.395	2365.0	7/8	194.386	3006.9
34	106.814	907.92	41	128.805	1320.3	48	150.796	1809.6	55	172.788	2375.8	62	194.779	3019.1
1/8	107.207	914.61	1/8	129.198	1328.3	1/8	151.189	1819.0	1/8	173.180	2386.6	1/8	195.171	3031.3
1/4	107.600	921.32	1/4	129.591	1336.4	1/4	151.582	1828.5	1/4	173.573	2397.5	1/4	195.564	3043.5
3/8	107.992	928.06	3/8	129.983	1344.5	3/8	151.975	1837.9	3/8	173.966	2408.3	3/8	195.957	3055.7
1/2	108.385	934.82	1/2	130.376	1352.7	1/2	152.367	1847.5	1/2	174.358	2419.2	1/2	196.350	3068.0
5/8	108.778	941.61	5/8	130.769	1360.8	5/8	152.760	1857.0	5/8	174.751	2430.1	5/8	196.742	3080.3
3/4	109.170	948.42	3/4	131.161	1369.0	3/4	153.153	1866.5	3/4	175.144	2441.1	3/4	197.135	3092.6
7/8	109.563	955.25	7/8	131.554	1377.2	7/8	153.545	1876.1	7/8	175.536	2452.0	7/8	197.528	3104.9
35	109.956	962.11	42	131.947	1385.4	49	153.938	1885.7	56	175.929	2463.0	63	197.920	3117.2
1/8	110.348	969.00	1/8	132.340	1393.7	1/8	154.331	1895.4	1/8	176.322	2474.0	1/8	198.313	3129.6
1/4	110.741	975.91	1/4	132.732	1402.0	1/4	154.723	1905.0	1/4	176.715	2485.0	1/4	198.706	3142.0
3/8	111.134	982.84	3/8	133.125	1410.3	3/8	155.116	1914.7	3/8	177.107	2496.1	3/8	199.098	3154.5
1/2	111.527	989.80	1/2	133.518	1418.6	1/2	155.509	1924.4	1/2	177.500	2507.2	1/2	199.491	3166.9
5/8	111.919	996.78	5/8	133.910	1427.0	5/8	155.902	1934.2	5/8	177.893	2518.3	5/8	199.884	3179.4
3/4	112.312	1003.8	3/4	134.303	1435.4	3/4	156.294	1943.9	3/4	178.285	2529.4	3/4	200.277	3191.9
7/8	112.705	1010.8	7/8	134.696	1443.8	7/8	156.687	1953.7	7/8	178.678	2540.6	7/8	200.669	3204.4
36	113.097	1017.9	43	135.088	1452.2	50	157.080	1963.5	57	179.071	2551.8	64	201.062	3217.0
1/8	113.490	1025.0	1/8	135.481	1460.7	1/8	157.472	1973.3	1/8	179.463	2563.0	1/8	201.455	3229.6
1/4	113.883	1032.1	1/4	135.874	1469.1	1/4	157.865	1983.2	1/4	179.856	2574.2	1/4	201.847	3242.2
3/8	114.275	1039.2	3/8	136.267	1477.6	3/8	158.258	1993.1	3/8	180.249	2585.4	3/8	202.240	3254.8
1/2	114.668	1046.3	1/2	136.659	1486.2	1/2	158.650	2003.0	1/2	180.642	2596.7	1/2	202.633	3267.5
5/8	115.061	1053.5	5/8	137.052	1494.7	5/8	159.043	2012.9	5/8	181.034	2608.0	5/8	203.025	3280.1
3/4	115.454	1060.7	3/4	137.445	1503.3	3/4	159.436	2022.8	3/4	181.427	2619.4	3/4	203.418	3292.8
7/8	115.846	1068.0	7/8	137.837	1511.9	7/8	159.829	2032.8	7/8	181.820	2630.7	7/8	203.811	3305.6

Circumferences and Areas of Circles

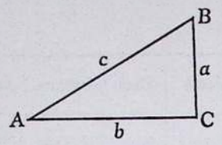
(continued)

Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area	Dia.	Circum.	Area
65	204.204	3318.3	72	226.195	4071.5	79	248.186	4901.7	86	270.177	5808.8	93	292.168	6792.9
1/8	204.596	3331.1	1/8	226.587	4085.7	1/8	248.579	4917.2	1/8	270.570	5825.7	1/8	292.561	6811.2
1/4	204.989	3343.9	1/4	226.980	4099.8	1/4	248.971	4932.7	1/4	270.962	5842.6	1/4	292.954	6829.5
3/8	205.382	3356.7	3/8	227.373	4114.0	3/8	249.364	4948.3	3/8	271.355	5859.6	3/8	293.346	6847.8
1/2	205.774	3369.6	1/2	227.765	4128.2	1/2	249.757	4963.9	1/2	271.748	5876.5	1/2	293.739	6866.1
5/8	206.167	3382.4	5/8	228.158	4142.5	5/8	250.149	4979.5	5/8	272.140	5893.5	5/8	294.132	6884.5
3/4	206.560	3395.3	3/4	228.551	4156.8	3/4	250.542	4995.2	3/4	272.533	5910.6	3/4	294.524	6902.9
7/8	206.952	3408.2	7/8	228.944	4171.1	7/8	250.935	5010.9	7/8	272.926	5927.6	7/8	294.917	6921.3
66	207.345	3421.2	73	229.336	4185.4	80	251.327	5026.5	87	273.319	5944.7	94	295.310	6939.8
1/8	207.738	3434.2	1/8	229.729	4199.7	1/8	251.720	5042.3	1/8	273.711	5961.8	1/8	295.702	6958.2
1/4	208.131	3447.2	1/4	230.122	4214.1	1/4	252.113	5058.0	1/4	274.104	5978.9	1/4	296.095	6976.7
3/8	208.523	3460.2	3/8	230.514	4228.5	3/8	252.506	5073.8	3/8	274.497	5996.0	3/8	296.488	6995.3
1/2	208.916	3473.2	1/2	230.907	4242.9	1/2	252.898	5089.6	1/2	274.889	6013.2	1/2	296.881	7013.8
5/8	209.309	3486.3	5/8	231.300	4257.4	5/8	253.291	5105.4	5/8	275.282	6030.4	5/8	297.273	7032.4
3/4	209.701	3499.4	3/4	231.692	4271.8	3/4	253.684	5121.2	3/4	275.675	6047.6	3/4	297.666	7051.0
7/8	210.094	3512.5	7/8	232.085	4286.3	7/8	254.076	5137.1	7/8	276.067	6064.9	7/8	298.059	7069.6
67	210.487	3525.7	74	232.478	4300.8	81	254.469	5153.0	88	276.460	6082.1	95	298.451	7088.2
1/8	210.879	3538.8	1/8	232.871	4315.4	1/8	254.862	5168.9	1/8	276.853	6099.4	1/8	298.844	7106.9
1/4	211.272	3552.0	1/4	233.263	4329.9	1/4	255.254	5184.9	1/4	277.246	6116.7	1/4	299.237	7125.6
3/8	211.665	3565.2	3/8	233.656	4344.5	3/8	255.647	5200.8	3/8	277.638	6134.1	3/8	299.629	7144.3
1/2	212.058	3578.5	1/2	234.049	4359.2	1/2	256.040	5216.8	1/2	278.031	6151.4	1/2	300.022	7163.0
5/8	212.450	3591.7	5/8	234.441	4373.8	5/8	256.433	5232.8	5/8	278.424	6168.8	5/8	300.415	7181.8
3/4	212.843	3605.0	3/4	234.834	4388.5	3/4	256.825	5248.9	3/4	278.816	6186.2	3/4	300.807	7200.6
7/8	213.236	3618.3	7/8	235.227	4403.1	7/8	257.218	5264.9	7/8	279.209	6203.7	7/8	301.200	7219.4
68	213.628	3631.7	75	235.619	4417.9	82	257.611	5281.0	89	279.602	6221.1	96	301.593	7238.2
1/8	214.021	3645.0	1/8	236.012	4432.6	1/8	258.003	5297.1	1/8	279.994	6238.6	1/8	301.986	7257.1
1/4	214.414	3658.4	1/4	236.405	4447.4	1/4	258.396	5313.3	1/4	280.387	6256.1	1/4	302.378	7276.0
3/8	214.806	3671.8	3/8	236.798	4462.2	3/8	258.789	5329.4	3/8	280.780	6273.7	3/8	302.771	7294.9
1/2	215.199	3685.3	1/2	237.190	4477.0	1/2	259.181	5345.6	1/2	281.173	6291.2	1/2	303.164	7313.8
5/8	215.592	3698.7	5/8	237.583	4491.8	5/8	259.574	5361.8	5/8	281.565	6308.8	5/8	303.556	7332.8
3/4	215.984	3712.2	3/4	237.976	4506.7	3/4	259.967	5378.1	3/4	281.958	6326.4	3/4	303.949	7351.8
7/8	216.377	3725.7	7/8	238.368	4521.5	7/8	260.359	5394.3	7/8	282.351	6344.1	7/8	304.342	7370.8
69	216.770	3739.3	76	238.761	4536.5	83	260.752	5410.6	90	282.743	6361.7	97	304.734	7389.8
1/8	217.163	3752.8	1/8	239.154	4551.4	1/8	261.145	5426.9	1/8	283.136	6379.4	1/8	305.127	7408.9
1/4	217.555	3766.4	1/4	239.546	4566.4	1/4	261.538	5443.3	1/4	283.529	6397.1	1/4	305.520	7428.0
3/8	217.948	3780.0	3/8	239.939	4581.3	3/8	261.930	5459.6	3/8	283.921	6414.9	3/8	305.913	7447.1
1/2	218.341	3793.7	1/2	240.332	4596.3	1/2	262.323	5476.0	1/2	284.314	6432.6	1/2	306.305	7466.2
5/8	218.733	3807.3	5/8	240.725	4611.4	5/8	262.716	5492.4	5/8	284.707	6450.4	5/8	306.698	7485.3
3/4	219.126	3821.0	3/4	241.117	4626.4	3/4	263.108	5508.8	3/4	285.100	6468.2	3/4	307.091	7504.5
7/8	219.519	3834.7	7/8	241.510	4641.5	7/8	263.501	5525.3	7/8	285.492	6486.0	7/8	307.483	7523.7
70	219.911	3848.5	77	241.903	4656.6	84	263.894	5541.8	91	285.885	6503.9	98	307.876	7543.0
1/8	220.304	3862.2	1/8	242.295	4671.8	1/8	264.286	5558.3	1/8	286.278	6521.8	1/8	308.269	7562.2
1/4	220.697	3876.0	1/4	242.688	4686.9	1/4	264.679	5574.8	1/4	286.670	6539.7	1/4	308.661	7581.5
3/8	221.090	3889.8	3/8	243.081	4702.1	3/8	265.072	5591.4	3/8	287.063	6557.6	3/8	309.054	7600.8
1/2	221.482	3903.6	1/2	243.473	4717.3	1/2	265.465	5607.9	1/2	287.456	6575.5	1/2	309.447	7620.1
5/8	221.875	3917.5	5/8	243.866	4732.5	5/8	265.857	5624.5	5/8	287.848	6593.5	5/8	309.840	7639.5
3/4	222.268	3931.4	3/4	244.259	4747.8	3/4	266.250	5641.2	3/4	288.241	6611.5	3/4	310.232	7658.9
7/8	222.660	3945.3	7/8	244.652	4763.1	7/8	266.643	5657.8	7/8	288.634	6629.6	7/8	310.625	7678.3
71	223.053	3959.2	78	245.044	4778.4	85	267.035	5674.5	92	289.027	6647.6	99	311.018	7697.7
1/8	223.446	3973.1	1/8	245.437	4793.7	1/8	267.428	5691.2	1/8	289.419	6665.7	1/8	311.410	7717.1
1/4	223.838	3987.1	1/4	245.830	4809.0	1/4	267.821	5707.9	1/4	289.812	6683.8	1/4	311.803	7736.6
3/8	224.231	4001.1	3/8	246.222	4824.4	3/8	268.213	5724.7	3/8	290.205	6701.9	3/8	312.196	7756.1
1/2	224.624	4015.2	1/2	246.615	4839.8	1/2	268.606	5741.5	1/2	290.597	6720.1	1/2	312.588	7775.6
5/8	225.017	4029.2	5/8	247.008	4855.2	5/8	268.999	5758.3	5/8	290.990	6738.2	5/8	312.981	7795.2
3/4	225.409	4043.3	3/4	247.400	4870.7	3/4	269.392	5775.1	3/4	291.383	6756.4	3/4	313.374	7814.8
7/8	225.802	4057.4	7/8	247.793	4886.2	7/8	269.784	5791.9	7/8	291.775	6774.7	7/8	313.767	7834.4
												100	314.159	7854.0

