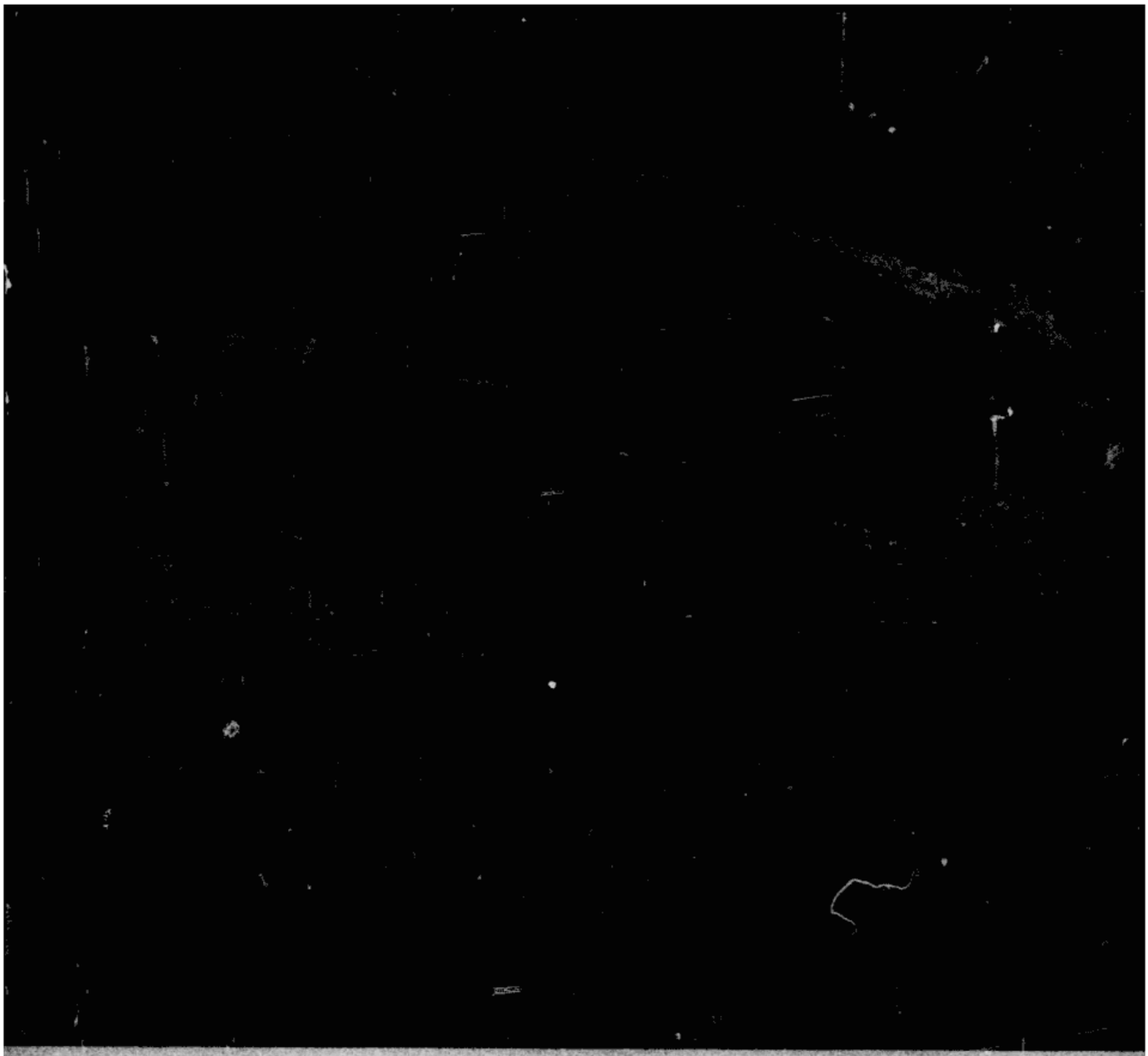


Raw Amosite Asbestos Fibre (Courtesy of The Cape Asbestos Company Limited)

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ASBESTOS

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FIBERS AND WHISKERS AS REINFORCEMENTS

The following article is based on a paper by Joseph P. Wronski, Physics Section Head, Raybestos-Manhattan, Inc., Manheim, Pennsylvania, originally presented at the Asbestos Textile Institute Conference on February 11, 1966.

The first part of this article appeared in August 1968 ASBESTOS.

The third important characteristic of fibers which affects their performance as reinforcements is their geometry — specifically the length of a fiber to its diameter which we will call its L/D ratio from here on. Imagine, first, a fiber reinforced material which is subjected to a tensile stress. This stress distributes itself through the entire body of the composite and is shared by the matrix to a lesser extent and the fibers to a greater extent. Our greatest interest is in that portion of the stress taken over by the fibers.

Perhaps the easiest way to visualize this is to assume we have a single fiber of relatively great length with most of its length imbedded in a matrix. We now apply a tensile load to the exposed end of the fiber. Essentially, there will be two stress systems acting on the fiber. The first is the tensile stress tending to pull the fiber apart. The second is a shear stress acting at the interface of the fiber and matrix and tending to prevent the fiber from being pulled out of the matrix. Under equilibrium conditions, the total tensile and shear forces will be equal and, going through the simple mathematics expressing this condition, we find that the tensile stress on the fiber is proportional to the matrix shear stress at the fiber multiplied by the ratio of fiber length (in the matrix) to fiber diameter.