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Mensuration of Plane Figures

Right Triangle



Angles $A + B = 90°$

$\sin A = \frac{a}{c}$

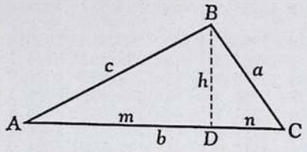
$\cos A = \frac{b}{c}$

$\tan A = \frac{a}{b}$

$a^2 + b^2 = c^2$

Area $= \frac{1}{2}ab$

Oblique Triangle



$\overline{AB} = c$ $\quad \overline{BC} = a$

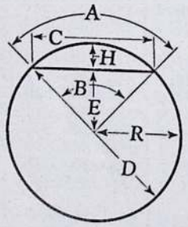
$\overline{AC} = b$ $\quad \overline{BD} = h$

$\overline{AD} = m$ $\quad \overline{DC} = n$

A, B and C are angles

Given	Required	Formulas
A,B,a	C,b,c	$C = 180° - A - B$; $b = \frac{a \sin B}{\sin A}$; $c = \frac{a \sin C}{\sin A}$
b,c,A	B,C,a	$\cos B = \frac{c^2 + a^2 - b^2}{2ac}$; $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$ $a^2 = b^2 + c^2 - 2bc \cos A$; $h = c \sin A$ $m = c \cos A$; $n = b - m$; $a^2 = h^2 + n^2$
a,c,A	B,C,b	$\sin C = \sin A \times \frac{c}{a}$; $B = 180° - A - C$ $b = a \frac{\sin B}{\sin A}$ Note: In some cases two values for B, C and b are possible
a,b,c	A	$\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{b \times c}}$ $\cos \frac{A}{2} = \sqrt{\frac{s(s-a)}{b \times c}}$ $\quad s = \frac{1}{2}(a+b+c)$ $\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$
a,b,c	m,n	$m = \frac{c^2 + b^2 - a^2}{2b}$; $n = \frac{a^2 + b^2 - c^2}{2b}$

Circle



B = Angle in Degrees
A = Length of Arc

Circumference $= \pi D = 2\pi R$

Area $= \pi R^2$

$A = \frac{\pi RB}{180}$

$C = 2\sqrt{2HR - H^2} = 2R \sin \frac{B}{2}$

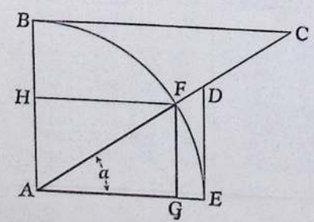
$H = R - \frac{1}{2}\sqrt{4R^2 - C^2} = 2R \sin^2 \frac{B}{4}$

$E = R - H$

Area of Sector $= \frac{1}{2}RA$

Area of Segment $= \frac{1}{2}RA - \frac{1}{2}EC$

Trigonometric Formulae



Radius $AE = 1$

$FG = \sin a$ $\quad BC = \cot a$ $\quad \sin^2 a + \cos^2 a = 1$

$AG = \cos a$ $\quad AD = \sec a$ $\quad \tan a = \frac{\sin a}{\cos a}$

$DE = \tan a$ $\quad AC = \csc a$ $\quad \sec^2 a - \tan^2 a = 1$

$\sin a$		$\sqrt{1 - \cos^2 a}$	$\frac{\tan a}{\sqrt{1 + \tan^2 a}}$	$\frac{1}{\sqrt{1 + \cot^2 a}}$
$\cos a$	$\sqrt{1 - \sin^2 a}$		$\frac{1}{\sqrt{1 + \tan^2 a}}$	$\frac{\cot a}{\sqrt{1 + \cot^2 a}}$
$\tan a$	$\frac{\sin a}{\sqrt{1 - \sin^2 a}}$	$\frac{\sqrt{1 - \cos^2 a}}{\cos a}$		$\frac{1}{\cot a}$
$\cot a$	$\frac{\sqrt{1 - \sin^2 a}}{\sin a}$	$\frac{\cos a}{\sqrt{1 - \cos^2 a}}$	$\frac{1}{\tan a}$	

Natural Trigonometric Functions

Degrees	Sines 0′	10′	20′	30′	40′	50′	60′	Cosines
0	0.00000	0.00291	0.00582	0.00873	0.01164	0.01454	0.01745	89
1	0.01745	0.02036	0.02327	0.02618	0.02908	0.03199	0.03490	88
2	0.03490	0.03781	0.04071	0.04362	0.04653	0.04943	0.05234	87
3	0.05234	0.05524	0.05814	0.06105	0.06395	0.06685	0.06976	86
4	0.06976	0.07266	0.07556	0.07846	0.08136	0.08426	0.08716	85
5	0.08716	0.09005	0.09295	0.09585	0.09874	0.10164	0.10453	84
6	0.10453	0.10742	0.11031	0.11320	0.11609	0.11898	0.12187	83
7	0.12187	0.12476	0.12764	0.13053	0.13341	0.13629	0.13917	82
8	0.13917	0.14205	0.14493	0.14781	0.15069	0.15356	0.15643	81
9	0.15643	0.15931	0.16218	0.16505	0.16792	0.17078	0.17365	80
10	0.17365	0.17651	0.17937	0.18224	0.18509	0.18795	0.19081	79
11	0.19081	0.19366	0.19652	0.19937	0.20222	0.20507	0.20791	78
12	0.20791	0.21076	0.21360	0.21644	0.21928	0.22212	0.22495	77
13	0.22495	0.22778	0.23062	0.23345	0.23627	0.23910	0.24192	76
14	0.24192	0.24474	0.24756	0.25038	0.25320	0.25601	0.25882	75
15	0.25882	0.26163	0.26443	0.26724	0.27004	0.27284	0.27564	74
16	0.27564	0.27843	0.28123	0.28402	0.28680	0.28959	0.29237	73
17	0.29237	0.29515	0.29793	0.30071	0.30348	0.30625	0.30902	72
18	0.30902	0.31178	0.31454	0.31730	0.32006	0.32282	0.32557	71
19	0.32557	0.32832	0.33106	0.33381	0.33655	0.33929	0.34202	70
20	0.34202	0.34475	0.34748	0.35021	0.35293	0.35565	0.35837	69
21	0.35837	0.36108	0.36379	0.36650	0.36921	0.37191	0.37461	68
22	0.37461	0.37730	0.37999	0.38268	0.38537	0.38805	0.39073	67
23	0.39073	0.39341	0.39608	0.39875	0.40141	0.40408	0.40674	66
24	0.40674	0.40939	0.41204	0.41469	0.41734	0.41998	0.42262	65
25	0.42262	0.42525	0.42788	0.43051	0.43313	0.43575	0.43837	64
26	0.43837	0.44098	0.44359	0.44620	0.44880	0.45140	0.45399	63
27	0.45399	0.45658	0.45917	0.46175	0.46433	0.46690	0.46947	62
28	0.46947	0.47204	0.47460	0.47716	0.47971	0.48226	0.48481	61
29	0.48481	0.48735	0.48989	0.49242	0.49495	0.49748	0.50000	60
30	0.50000	0.50252	0.50503	0.50754	0.51004	0.51254	0.51504	59
31	0.51504	0.51753	0.52002	0.52250	0.52498	0.52745	0.52992	58
32	0.52992	0.53238	0.53484	0.53730	0.53975	0.54220	0.54464	57
33	0.54464	0.54708	0.54951	0.55194	0.55436	0.55678	0.55919	56
34	0.55919	0.56160	0.56401	0.56641	0.56880	0.57119	0.57358	55
35	0.57358	0.57596	0.57833	0.58070	0.58307	0.58543	0.58779	54
36	0.58779	0.59014	0.59248	0.59482	0.59716	0.59949	0.60182	53
37	0.60182	0.60414	0.60645	0.60876	0.61107	0.61337	0.61566	52
38	0.61566	0.61795	0.62024	0.62251	0.62479	0.62706	0.62932	51
39	0.62932	0.63158	0.63383	0.63608	0.63832	0.64056	0.64279	50
40	0.64279	0.64501	0.64723	0.64945	0.65166	0.65386	0.65606	49
41	0.65606	0.65825	0.66044	0.66262	0.66480	0.66697	0.66913	48
42	0.66913	0.67129	0.67344	0.67559	0.67773	0.67987	0.68200	47
43	0.68200	0.68412	0.68624	0.68835	0.69046	0.69256	0.69466	46
44	0.69466	0.69675	0.69883	0.70091	0.70298	0.70505	0.70711	45
Sines	60′	50′	40′	30′	20′	10′	0′	Degrees
	Cosines							

Natural Trigonometric Functions

(continued)

Degrees	Cosines							Sines
	0′	10′	20′	30′	40′	50′	50′	
0	1.00000	1.00000	0.99998	0.99996	0.99993	0.99989	0.99985	89
1	0.99985	0.99979	0.99973	0.99966	0.99958	0.99949	0.99939	88
2	0.99939	0.99929	0.99917	0.99905	0.99892	0.99878	0.99863	87
3	0.99863	0.99847	0.99831	0.99813	0.99795	0.99776	0.99756	86
4	0.99756	0.99736	0.99714	0.99692	0.99668	0.99644	0.99619	85
5	0.99619	0.99594	0.99567	0.99540	0.99511	0.99482	0.99452	84
6	0.99452	0.99421	0.99390	0.99357	0.99324	0.99290	0.99255	83
7	0.99255	0.99219	0.99182	0.99144	0.99106	0.99067	0.99027	82
8	0.99027	0.98986	0.98944	0.98902	0.98858	0.98814	0.98769	81
9	0.98769	0.98723	0.98676	0.98629	0.98580	0.98531	0.98481	80
10	0.98481	0.98430	0.98378	0.98325	0.98272	0.98218	0.98163	79
11	0.98163	0.98107	0.98050	0.97992	0.97934	0.97875	0.97815	78
12	0.97815	0.97754	0.97692	0.97630	0.97566	0.97502	0.97437	77
13	0.97437	0.97371	0.97304	0.97237	0.97169	0.97100	0.97030	76
14	0.97030	0.96959	0.96887	0.96815	0.96742	0.96667	0.96593	75
15	0.96593	0.96517	0.96440	0.96363	0.96285	0.96206	0.96126	74
16	0.96126	0.96046	0.95964	0.95882	0.95799	0.95715	0.95630	73
17	0.95630	0.95545	0.95459	0.95372	0.95284	0.95195	0.95106	72
18	0.95106	0.95015	0.94924	0.94832	0.94740	0.94646	0.94552	71
19	0.94552	0.94457	0.94361	0.94264	0.94167	0.94068	0.93969	70
20	0.93969	0.93869	0.93769	0.93667	0.93565	0.93462	0.93358	69
21	0.93358	0.93253	0.93148	0.93042	0.92935	0.92827	0.92718	68
22	0.92718	0.92609	0.92499	0.92388	0.92276	0.92164	0.92050	67
23	0.92050	0.91936	0.91822	0.91706	0.91590	0.91472	0.91355	66
24	0.91355	0.91236	0.91116	0.90996	0.90875	0.90753	0.90631	65
25	0.90631	0.90507	0.90383	0.90259	0.90133	0.90007	0.89879	64
26	0.89879	0.89752	0.89623	0.89493	0.89363	0.89232	0.89101	63
27	0.89101	0.88968	0.88835	0.88701	0.88566	0.88431	0.88295	62
28	0.88295	0.88158	0.88020	0.87882	0.87743	0.87603	0.87462	61
29	0.87462	0.87321	0.87178	0.87036	0.86892	0.86748	0.86603	60
30	0.86603	0.86457	0.86310	0.86163	0.86015	0.85866	0.85717	59
31	0.85717	0.85567	0.85416	0.85264	0.85112	0.84959	0.84805	58
32	0.84805	0.84650	0.84495	0.84339	0.84182	0.84025	0.83867	57
33	0.83867	0.83708	0.83549	0.83389	0.83228	0.83066	0.82904	56
34	0.82904	0.82741	0.82577	0.82413	0.82248	0.82082	0.81915	55
35	0.81915	0.81748	0.81580	0.81412	0.81242	0.81072	0.80902	54
36	0.80902	0.80730	0.80558	0.80386	0.80212	0.80038	0.79864	53
37	0.79864	0.79688	0.79512	0.79335	0.79158	0.78980	0.78801	52
38	0.78801	0.78622	0.78442	0.78261	0.78079	0.77897	0.77715	51
39	0.77715	0.77531	0.77347	0.77162	0.76977	0.76791	0.76604	50
40	0.76604	0.76417	0.76229	0.76041	0.75851	0.75661	0.75471	49
41	0.75471	0.75280	0.75088	0.74896	0.74703	0.74509	0.74314	48
42	0.74314	0.74120	0.73924	0.73728	0.73531	0.73333	0.73135	47
43	0.73135	0.72937	0.72737	0.72537	0.72337	0.72136	0.71934	46
44	0.71934	0.71732	0.71529	0.71325	0.71121	0.70916	0.70711	45
Cosines	60′	50′	40′	30′	20′	10′	0′	Degrees
	Sines							

Natural Trigonometric Functions

(continued)

Degrees	Tangents							Cotangents
	0′	10′	20′	30′	40′	50′	60′	
0	0.00000	0.00291	0.00582	0.00873	0.01164	0.01455	0.01746	89
1	0.01746	0.02036	0.02328	0.02619	0.02910	0.03201	0.03492	88
2	0.03492	0.03783	0.04075	0.04366	0.04658	0.04949	0.05241	87
3	0.05241	0.05533	0.05824	0.06116	0.06408	0.06700	0.06993	86
4	0.06993	0.07285	0.07578	0.07870	0.08163	0.08456	0.08749	85
5	0.08749	0.09042	0.09335	0.09629	0.09923	0.10216	0.10510	84
6	0.10510	0.10805	0.11099	0.11394	0.11688	0.11983	0.12278	83
7	0.12278	0.12574	0.12869	0.13165	0.13461	0.13758	0.14054	82
8	0.14054	0.14351	0.14648	0.14945	0.15243	0.15540	0.15838	81
9	0.15838	0.16137	0.16435	0.16734	0.17033	0.17333	0.17633	80
10	0.17633	0.17933	0.18233	0.18534	0.18835	0.19136	0.19438	79
11	0.19438	0.19740	0.20042	0.20345	0.20648	0.20952	0.21256	78
12	0.21256	0.21560	0.21864	0.22169	0.22475	0.22781	0.23087	77
13	0.23087	0.23393	0.23700	0.24008	0.24316	0.24624	0.24933	76
14	0.24933	0.25242	0.25552	0.25862	0.26172	0.26483	0.26795	75
15	0.26795	0.27107	0.27419	0.27732	0.28046	0.28360	0.28675	74
16	0.28675	0.28990	0.29305	0.29621	0.29938	0.30255	0.30573	73
17	0.30573	0.30891	0.31210	0.31530	0.31850	0.32171	0.32492	72
18	0.32492	0.32814	0.33136	0.33460	0.33783	0.34108	0.34433	71
19	0.34433	0.34758	0.35085	0.35412	0.35740	0.36068	0.36397	70
20	0.36397	0.36727	0.37057	0.37388	0.37720	0.38053	0.38386	69
21	0.38386	0.38721	0.39055	0.39391	0.39727	0.40065	0.40403	68
22	0.40403	0.40741	0.41081	0.41421	0.41763	0.42105	0.42447	67
23	0.42447	0.42791	0.43136	0.43481	0.43828	0.44175	0.44523	66
24	0.44523	0.44872	0.45222	0.45573	0.45924	0.46277	0.46631	65
25	0.46631	0.46985	0.47341	0.47698	0.48055	0.48414	0.48773	64
26	0.48773	0.49134	0.49495	0.49858	0.50222	0.50587	0.50953	63
27	0.50953	0.51319	0.51688	0.52057	0.52427	0.52798	0.53171	62
28	0.53171	0.53545	0.53920	0.54296	0.54673	0.55051	0.55431	61
29	0.55431	0.55812	0.56194	0.56577	0.56962	0.57348	0.57735	60
30	0.57735	0.58124	0.58513	0.58905	0.59297	0.59691	0.60086	59
31	0.60086	0.60483	0.60881	0.61280	0.61681	0.62083	0.62487	58
32	0.62487	0.62892	0.63299	0.63707	0.64117	0.64528	0.64941	57
33	0.64941	0.65355	0.65771	0.66189	0.66608	0.67028	0.67451	56
34	0.67451	0.67875	0.68301	0.68728	0.69157	0.69588	0.70021	55
35	0.70021	0.70455	0.70891	0.71329	0.71769	0.72211	0.72654	54
36	0.72654	0.73100	0.73547	0.73996	0.74447	0.74900	0.75355	53
37	0.75355	0.75812	0.76272	0.76733	0.77196	0.77661	0.78129	52
38	0.78129	0.78598	0.79070	0.79544	0.80020	0.80498	0.80978	51
39	0.80978	0.81461	0.81946	0.82434	0.82923	0.83415	0.83910	50
40	0.83910	0.84407	0.84906	0.85408	0.85912	0.86419	0.86929	49
41	0.86929	0.87441	0.87955	0.88473	0.88992	0.89515	0.90040	48
42	0.90040	0.90569	0.91099	0.91633	0.92170	0.92709	0.93252	47
43	0.93252	0.93797	0.94345	0.94896	0.95451	0.96008	0.96569	46
44	0.96569	0.97133	0.97700	0.98270	0.98843	0.99420	1.00000	45
Tangents	60′	50′	40′	30′	20′	10′	0′	Degrees
	Cotangents							

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Four-Place Table of Common Logarithms

The common logarithms of numbers between 1 and 10, correct to four places, are given in the table shown on this and the following page.

If the decimal point in the number is moved n places to the right (or left), the value of n (or $-n$) is added to the logarithm, thus:

log 3.14 = 0.4969
log 314. = 0.4969+2 or 2.4969
log .0314 = 0.4969−2, which may be written, $\bar{2}$.4969 or 8.4969−10

If the given number has more than four significant figures, it should be reduced to four figures, since those beyond four figures will not affect the result in four-place computations.

The logarithm of a number having four significant figures must be interpolated by adding to the logarithm of the three figure number, the amount under the fourth figure, as read in the proportional parts section of the table.

Thus, the logarithm of 3.1416 is found as follows:

a. Reduce the number to four significant figures: 3.142
b. The log of 3.14 is .4969
c. The value of the proportional part under 2 (the fourth figure) is 3
d. Then, the log 3.142 = 0.4969+.0003 or 0.4972

$$\log ab = \log a + \log b \qquad \log a^n = n \log a$$

$$\log \frac{a}{b} = \log a - \log b \qquad \log \sqrt[n]{a} = \frac{\log a}{n}$$

N	0	1	2	3	4	5	6	7	8	9	Proportional Parts 1	2	3	4	5	6	7	8	9
1.0	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
1.1	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
1.2	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
1.3	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
1.4	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
1.5	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
1.6	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
1.7	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
1.8	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
1.9	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
2.0	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
2.1	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
2.2	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
2.3	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
2.4	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
2.5	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
2.6	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
2.7	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
2.8	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
2.9	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
3.0	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
3.1	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
3.2	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
3.3	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
3.4	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
3.5	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
3.6	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
3.7	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
3.8	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
3.9	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
N	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Four-Place Table of Common Logarithms (Cont.)

N	0	1	2	3	4	5	6	7	8	9	Proportional Parts 1	2	3	4	5	6	7	8	9
4.0	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
4.1	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
4.2	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
4.3	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
4.4	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
4.5	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
4.6	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
4.7	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
4.8	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
4.9	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8
5.0	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8
5.1	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
5.2	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
5.3	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
5.4	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
5.5	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
5.6	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
5.7	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
5.8	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
5.9	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
6.0	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
6.1	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
6.2	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
6.3	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
6.4	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
6.5	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
6.6	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	5	6
6.7	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
6.8	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
6.9	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
7.0	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
7.1	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
7.2	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
7.3	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
7.4	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
7.5	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
7.6	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
7.7	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
7.8	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
7.9	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
8.0	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
8.1	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
8.2	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
8.3	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
8.4	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
8.5	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
8.6	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
8.7	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
8.8	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
8.9	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
9.0	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
9.1	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
9.2	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
9.3	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
9.4	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
9.5	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
9.6	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
9.7	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
9.8	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
9.9	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	3	4
N	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

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Steam

There are three states of matter: solid, liquid, and gas. Under normal atmospheric conditions, substances exist in any one of these three states, and when the outside conditions are varied, they change from one state to another.

Water under average conditions exists in the form of a liquid. When a body of water is heated by means of some external medium, the temperature of the water rises, and soon small bubbles are noted on the surface which break and form continuously. This phenomenon is described as "boiling".

The amount of heat necessary to cause the temperature of the water to rise is expressed in British Thermal Units (B.t.u.), where one B.t.u. is the quantity of heat required to raise the temperature of 1 pound of water from 60 to 61° F. or, as is generally stated, 1/180 part of the heat necessary to raise the temperature of 1 pound of water from 32° F. (freezing point) to 212° F. (boiling point).

After the temperature of 212° F. is reached, each pound of water contains 180 B.t.u. (above 32° F.). This quantity of heat is called "*heat of the liquid*" or "*sensible heat*". In order to change the liquid into a vapor at atmospheric pressure (14.7 pounds per square inch absolute), 970.2 B.t.u. must be added to each pound of water after the temperature of 212° F. is reached. During this transition period the temperature remains constant. The added quantity of heat is called the "*latent heat of evaporation*". Consequently, the "*total heat*" of the vapor, formed when water boils at atmospheric pressure, is the sum of the two quantities 180 B.t.u. and 970.2 B.t.u., or 1150.2 B.t.u. per pound.

If water is heated in a closed vessel not completely filled, the pressure will rise after steam begins to form accompanied by an increase in temperature.

Saturated Steam: Saturated steam is steam in contact with the liquid water from which it was generated, at a temperature which is the boiling point of the water and the condensing point of the steam. It may be either "dry" or "wet", depending upon the generating conditions. "Dry" saturated steam is steam free from mechanically mixed water particles. "Wet" saturated steam, on the other hand, contains water particles in suspension. Saturated steam at any pressure has a definite temperature.

Superheated Steam: Superheated steam is steam at any given pressure which is heated to a temperature higher than the temperature of saturated steam at that pressure.

Steam Data.....page 569
Properties of Saturated Steam.....pages 570 to 573
Properties of Superheated Steam....pages 574 to 576
Temperature Conversion table.....page 557

Steam Data

Boiler Horse Power

The accepted rule for figuring boiler horse power is as follows:

One Horse Power equals the evaporation of 30 pounds of water per hour from an initial temperature of 100° F. into steam at 70 pounds gauge pressure, or its equivalent; that is, 34½ pounds of water evaporated per hour from a temperature of 212° F. into steam at 212° F.

Horse Power of an Engine

P = Mean effective pressure per square inch of the steam on the piston.
L = Length of stroke in feet.
A = Area of piston in square inches.
N = Number of strokes per minute.

Then Horse Power $= \frac{PLAN}{33000}$

The approximate mean effective pressure in the cylinder when the valve cuts off at:

¼ stroke equals steam pressure × .507
⅓ stroke equals steam pressure × .670
⅜ stroke equals steam pressure × .743
½ stroke equals steam pressure × .847
⅝ stroke equals steam pressure × .919
⅔ stroke equals steam pressure × .937
¾ stroke equals steam pressure × .966
⅞ stroke equals steam pressure × .992

Ranges in Steam Consumption by Prime Movers

(For Estimating Purposes)

Simple Non-Condensing Engines	29 —	45 pounds per H. P. hour
Simple Non-Condensing Automatic Engines	26 —	40 pounds per H. P. hour
Simple Non-Condensing Corliss Engines	26 —	35 pounds per H. P. hour
Compound Non-Condensing Engines	19 —	28 pounds per H. P. hour
Compound Condensing Engines	12 —	22 pounds per H. P. hour
Simple Duplex Steam Pumps	120 —	200 pounds per H. P. hour
Turbines, Non-Condensing	21 —	45 pounds per H. P. hour
Turbines, Condensing	9 —	32 pounds per H. P. hour

Flow of Steam in Pipes

To determine the velocity of steam in feet per minute through a pipe, the quantity, pressure and area being known.

V = Velocity in feet per minute.
W = Pounds of steam per hour.
v = Specific volume in cubic feet per pound. (See steam tables, pages 570 to 576.)
a = Area of pipe in square inches. (See steel pipe data, pages 490 and 491.)
1728 = Cubic inches in a cubic foot.
60 = Minutes in an hour.
12 = Inches in a foot.

Then $V = \frac{W \times v \times 1728}{60 \times a \times 12} = \frac{W \times v \times 2.4}{a}$

$W = \frac{a \times V}{v \times 2.4}$

$v = \frac{a \times V}{W \times 2.4}$

$a = \frac{W \times v \times 2.4}{V}$

Loss of Pressure

The above formula does not consider the probable drop, or loss of pressure which is dependent upon the velocity of flow, length of line, number of turns in fittings or valves, and the covering of the pipe. In every steam line there must be a difference in pressure between the inlet and outlet or there could be no flow, and this difference is increased by friction and radiation.

Reasonable Velocities for Flow of Steam in Pipes

The table below giving reasonable velocities, based on average practice, can be used to advantage in steam lines. It must be realized that the lower velocities should be used for smaller pipes and the higher velocities for pipes larger than 12 inches.

Condition of Steam	Pressure Pounds per Square Inch	Use	Reasonable Velocity Feet per Minute
Saturated	0 pounds — 15 pounds	Heating (Short lines)	4,000 to 6,000
Saturated	50 pounds and up	Miscellaneous	6,000 to 10,000
Superheated	200 pounds and up	High Pressure Steam Piping	7,000 to 20,000

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Properties of Saturated Steam[1]

Absolute Pressure Lbs. per Sq. In. P	Absolute Pressure Inches of Hg	Vacuum Inches of Hg	Temperature Degrees F. t	Heat of the Liquid Btu/lb. h_f	Latent Heat of Evaporation Btu/lb. h_{fg}	Total Heat of Steam Btu/lb. h_g	Specific Volume Cu. ft. per lb. v_g
0.20	0.41	29.51	53.14	21.21	1063.8	1085.0	1526.0
0.25	0.51	29.41	59.30	27.36	1060.3	1087.7	1235.3
0.30	0.61	29.31	64.47	32.52	1057.4	1090.0	1039.5
0.35	0.71	29.21	68.93	36.97	1054.9	1091.9	898.5
0.40	0.81	29.11	72.86	40.89	1052.7	1093.6	791.9
0.45	0.92	29.00	76.38	44.41	1050.7	1095.1	708.5
0.50	1.02	28.90	79.58	47.60	1048.8	1096.4	641.4
0.60	1.22	28.70	85.21	53.21	1045.7	1098.9	540.0
0.70	1.43	28.49	90.08	58.07	1042.9	1101.0	466.9
0.80	1.63	28.29	94.38	62.36	1040.4	1102.8	411.7
0.90	1.83	28.09	98.24	66.21	1038.3	1104.5	368.4
1.0	2.04	27.88	101.74	69.70	1036.3	1106.0	333.6
1.2	2.44	27.48	107.92	75.87	1032.7	1108.6	280.9
1.4	2.85	27.07	113.26	81.20	1029.6	1110.8	243.0
1.6	3.26	26.66	117.99	85.91	1026.9	1112.8	214.3
1.8	3.66	26.26	122.23	90.14	1024.5	1114.6	191.8
2.0	4.07	25.85	126.08	93.99	1022.2	1116.2	173.73
2.2	4.48	25.44	129.62	97.52	1020.2	1117.7	158.85
2.4	4.89	25.03	132.89	100.79	1018.3	1119.1	146.38
2.6	5.29	24.63	135.94	103.83	1016.5	1120.3	135.78
2.8	5.70	24.22	138.79	106.68	1014.8	1121.5	126.65
3.0	6.11	23.81	141.48	109.37	1013.2	1122.6	118.71
3.5	7.13	22.79	147.57	115.46	1009.6	1125.1	102.72
4.0	8.14	21.78	152.97	120.86	1006.4	1127.3	90.63
4.5	9.16	20.76	157.83	125.71	1003.6	1129.3	81.16
5.0	10.18	19.74	162.24	130.13	1001.0	1131.1	73.52
5.5	11.20	18.72	166.30	134.19	998.5	1132.7	67.24
6.0	12.22	17.70	170.06	137.96	996.2	1134.2	61.98
6.5	13.23	16.69	173.56	141.47	994.1	1135.6	57.50
7.0	14.25	15.67	176.85	144.76	992.1	1136.9	53.64
7.5	15.27	14.65	179.94	147.86	990.2	1138.1	50.29
8.0	16.29	13.63	182.86	150.79	988.5	1139.3	47.34
8.5	17.31	12.61	185.64	153.57	986.8	1140.4	44.73
9.0	18.32	11.60	188.28	156.22	985.2	1141.4	42.40
9.5	19.34	10.58	190.80	158.75	983.6	1142.3	40.31
10.0	20.36	9.56	193.21	161.17	982.1	1143.3	38.42
11.0	22.40	7.52	197.75	165.73	979.3	1145.0	35.14
12.0	24.43	5.49	201.96	169.96	976.6	1146.6	32.40
13.0	26.47	3.45	205.88	173.91	974.2	1148.1	30.06
14.0	28.50	1.42	209.56	177.61	971.9	1149.5	28.04

Pressure Lbs. per Sq. In. Absolute P	Pressure Lbs. per Sq. In. Gage p	Temperature Degrees F. t	Heat of the Liquid Btu/lb. h_f	Latent Heat of Evaporation Btu/lb. h_{fg}	Total Heat of Steam Btu/lb. h_g	Specific Volume Cu. ft. per lb. v_g
14.696	0.0	212.00	180.07	970.3	1150.4	26.80
15.0	0.3	213.03	181.11	969.7	1150.8	26.29
16.0	1.3	216.32	184.42	967.6	1152.0	24.75
17.0	2.3	219.44	187.56	965.5	1153.1	23.39
18.0	3.3	222.41	190.56	963.6	1154.2	22.17
19.0	4.3	225.24	193.42	961.9	1155.3	21.08
20.0	5.3	227.96	196.16	960.1	1156.3	20.089
21.0	6.3	230.57	198.79	958.4	1157.2	19.192
22.0	7.3	233.07	201.33	956.8	1158.1	18.375
23.0	8.3	235.49	203.78	955.2	1159.0	17.627
24.0	9.3	237.82	206.14	953.7	1159.8	16.938
25.0	10.3	240.07	208.42	952.1	1160.6	16.303
26.0	11.3	242.25	210.62	950.7	1161.3	15.715
27.0	12.3	244.36	212.75	949.3	1162.0	15.170
28.0	13.3	246.41	214.83	947.9	1162.7	14.663
29.0	14.3	248.40	216.86	946.5	1163.4	14.189
30.0	15.3	250.33	218.82	945.3	1164.1	13.746
31.0	16.3	252.22	220.73	944.0	1164.7	13.330
32.0	17.3	254.05	222.59	942.8	1165.4	12.940
33.0	18.3	255.84	224.41	941.6	1166.0	12.572
34.0	19.3	257.58	226.18	940.3	1166.5	12.226

[1] Abstracted from Thermodynamic Properties of Steam by J. H. Keenan and F. G. Keyes, 1936 Edition, by permission of the publishers, John Wiley & Sons, Inc.

Pressure Lbs. per Sq. In. Absolute P	Pressure Lbs. per Sq. In. Gage p	Temperature Degrees F. t	Heat of the Liquid Btu/lb. h_f	Latent Heat of Evaporation Btu/lb. h_{fg}	Total Heat of Steam Btu/lb. h_g	Specific Volume Cu. ft. per lb. v_g
35.0	20.3	259.28	227.91	939.2	1167.1	11.898
36.0	21.3	260.95	229.60	938.0	1167.6	11.588
37.0	22.3	262.57	231.26	936.9	1168.2	11.294
38.0	23.3	264.16	232.89	935.8	1168.7	11.015
39.0	24.3	265.72	234.48	934.7	1169.2	10.750
40.0	25.3	267.25	236.03	933.7	1169.7	10.498
41.0	26.3	268.74	237.55	932.6	1170.2	10.258
42.0	27.3	270.21	239.04	931.6	1170.7	10.029
43.0	28.3	271.64	240.51	930.6	1171.1	9.810
44.0	29.3	273.05	241.95	929.6	1171.6	9.601
45.0	30.3	274.44	243.36	928.6	1172.0	9.401
46.0	31.3	275.80	244.75	927.7	1172.4	9.209
47.0	32.3	277.13	246.12	926.7	1172.9	9.025
48.0	33.3	278.45	247.47	925.8	1173.3	8.848
49.0	34.3	279.74	248.79	924.9	1173.7	8.678
50.0	35.3	281.01	250.09	924.0	1174.1	8.515
51.0	36.3	282.26	251.37	923.0	1174.4	8.359
52.0	37.3	283.49	252.63	922.2	1174.8	8.208
53.0	38.3	284.70	253.87	921.3	1175.2	8.062
54.0	39.3	285.90	255.09	920.5	1175.6	7.922
55.0	40.3	287.07	256.30	919.6	1175.9	7.787
56.0	41.3	288.23	257.50	918.8	1176.3	7.656
57.0	42.3	289.37	258.67	917.9	1176.6	7.529
58.0	43.3	290.50	259.82	917.1	1176.9	7.407
59.0	44.3	291.61	260.96	916.3	1177.3	7.289
60.0	45.3	292.71	262.09	915.5	1177.6	7.175
61.0	46.3	293.79	263.20	914.7	1177.9	7.064
62.0	47.3	294.85	264.30	913.9	1178.2	6.957
63.0	48.3	295.90	265.38	913.1	1178.5	6.853
64.0	49.3	296.94	266.45	912.3	1178.8	6.752
65.0	50.3	297.97	267.50	911.6	1179.1	6.655
66.0	51.3	298.99	268.55	910.8	1179.4	6.560
67.0	52.3	299.99	269.58	910.1	1179.7	6.468
68.0	53.3	300.98	270.60	909.4	1180.0	6.378
69.0	54.3	301.96	271.61	908.7	1180.3	6.291
70.0	55.3	302.92	272.61	907.9	1180.6	6.206
71.0	56.3	303.88	273.60	907.2	1180.8	6.124
72.0	57.3	304.83	274.57	906.5	1181.1	6.044
73.0	58.3	305.76	275.54	905.8	1181.3	5.966
74.0	59.3	306.68	276.49	905.1	1181.6	5.890
75.0	60.3	307.60	277.43	904.5	1181.9	5.816
76.0	61.3	308.50	278.37	903.7	1182.1	5.743
77.0	62.3	309.40	279.30	903.1	1182.4	5.673
78.0	63.3	310.29	280.21	902.4	1182.6	5.604
79.0	64.3	311.16	281.12	901.7	1182.8	5.537
80.0	65.3	312.03	282.02	901.1	1183.1	5.472
81.0	66.3	312.89	282.91	900.4	1183.3	5.408
82.0	67.3	313.74	283.79	899.7	1183.5	5.346
83.0	68.3	314.59	284.66	899.1	1183.8	5.285
84.0	69.3	315.42	285.53	898.5	1184.0	5.226
85.0	70.3	316.25	286.39	897.8	1184.2	5.168
86.0	71.3	317.07	287.24	897.2	1184.4	5.111
87.0	72.3	317.88	288.08	896.5	1184.6	5.055
88.0	73.3	318.68	288.91	895.9	1184.8	5.001
89.0	74.3	319.48	289.74	895.3	1185.1	4.948
90.0	75.3	320.27	290.56	894.7	1185.3	4.896
91.0	76.3	321.06	291.38	894.1	1185.5	4.845
92.0	77.3	321.83	292.18	893.5	1185.7	4.796
93.0	78.3	322.60	292.98	892.9	1185.9	4.747
94.0	79.3	323.36	293.78	892.3	1186.1	4.699
95.0	80.3	324.12	294.56	891.7	1186.2	4.652
96.0	81.3	324.87	295.34	891.1	1186.4	4.606
97.0	82.3	325.61	296.12	890.5	1186.6	4.561
98.0	83.3	326.35	296.89	889.9	1186.8	4.517
99.0	84.3	327.08	297.65	889.4	1187.0	4.474
100.0	85.3	327.81	298.40	888.8	1187.2	4.432
101.0	86.3	328.53	299.15	888.2	1187.4	4.391
102.0	87.3	329.25	299.90	887.6	1187.5	4.350
103.0	88.3	329.96	300.64	887.1	1187.7	4.310
104.0	89.3	330.66	301.37	886.5	1187.9	4.271
105.0	90.3	331.36	302.10	886.0	1188.1	4.232
106.0	91.3	332.05	302.82	885.4	1188.2	4.194
107.0	92.3	332.74	303.54	884.9	1188.4	4.157
108.0	93.3	333.42	304.26	884.3	1188.6	4.120
109.0	94.3	334.10	304.97	883.7	1188.7	4.084

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Pressure Lbs. per Sq. In. Absolute P	Pressure Lbs. per Sq. In. Gage p	Temperature Degrees F. t	Heat of the Liquid Btu/lb. h_f	Latent Heat of Evaporation Btu/lb. h_{fg}	Total Heat of Steam Btu/lb. h_g	Specific Volume Cu. ft. per lb. v_g
110.0	95.3	334.77	305.66	883.2	1188.9	4.049
111.0	96.3	335.44	306.37	882.6	1189.0	4.015
112.0	97.3	336.11	307.06	882.1	1189.2	3.981
113.0	98.3	336.77	307.75	881.6	1189.4	3.947
114.0	99.3	337.42	308.43	881.1	1189.5	3.914
115.0	100.3	338.07	309.11	880.6	1189.7	3.882
116.0	101.3	338.72	309.79	880.0	1189.8	3.850
117.0	102.3	339.36	310.46	879.5	1190.0	3.819
118.0	103.3	339.99	311.12	879.0	1190.1	3.788
119.0	104.3	340.62	311.78	878.4	1190.2	3.758
120.0	105.3	341.25	312.44	877.9	1190.4	3.728
121.0	106.3	341.88	313.10	877.4	1190.5	3.699
122.0	107.3	342.50	313.75	876.9	1190.7	3.670
123.0	108.3	343.11	314.40	876.4	1190.8	3.642
124.0	109.3	343.72	315.04	875.9	1190.9	3.614
125.0	110.3	344.33	315.68	875.4	1191.1	3.587
126.0	111.3	344.94	316.31	874.9	1191.2	3.560
127.0	112.3	345.54	316.94	874.4	1191.3	3.533
128.0	113.3	346.13	317.57	873.9	1191.5	3.507
129.0	114.3	346.73	318.19	873.4	1191.6	3.481
130.0	115.3	347.32	318.81	872.9	1191.7	3.455
131.0	116.3	347.90	319.43	872.5	1191.9	3.430
132.0	117.3	348.48	320.04	872.0	1192.0	3.405
133.0	118.3	349.06	320.65	871.5	1192.1	3.381
134.0	119.3	349.64	321.25	871.0	1192.2	3.357
135.0	120.3	350.21	321.85	870.6	1192.4	3.333
136.0	121.3	350.78	322.45	870.1	1192.5	3.310
137.0	122.3	351.35	323.05	869.6	1192.6	3.287
138.0	123.3	351.91	323.64	869.1	1192.7	3.264
139.0	124.3	352.47	324.23	868.7	1192.9	3.242
140.0	125.3	353.02	324.82	868.2	1193.0	3.220
141.0	126.3	353.57	325.40	867.7	1193.1	3.198
142.0	127.3	354.12	325.98	867.2	1193.2	3.177
143.0	128.3	354.67	326.56	866.7	1193.3	3.155
144.0	129.3	355.21	327.13	866.3	1193.4	3.134
145.0	130.3	355.76	327.70	865.8	1193.5	3.114
146.0	131.3	356.29	328.27	865.3	1193.6	3.094
147.0	132.3	356.83	328.83	864.9	1193.8	3.074
148.0	133.3	357.36	329.39	864.5	1193.9	3.054
149.0	134.3	357.89	329.95	864.0	1194.0	3.034
150.0	135.3	358.42	330.51	863.6	1194.1	3.015
152.0	137.3	359.46	331.61	862.7	1194.3	2.977
154.0	139.3	360.49	332.70	861.8	1194.5	2.940
156.0	141.3	361.52	333.79	860.9	1194.7	2.904
158.0	143.3	362.53	334.86	860.0	1194.9	2.869
160.0	145.3	363.53	335.93	859.2	1195.1	2.834
162.0	147.3	364.53	336.98	858.3	1195.3	2.801
164.0	149.3	365.51	338.02	857.5	1195.5	2.768
166.0	151.3	366.48	339.05	856.6	1195.7	2.736
168.0	153.3	367.45	340.07	855.7	1195.8	2.705
170.0	155.3	368.41	341.09	854.9	1196.0	2.675
172.0	157.3	369.35	342.10	854.1	1196.2	2.645
174.0	159.3	370.29	343.10	853.3	1196.4	2.616
176.0	161.3	371.22	344.09	852.4	1196.5	2.587
178.0	163.3	372.14	345.06	851.6	1196.7	2.559
180.0	165.3	373.06	346.03	850.8	1196.9	2.532
182.0	167.3	373.96	347.00	850.0	1197.0	2.505
184.0	169.3	374.86	347.96	849.2	1197.2	2.479
186.0	171.3	375.75	348.92	848.4	1197.3	2.454
188.0	173.3	376.64	349.86	847.6	1197.5	2.429
190.0	175.3	377.51	350.79	846.8	1197.6	2.404
192.0	177.3	378.38	351.72	846.1	1197.8	2.380
194.0	179.3	379.24	352.64	845.3	1197.9	2.356
196.0	181.3	380.10	353.55	844.5	1198.1	2.333
198.0	183.3	380.95	354.46	843.7	1198.2	2.310
200.0	185.3	381.79	355.36	843.0	1198.4	2.288
205.0	190.3	383.86	357.58	841.1	1198.7	2.234
210.0	195.3	385.90	359.77	839.2	1199.0	2.183
215.0	200.3	387.89	361.91	837.4	1199.3	2.134
220.0	205.3	389.86	364.02	835.6	1199.6	2.087
225.0	210.3	391.79	366.09	833.8	1199.9	2.0422
230.0	215.3	393.68	368.13	832.0	1200.1	1.9992
235.0	220.3	395.54	370.14	830.3	1200.4	1.9579
240.0	225.3	397.37	372.12	828.5	1200.6	1.9183
245.0	230.3	399.18	374.08	826.8	1200.9	1.8803

Pressure Lbs. per Sq. In. Absolute P	Pressure Lbs. per Sq. In. Gage p	Temperature Degrees F. t	Heat of the Liquid Btu/lb. h_f	Latent Heat of Evaporation Btu/lb. h_{fg}	Total Heat of Steam Btu/lb. h_g	Specific Volume Cu. ft. per lb. v_g
250.0	235.3	400.95	376.00	825.1	1201.1	1.8438
255.0	240.3	402.70	377.89	823.4	1201.3	1.8086
260.0	245.3	404.42	379.76	821.8	1201.5	1.7748
265.0	250.3	406.11	381.60	820.1	1201.7	1.7422
270.0	255.3	407.78	383.42	818.5	1201.9	1.7107
275.0	260.3	409.43	385.21	816.9	1202.1	1.6804
280.0	265.3	411.05	386.98	815.3	1202.3	1.6511
285.0	270.3	412.65	388.73	813.7	1202.4	1.6228
290.0	275.3	414.23	390.46	812.1	1202.6	1.5954
295.0	280.3	415.79	392.16	810.5	1202.7	1.5689
300.0	285.3	417.33	393.84	809.0	1202.8	1.5433
320.0	305.3	423.29	400.39	803.0	1203.4	1.4485
340.0	325.3	428.97	406.66	797.1	1203.7	1.3645
360.0	345.3	434.40	412.67	791.4	1204.1	1.2895
380.0	365.3	439.60	418.45	785.8	1204.3	1.2222
400.0	385.3	444.59	424.0	780.5	1204.5	1.1613
420.0	405.3	449.39	429.4	775.2	1204.6	1.1061
440.0	425.3	454.02	434.6	770.0	1204.6	1.0556
460.0	445.3	458.50	439.7	764.9	1204.6	1.0094
480.0	465.3	462.82	444.6	759.9	1204.5	0.9670
500.0	485.3	467.01	449.4	755.0	1204.4	0.9278
520.0	505.3	471.07	454.1	750.1	1204.2	0.8915
540.0	525.3	475.01	458.6	745.4	1204.0	0.8578
560.0	545.3	478.85	463.0	740.8	1203.8	0.8265
580.0	565.3	482.58	467.4	736.1	1203.5	0.7973
600.0	585.3	486.21	471.6	731.6	1203.2	0.7698
620.0	605.3	489.75	475.7	727.2	1202.9	0.7440
640.0	625.3	493.21	479.8	722.7	1202.5	0.7198
660.0	645.3	496.58	483.8	718.3	1202.1	0.6971
680.0	665.3	499.88	487.7	714.0	1201.7	0.6757
700.0	685.3	503.10	491.5	709.7	1201.2	0.6554
720.0	705.3	506.25	495.3	705.4	1200.7	0.6362
740.0	725.3	509.34	499.0	701.2	1200.2	0.6180
760.0	745.3	512.36	502.6	697.1	1199.7	0.6007
780.0	765.3	515.33	506.2	692.9	1199.1	0.5843
800.0	785.3	518.23	509.7	688.9	1198.6	0.5687
820.0	805.3	521.08	513.2	684.8	1198.0	0.5538
840.0	825.3	523.88	516.6	680.8	1197.4	0.5396
860.0	845.3	526.63	520.0	676.8	1196.8	0.5260
880.0	865.3	529.33	523.3	672.8	1196.1	0.5130
900.0	885.3	531.98	526.6	668.8	1195.4	0.5006
920.0	905.3	534.59	529.8	664.9	1194.7	0.4886
940.0	925.3	537.16	533.0	661.0	1194.0	0.4772
960.0	945.3	539.68	536.2	657.1	1193.3	0.4663
980.0	965.3	542.17	539.3	653.3	1192.6	0.4557
1000.0	985.3	544.61	542.4	649.4	1191.8	0.4456
1050.0	1035.3	550.57	550.0	639.9	1189.9	0.4218
1100.0	1085.3	556.31	557.4	630.4	1187.8	0.4001
1150.0	1135.3	561.86	564.6	621.0	1185.6	0.3802
1200.0	1185.3	567.22	571.7	611.7	1183.4	0.3619
1250.0	1235.3	572.42	578.6	602.4	1181.0	0.3450
1300.0	1285.3	577.46	585.4	593.2	1178.6	0.3293
1350.0	1335.3	582.35	592.1	584.0	1176.1	0.3148
1400.0	1385.3	587.10	598.7	574.7	1173.4	0.3012
1450.0	1435.3	591.73	605.2	565.5	1170.7	0.2884
1500.0	1485.3	596.23	611.6	556.3	1167.9	0.2765
1600.0	1585.3	604.90	624.1	538.0	1162.1	0.2548
1700.0	1685.3	613.15	636.3	519.6	1155.9	0.2354
1800.0	1785.3	621.03	648.3	501.1	1149.4	0.2179
1900.0	1885.3	628.58	660.1	482.4	1142.4	0.2021
2000.0	1985.3	635.82	671.7	463.4	1135.1	0.1878
2100.0	2085.3	642.77	683.3	444.1	1127.4	0.1746
2200.0	2185.3	649.46	694.8	424.4	1119.2	0.1625
2300.0	2285.3	655.91	706.5	403.9	1110.4	0.1513
2400.0	2385.3	662.12	718.4	382.7	1101.1	0.1407
2500.0	2485.3	668.13	730.6	360.5	1091.1	0.1307
2600.0	2585.3	673.94	743.0	337.2	1080.2	0.1213
2700.0	2685.3	679.55	756.2	312.1	1068.3	0.1123
2800.0	2785.3	684.99	770.1	284.7	1054.8	0.1035
2900.0	2885.3	690.26	785.4	253.6	1039.0	0.0947
3000.0	2985.3	695.36	802.5	217.8	1020.3	0.0858
3100.0	3085.3	700.31	825.0	168.1	993.1	0.0753
3200.0	3185.3	705.11	872.4	62.0	934.4	0.0580
3206.2	3191.5	705.40	902.7	0.0	902.7	0.0503

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Properties of Superheated Steam[1]

v = specific volume, cubic feet per pound
h = total heat of steam, Btu per pound

Pressure Lbs. per Sq. In. Abs. P	Pressure Lbs. per Sq. In. Gage p	Sat. Temp. t		Total Temperature — Degrees Fahrenheit 360°	400°	440°	480°	500°	600°	700°	800°	900°	1000°	1200°
14.696	0.0	212.00	v	33.03	34.68	36.32	37.96	38.78	42.86	46.94	51.00	55.07	59.13	67.25
			h	1221.1	1239.9	1258.8	1277.6	1287.1	1334.8	1383.2	1432.3	1482.3	1533.1	1637.5
20.0	5.3	227.96	v	24.21	25.43	26.65	27.86	28.46	31.47	34.47	37.46	40.45	43.44	49.41
			h	1220.3	1239.2	1258.2	1277.1	1286.6	1334.4	1382.9	1432.1	1482.1	1533.0	1637.4
30.0	15.3	250.33	v	16.072	16.897	17.714	18.528	18.933	20.95	22.96	24.96	26.95	28.95	32.93
			h	1218.6	1237.9	1257.0	1276.2	1285.7	1333.8	1382.4	1431.7	1481.8	1532.7	1637.2
40.0	25.3	267.25	v	12.001	12.628	13.247	13.862	14.168	15.688	17.198	18.702	20.20	21.70	24.69
			h	1216.9	1236.5	1255.9	1275.2	1284.8	1333.1	1381.9	1431.3	1481.4	1532.4	1637.0
50.0	35.3	281.01	v	9.557	10.065	10.567	11.062	11.309	12.532	13.744	14.950	16.152	17.352	19.747
			h	1215.2	1235.1	1254.7	1274.2	1283.9	1332.5	1381.4	1430.9	1481.1	1532.1	1636.8
60.0	45.3	292.71	v	7.927	8.357	8.779	9.196	9.403	10.427	11.441	12.449	13.452	14.454	16.451
			h	1213.4	1233.6	1253.5	1273.2	1283.0	1331.8	1380.9	1430.5	1480.8	1531.9	1636.6
70.0	55.3	302.92	v	6.762	7.136	7.502	7.863	8.041	8.924	9.796	10.662	11.524	12.383	14.097
			h	1211.5	1232.1	1252.3	1272.2	1282.0	1331.1	1380.4	1430.1	1480.5	1531.6	1636.3
80.0	65.3	312.03	v	5.888	6.220	6.544	6.862	7.020	7.797	8.562	9.322	10.077	10.830	12.332
			h	1209.7	1230.7	1251.1	1271.1	1281.1	1330.5	1379.9	1429.7	1480.1	1531.3	1636.2
90.0	75.3	320.27	v	5.208	5.508	5.799	6.084	6.225	6.920	7.603	8.279	8.952	9.623	10.959
			h	1207.7	1229.1	1249.8	1270.1	1280.1	1329.8	1379.4	1429.3	1479.8	1531.0	1635.9
100.0	85.3	327.81	v	4.663	4.937	5.202	5.462	5.589	6.218	6.835	7.446	8.052	8.656	9.860
			h	1205.7	1227.6	1248.6	1269.0	1279.1	1329.1	1378.9	1428.9	1479.5	1530.8	1635.7
120.0	105.3	341.25	v	3.844	4.081	4.307	4.527	4.636	5.165	5.683	6.195	6.702	7.207	8.212
			h	1201.6	1224.4	1246.0	1266.9	1277.2	1327.7	1377.8	1428.1	1478.8	1530.2	1635.3
140.0	125.3	353.02	v	3.258	3.468	3.667	3.860	3.954	4.413	4.861	5.301	5.738	6.172	7.035
			h	1197.3	1221.1	1243.3	1264.7	1275.2	1326.4	1376.8	1427.3	1478.2	1529.7	1634.9
160.0	145.3	363.53	v		3.008	3.187	3.359	3.443	3.849	4.244	4.631	5.015	5.396	6.152
			h		1217.6	1240.6	1262.4	1273.1	1325.0	1375.7	1426.4	1477.5	1529.1	1634.5
180.0	165.3	373.06	v		2.649	2.813	2.969	3.044	3.411	3.764	4.110	4.452	4.792	5.466
			h		1214.0	1237.8	1260.2	1271.0	1323.5	1374.7	1425.6	1476.8	1528.6	1634.1
200.0	185.3	381.79	v		2.361	2.513	2.656	2.726	3.060	3.380	3.693	4.002	4.309	4.917
			h		1210.3	1234.9	1257.8	1268.9	1322.1	1373.6	1424.8	1476.2	1528.0	1633.7
220.0	205.3	389.86	v		2.125	2.267	2.400	2.465	2.772	3.066	3.352	3.634	3.913	4.467
			h		1206.5	1231.9	1255.4	1266.7	1320.7	1372.6	1424.0	1475.5	1527.5	1633.3
240.0	225.3	397.37	v		1.9276	2.062	2.187	2.247	2.533	2.804	3.068	3.327	3.584	4.093
			h		1202.5	1228.8	1253.0	1264.5	1319.2	1371.5	1423.2	1474.8	1526.9	1632.9
260.0	245.3	404.42	v			1.8882	2.006	2.063	2.330	2.582	2.827	3.067	3.305	3.776
			h			1225.7	1250.5	1262.3	1317.7	1370.4	1422.3	1474.2	1526.3	1632.5
280.0	265.3	411.05	v			1.7388	1.8512	1.9047	2.156	2.392	2.621	2.845	3.066	3.504
			h			1222.4	1247.9	1260.0	1316.2	1369.4	1421.5	1473.5	1525.8	1632.1
300.0	285.3	417.33	v			1.6090	1.7165	1.7675	2.005	2.227	2.442	2.652	2.859	3.269
			h			1219.1	1245.3	1257.6	1314.7	1368.3	1420.6	1472.8	1525.2	1631.7
320.0	305.3	423.29	v			1.4950	1.5985	1.6472	1.8734	2.083	2.285	2.483	2.678	3.063
			h			1215.6	1242.6	1255.2	1313.2	1367.2	1419.8	1472.1	1524.7	1631.3
340.0	325.3	428.97	v			1.3941	1.4941	1.5410	1.7569	1.9562	2.147	2.334	2.518	2.881
			h			1212.1	1239.9	1252.8	1311.6	1366.1	1419.0	1471.5	1524.1	1630.9
360.0	345.3	434.40	v			1.3041	1.4012	1.4464	1.6533	1.8431	2.025	2.202	2.376	2.719
			h			1208.4	1237.1	1250.3	1310.1	1365.0	1418.1	1470.8	1523.5	1630.5

[1]Abstracted from Thermodynamic Properties of Steam by J. H. Keenan and F. G. Keyes, 1936 Edition, by permission of the publishers, John Wiley & Sons, Inc.

Properties of Superheated Steam (Cont.)

v = specific volume, cubic feet per pound
h = total heat of steam, Btu per pound

Pressure Lbs. per Sq. In. Abs. P	Pressure Lbs. per Sq. In. Gage p	Sat. Temp. t		Total Temperature — Degrees Fahrenheit 500°	540°	600°	640°	660°	700°	740°	800°	900°	1000°	1200°
380.0	365.3	439.60	v	1.3616	1.4444	1.5605	1.6345	1.6707	1.7419	1.8118	1.9149	2.083	2.249	2.575
			h	1247.7	1273.1	1308.5	1331.0	1342.0	1363.8	1385.3	1417.3	1470.1	1523.0	1630.0
400.0	385.3	444.59	v	1.2851	1.3652	1.4770	1.5480	1.5827	1.6508	1.7177	1.8161	1.9767	2.134	2.445
			h	1245.1	1271.0	1306.9	1329.6	1340.8	1362.7	1384.3	1416.4	1469.4	1522.4	1629.6
420.0	405.3	449.39	v	1.2158	1.2935	1.4014	1.4697	1.5030	1.5684	1.6324	1.7267	1.8802	2.031	2.327
			h	1242.5	1268.9	1305.3	1328.3	1339.5	1361.6	1383.3	1415.5	1468.7	1521.9	1629.2
440.0	425.3	454.02	v	1.1526	1.2282	1.3327	1.3984	1.4306	1.4934	1.5549	1.6454	1.7925	1.9368	2.220
			h	1239.8	1266.7	1303.6	1326.9	1338.2	1360.4	1382.3	1414.7	1468.1	1521.3	1628.8
460.0	445.3	458.50	v	1.0948	1.1685	1.2698	1.3334	1.3644	1.4250	1.4842	1.5711	1.7124	1.8508	2.122
			h	1237.0	1264.5	1302.0	1325.4	1336.9	1359.3	1381.3	1413.8	1467.4	1520.7	1628.4
480.0	465.3	462.82	v	1.0417	1.1138	1.2122	1.2737	1.3038	1.3622	1.4193	1.5031	1.6390	1.7720	2.033
			h	1234.2	1262.3	1300.3	1324.0	1335.6	1358.2	1380.3	1412.9	1466.7	1520.2	1628.0
500.0	485.3	467.01	v	0.9927	1.0633	1.1591	1.2188	1.2478	1.3044	1.3596	1.4405	1.5715	1.6996	1.9504
			h	1231.3	1260.0	1298.6	1322.6	1334.2	1357.0	1379.3	1412.1	1466.0	1519.6	1627.6
520.0	505.3	471.07	v	0.9473	1.0166	1.1101	1.1681	1.1962	1.2511	1.3045	1.3826	1.5091	1.6326	1.8743
			h	1228.3	1257.7	1296.9	1321.1	1332.9	1355.8	1378.2	1411.2	1465.3	1519.0	1627.2
540.0	525.3	475.01	v	0.9052	0.9733	1.0646	1.1211	1.1485	1.2017	1.2535	1.3291	1.4514	1.5707	1.8039
			h	1225.3	1255.4	1295.2	1319.7	1331.5	1354.6	1377.2	1410.3	1464.6	1518.5	1626.8
560.0	545.3	478.85	v	0.8659	0.9330	1.0224	1.0775	1.1041	1.1558	1.2060	1.2794	1.3978	1.5132	1.7385
			h	1222.2	1253.0	1293.4	1318.2	1330.2	1353.5	1376.1	1409.4	1463.9	1517.9	1626.4
580.0	565.3	482.58	v	0.8291	0.8954	0.9830	1.0368	1.0627	1.1131	1.1619	1.2331	1.3479	1.4596	1.6776
			h	1219.0	1250.5	1291.7	1316.7	1328.8	1352.3	1375.1	1408.6	1463.2	1517.3	1626.0
600.0	585.3	486.21	v	0.7947	0.8602	0.9463	0.9988	1.0241	1.0732	1.1207	1.1899	1.3013	1.4096	1.6208
			h	1215.7	1248.1	1289.9	1315.2	1327.4	1351.1	1374.0	1407.7	1462.5	1516.7	1625.5
620.0	605.3	489.75	v	0.7624	0.8272	0.9118	0.9633	0.9880	1.0358	1.0821	1.1494	1.2577	1.3628	1.5676
			h	1212.4	1245.5	1288.1	1313.7	1326.0	1349.9	1373.0	1406.8	1461.8	1516.2	1625.1
640.0	625.3	493.21	v	0.7319	0.7962	0.8795	0.9299	0.9541	1.0008	1.0459	1.1115	1.2168	1.3190	1.5178
			h	1209.0	1243.0	1286.2	1312.2	1324.6	1348.6	1371.9	1405.9	1461.1	1515.6	1624.7
660.0	645.3	496.58	v	0.7032	0.7670	0.8491	0.8985	0.9222	0.9679	1.0119	1.0759	1.1784	1.2778	1.4709
			h	1205.4	1240.4	1284.4	1310.6	1323.2	1347.4	1370.8	1405.0	1460.4	1515.0	1624.3
680.0	665.3	499.88	v	0.6759	0.7395	0.8205	0.8690	0.8922	0.9369	0.9800	1.0424	1.1423	1.2390	1.4269
			h	1201.8	1237.7	1282.5	1309.1	1321.7	1346.2	1369.8	1404.1	1459.7	1514.5	1623.9
700.0	685.3	503.10	v		0.7134	0.7934	0.8411	0.8639	0.9077	0.9498	1.0108	1.1082	1.2024	1.3853
			h		1235.0	1280.6	1307.5	1320.3	1345.0	1368.7	1403.2	1459.0	1513.9	1623.5
750.0	735.3	510.86	v		0.6540	0.7319	0.7778	0.7996	0.8414	0.8813	0.9391	1.0310	1.1196	1.2912
			h		1227.9	1275.7	1303.5	1316.6	1341.8	1366.0	1400.9	1457.2	1512.4	1622.4
800.0	785.3	518.23	v		0.6015	0.6779	0.7223	0.7433	0.7833	0.8215	0.8763	0.9633	1.0470	1.2088
			h		1220.5	1270.7	1299.4	1312.9	1338.6	1363.2	1398.6	1455.4	1511.0	1621.4
850.0	835.3	525.26	v		0.5546	0.6301	0.6732	0.6934	0.7320	0.7685	0.8209	0.9037	0.9830	1.1360
			h		1212.7	1265.5	1295.2	1309.0	1335.4	1360.4	1396.3	1453.6	1509.5	1620.4
900.0	885.3	531.98	v		0.5124	0.5873	0.6294	0.6491	0.6863	0.7215	0.7716	0.8506	0.9262	1.0714
			h		1204.4	1260.1	1290.9	1305.1	1332.1	1357.5	1393.9	1451.8	1508.1	1619.3
950.0	935.3	538.42	v		0.4740	0.5489	0.5901	0.6092	0.6453	0.6793	0.7275	0.8031	0.8753	1.0136
			h		1195.5	1254.6	1286.4	1301.1	1328.7	1354.7	1391.6	1450.0	1506.6	1618.3
1000.0	985.3	544.61	v			0.5140	0.5546	0.5733	0.6084	0.6413	0.6878	0.7604	0.8294	0.9615
			h			1248.8	1281.9	1297.0	1325.3	1351.7	1389.2	1448.2	1505.1	1617.3

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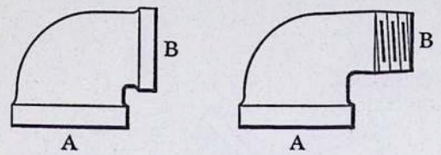
Properties of Superheated Steam (Cont.)

v = specific volume, cubic feet per pound
h = total heat of steam, Btu per pound

Pressure Lbs. per Sq. In. Abs. P	Pressure Lbs. per Sq. In. Gage p	Sat. Temp. t		Total Temperature — Degrees Fahrenheit 660°	700°	740°	760°	780°	800°	860°	900°	1000°	1100°	1200°
1100.0	1085.3	556.31	v	0.5110	0.5445	0.5755	0.5904	0.6049	0.6191	0.6601	0.6866	0.7503	0.8117	0.8715
			h	1288.5	1318.3	1345.8	1358.9	1371.7	1384.3	1420.8	1444.5	1502.2	1558.8	1615.2
1200.0	1185.3	567.22	v	0.4586	0.4909	0.5206	0.5347	0.5484	0.5617	0.6003	0.6250	0.6843	0.7412	0.7967
			h	1279.6	1311.0	1339.6	1353.2	1366.4	1379.3	1416.7	1440.7	1499.2	1556.4	1613.1
1300.0	1285.3	577.46	v	0.4139	0.4454	0.4739	0.4874	0.5004	0.5131	0.5496	0.5728	0.6284	0.6816	0.7333
			h	1270.2	1303.4	1333.3	1347.3	1361.0	1374.3	1412.5	1437.0	1496.2	1553.9	1611.0
1400.0	1385.3	587.10	v	0.3753	0.4062	0.4338	0.4468	0.4593	0.4714	0.5061	0.5281	0.5805	0.6305	0.6789
			h	1260.3	1295.5	1326.7	1341.3	1355.4	1369.1	1408.2	1433.1	1493.2	1551.4	1608.9
1500.0	1485.3	596.23	v	0.3413	0.3719	0.3989	0.4114	0.4235	0.4352	0.4684	0.4893	0.5390	0.5862	0.6318
			h	1249.8	1287.2	1320.0	1335.2	1349.7	1363.8	1403.9	1429.3	1490.1	1548.9	1606.8
1600.0	1585.3	604.90	v	0.3112	0.3417	0.3682	0.3804	0.3921	0.4034	0.4353	0.4553	0.5027	0.5474	0.5906
			h	1238.7	1278.7	1313.0	1328.8	1343.9	1358.4	1399.5	1425.3	1487.0	1546.4	1604.6
1700.0	1685.3	613.15	v	0.2842	0.3148	0.3410	0.3529	0.3643	0.3753	0.4061	0.4253	0.4706	0.5132	0.5542
			h	1226.8	1269.7	1305.8	1322.3	1337.9	1352.9	1395.0	1421.4	1484.0	1543.8	1602.5
1800.0	1785.3	621.03	v	0.2597	0.2907	0.3166	0.3284	0.3395	0.3502	0.3801	0.3986	0.4421	0.4828	0.5218
			h	1214.0	1260.3	1298.4	1315.5	1331.8	1347.2	1390.4	1417.4	1480.8	1541.3	1600.4
1900.0	1885.3	628.58	v	0.2371	0.2688	0.2947	0.3063	0.3173	0.3277	0.3568	0.3747	0.4165	0.4556	0.4929
			h	1200.2	1250.4	1290.6	1308.6	1325.4	1341.5	1385.8	1413.3	1477.7	1538.8	1598.2
2000.0	1985.3	635.82	v	0.2161	0.2489	0.2748	0.2863	0.2972	0.3074	0.3358	0.3532	0.3935	0.4311	0.4668
			h	1184.9	1240.0	1282.6	1301.4	1319.0	1335.5	1381.2	1409.2	1474.5	1536.2	1596.1
2100.0	2085.3	642.77	v	0.1962	0.2306	0.2567	0.2682	0.2789	0.2890	0.3167	0.3337	0.3727	0.4089	0.4433
			h	1167.7	1229.0	1274.3	1294.0	1312.3	1329.5	1376.4	1405.0	1471.4	1533.6	1593.9
2200.0	2185.3	649.46	v	0.1768	0.2135	0.2400	0.2514	0.2621	0.2721	0.2994	0.3159	0.3538	0.3887	0.4218
			h	1147.8	1217.4	1265.7	1286.3	1305.4	1323.3	1371.5	1400.8	1468.2	1531.1	1591.8
2300.0	2285.3	655.91	v	0.1575	0.1978	0.2247	0.2362	0.2468	0.2567	0.2835	0.2997	0.3365	0.3703	0.4023
			h	1123.8	1204.9	1256.7	1278.4	1298.4	1316.9	1366.6	1396.5	1464.9	1528.5	1589.6
2400.0	2385.3	662.12	v		0.1828	0.2105	0.2221	0.2327	0.2425	0.2689	0.2848	0.3207	0.3534	0.3843
			h		1191.5	1247.3	1270.2	1291.1	1310.3	1361.6	1392.2	1461.7	1525.9	1587.4
2500.0	2485.3	668.13	v		0.1686	0.1973	0.2090	0.2196	0.2294	0.2555	0.2710	0.3061	0.3379	0.3678
			h		1176.8	1237.6	1261.8	1283.6	1303.6	1356.5	1387.8	1458.4	1523.2	1585.3
2600.0	2585.3	673.94	v		0.1549	0.1849	0.1967	0.2074	0.2172	0.2431	0.2584	0.2926	0.3236	0.3526
			h		1160.6	1227.3	1252.9	1275.8	1296.8	1351.4	1383.4	1455.1	1520.6	1583.1
2700.0	2685.3	679.55	v		0.1415	0.1732	0.1853	0.1960	0.2059	0.2315	0.2466	0.2801	0.3103	0.3385
			h		1142.5	1216.5	1243.8	1267.9	1289.7	1346.1	1378.9	1451.8	1518.0	1580.9
2800.0	2785.3	684.99	v		0.1281	0.1622	0.1745	0.1854	0.1953	0.2208	0.2356	0.2685	0.2979	0.3254
			h		1121.4	1205.1	1234.2	1259.6	1282.4	1340.8	1374.3	1448.5	1515.4	1578.7
2900.0	2885.3	690.26	v		0.1143	0.1517	0.1644	0.1754	0.1853	0.2108	0.2254	0.2577	0.2864	0.3132
			h		1095.9	1193.0	1224.3	1251.1	1274.9	1335.3	1369.7	1445.1	1512.7	1576.5
3000.0	2985.3	695.36	v		0.0984	0.1416	0.1548	0.1660	0.1760	0.2014	0.2159	0.2476	0.2757	0.3018
			h		1060.7	1180.1	1213.8	1242.2	1267.2	1329.7	1365.0	1441.8	1510.0	1574.3
3100.0	3085.3	700.31	v			0.1320	0.1456	0.1571	0.1672	0.1926	0.2070	0.2382	0.2657	0.2911
			h			1166.2	1202.9	1233.0	1259.3	1324.1	1360.3	1438.4	1507.4	1572.1
3200.0	3185.3	705.11	v			0.1226	0.1369	0.1486	0.1589	0.1843	0.1986	0.2293	0.2563	0.2811
			h			1151.1	1191.4	1223.5	1251.1	1318.3	1355.5	1434.9	1504.7	1569.9
3206.2	3191.5	705.40	v			0.1220	0.1363	0.1480	0.1583	0.1838	0.1981	0.2288	0.2557	0.2806
			h			1150.2	1190.6	1222.9	1250.5	1317.9	1355.2	1434.7	1504.5	1569.8

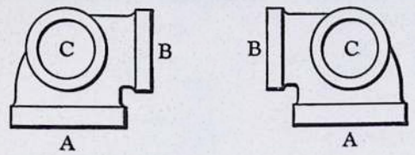
How to Read Reducing Fittings

Elbows



90° Elbow Reducing

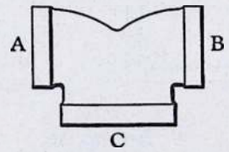
90° Street Elbow Reducing on male end



Right Hand

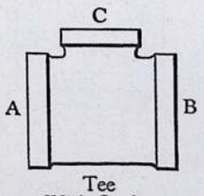
Left Hand

Side Outlet 90° Elbows Reducing on two Outlets

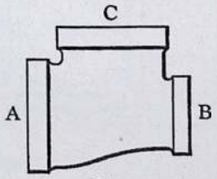


Double Branch Elbow Reducing on both ends of Run

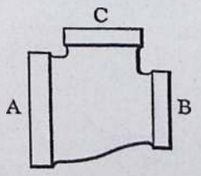
Tees



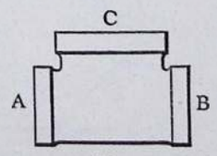
Tee With Outlet reduced



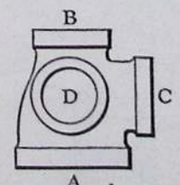
Tee With one end of Run reduced



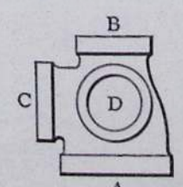
Tee With one end of Run and Outlet reduced



Tee Bull head type—Both ends of Run reduced



Right Hand



Left Hand

Side Outlet Tees With one end of Run and Outlets reduced

To assist the user in "reading" reducing fittings, a variety of types most commonly required for piping systems are illustrated on this page. In these illustrations, each opening of the fitting is identified with a letter which indicates the sequence to be followed in reading the size of the fitting.

In designating the outlets of reducing fittings, the openings should be read in the order indicated by the sequence of the letters "A", "B", "C", and "D". On side outlet reducing fittings, the size of the side outlet is named last.

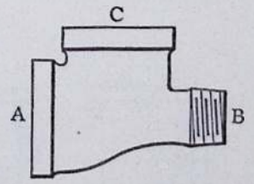
For example: A Cross having one end of the run and one outlet reduced is designated as:

A B C D
2½ x 1¼ x 2½ x 1½

Simply name the largest opening first and then name the other openings in the order indicated.

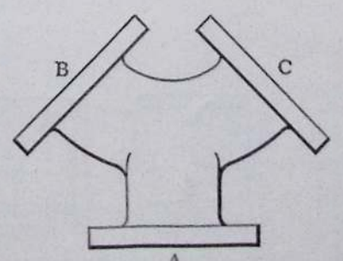
Flanged fittings: Although all but one of the illustrations are of screwed fittings, the same rules apply to the "reading" of reducing flanged fittings.

Service Tee



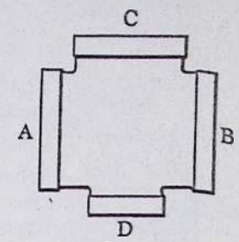
Service Tee Reducing on male end only

True "Y"

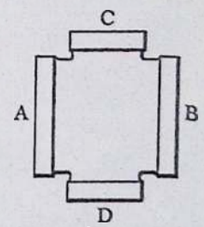


True "Y"

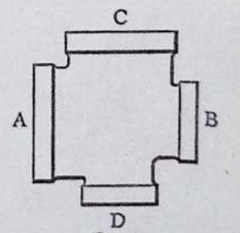
Crosses



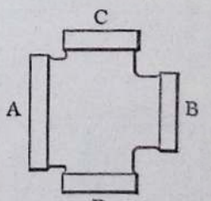
Cross Reducing on one Outlet only



Cross Reducing on both Outlets

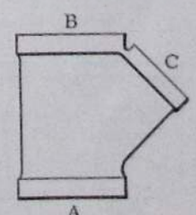


Cross Reducing on one end of Run and on one Outlet



Cross Reducing on one end of Run and on both Outlets

45° Y-Bend



45° Y-Bend (Lateral) Reducing on Outlet only

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Taps and Drains for Flanged Fittings

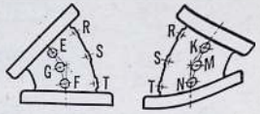
Designating Location of Tapped Holes

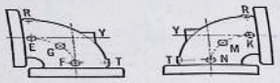
The illustrations on this page indicate a standard method used for designating the location of tapped holes on ferrous flanged fittings in all pressure classes.

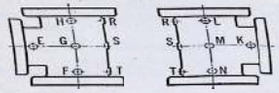
When a tapped connection is required at the heel of an elbow without a boss (at location S), the tapping should be done at right angles to the point of tangency of the radius or sweep of the fitting. This shall be standard practice, and where the tapping is required parallel to the run (at locations V and Y), the fitting shall be furnished with a boss.

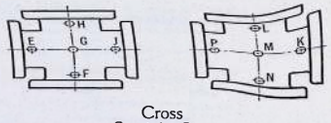


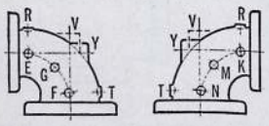
90° Elbow

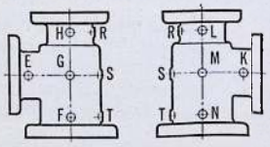

45° Elbow

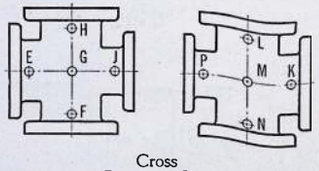

90° Elbow
Straight Size

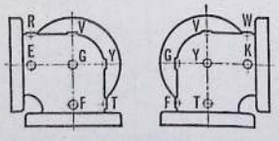

Tee
Straight Size

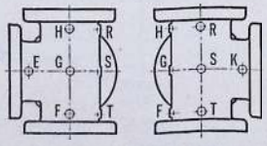

Cross
Straight Size

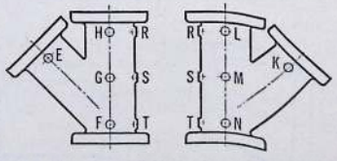

90° Elbow
Reducing Size

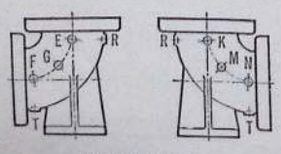

Tee
Reducing Size

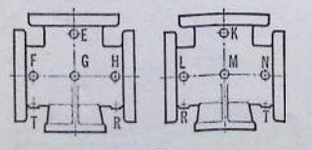

Cross
Reducing Size

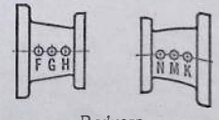

Side Outlet Elbow
Straight Size


Side Outlet Tee
Straight Size


45° Lateral
Straight Size

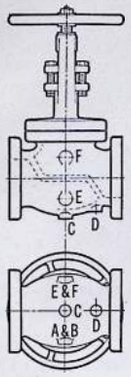

90° Base Elbow

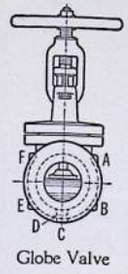

Base Tee
Straight Size

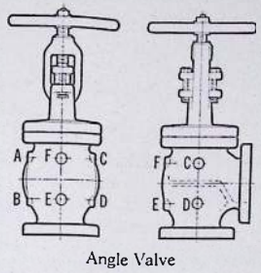

Reducer

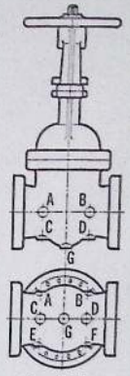
Taps and Drains for Flanged Valves

Designating Location of Tapped Holes


Globe Valve


Globe Valve


Angle Valve


Gate Valve

The illustrations shown above and at the sides indicate a standard method use for designating the location of tapped holes on both Cast Iron and Cast Steel Globe, Angle, and Gate Valves in all pressure classes.

Valve bodies can be tapped without a boss for a very small drain hole; the maximum size of the hole, however, depends entirely upon the location of the tapped hole and the pressure class of the valve.

Gate valves are regularly made with bosses (except at location "G"). Globe and angle valves are not regularly made with bosses but can be so furnished when orders specify.

Location of By-Passes on Flanged Valves

Gate valves: When gate valves are ordered with by-pass attached, it shall be regular practice to attach said by-pass at the side of the main valve with the stems of both valves parallel, pointing vertically upward.

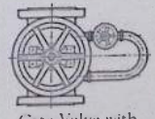
The more common of the "special" attached-locations is on the center of the flow line, at the bottom of the main valve, with the stem of the by-pass valve at right angles to the main valve stem. This is designated as the bottom "attachment", or defined as "by-pass at bottom". When any other "special" attached-location or other position of the by-pass valve stem is desired, a sketch should be submitted.

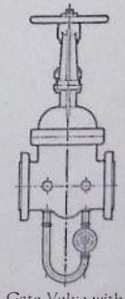
Globe valves: When globe valves are ordered with by-pass attached, it shall be regular practice to attach said by-pass at the right-hand side of the main valve, with the stems of both valves parallel, pointing vertically upward. When by-pass is "specially" required attached at the left-hand side, the designation shall be "left-hand attachment".

Right-hand side of a globe valve is the side at the right, when facing the flow-port which leads to the under side of the disc.

Angle valves: When angle valves are ordered with by-pass attached, it shall be regular practice to attach said by-pass at the back of the main valve, with the stems of both valves parallel, pointing vertically upward. When by-pass is "specially" required attached at the right or left-hand side, the designations shall be "right-hand attachment" or "left-hand attachment". Right-hand side of an angle valve is at the right, when facing the back of the valve.

These illustrations are representative of steel valves.


Gate Valve with By-Pass on Side


Gate Valve with By-Pass at Bottom

For by-passes, see the following pages:
Iron Wedge Gate Valves ..... *page 84*
Iron Double Disc Gate Valves ..... *page 102*
Steel Wedge Gate Valves ..... *page 231*

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Abbreviations Used in This Catalog

AAR.....Association of American Railroads

A.G.A.....American Gas Association

A.I.S.I.....American Iron and Steel Institute

API.....American Petroleum Institute

ASA.....American Standards Association

A.S.M.E.....American Society of Mechanical Engineers

A.S.T.M.....American Society for Testing Materials

A.W.W.A.....American Water Works Association

B&S.....Brown & Sharp (used herein to indicate thickness of copper gaskets)

Btu.....British Thermal Unit

BWG.....Birmingham Wire Gauge (used herein to indicate thickness of boiler tubes)

cfm.....Cubic feet per minute

F.&D.....Faced and drilled

F.D.&S.F.....Faced, drilled, and spot faced

gpm.....Gallons per minute

H.P.....Horsepower

MSS.....Manufacturers Standardization Society of the Valve and Fittings Industry

NEMA.....National Electrical Manufacturers Association

N.F.P.A.....National Fire Protection Association

NPSC.....Symbol indicating American Standard Straight Pipe Thread in pipe couplings

NPSL.....Symbol indicating American Standard Straight Pipe Thread for locknuts and locknut pipe threads

NPSM.....Symbol indicating American Standard Straight Pipe Thread for mechanical joints

NPT.....Symbol indicating American Standard Taper Pipe Thread

NPTE.....Symbol indicating external American Standard Taper Pipe Thread (Male)

NPTI.....Symbol indicating internal American Standard Taper Pipe Thread (Female)

P.D.....Used in conjunction with threads to indicate "Pitch Diameter"

psi.....Pounds per square inch

rpm.....Revolutions per minute

S.A.E.....Society of Automotive Engineers

SP.....When used in conjunction with references to "MSS", is the abbreviation for "Standard Practice", thus: MSS Bronze Flange and Flange Fitting Standard, No. SP-2-1946.

SWP.....When used in conjunction with working pressure ratings, indicates "steam working pressure"

Symbols used to designate type of service for which product is recommended; these are frequently combined, like "WOG", and also appear as part of the marking on products:

G signifies Gas
L signifies Liquid
O signifies Oil
S signifies Steam
W signifies Water

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