It is this relationship between matrix shear stress and fiber tensile stress that points up the importance of the L/D ratio of the fiber. Quite simply, this means that if we use fibers in a reinforcement that are long in relation to their diameter (have a high L/D ratio) then we can use a matrix material with a lower shear strength than could be used if the fibers had a lower L/D ratio. This can be very important in designing a fiber reinforced composite. In developing a composite for a certain service we might be forced to use a matrix material having a rather low shear strength. In this case, we would want to use a fiber with the highest possible L/D ratio in order to fully exploit the strength of the fiber. Otherwise, the composite might fail

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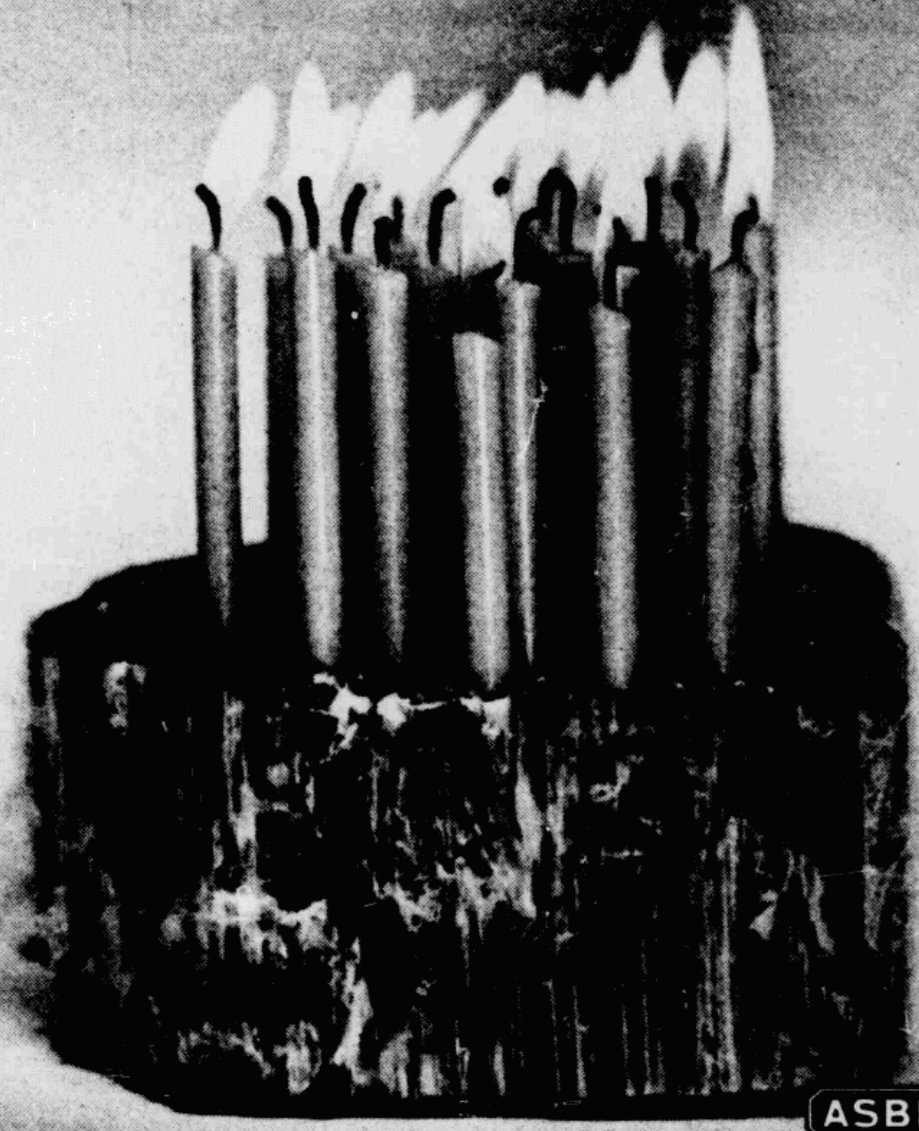
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under load due to shear failure of the matrix long before the full strength of the fibers had been exploited.

In earlier days, there was a saying that it was impossible to reduce a piece of asbestos fiber to its ultimate single crystal. If you have ever taken a piece of crude asbestos and split off fibers and then tried to reduce them, by splitting, to a single crystal you will know how thin a fiber you can get by normal hand methods and still not approach the single crystal form. For purposes of comparison with other materials it is interesting to know the approximate diameter and length of the ultimate asbestos crystal. The electron microscope has made it possible to determine these dimensions with a fair degree of accuracy so we now know that the diameter of the unit asbestos fiber is about .02 microns (less than one millionth of an inch) and its length, estimated from certain published strength data, could be on the order of about 100 microns, giving an L/D ratio of about 5000. The following Table III shows how these figures compare with similar figures for other fibers or whiskers. The data shown were obtained from various sources, many of which are not in agreement. However, the figures chosen are considered reasonably typical for the materials listed. In addition to data on the material sizes, the Table also shows the calculated minimum matrix shear strength which would be required in a composite using each of these fibers as a reinforcement to exploit the full strength of the fiber in question. In such a composite, the fiber would fail under load before the matrix material would fail in shear.

Table III

Fiber	Diameter (microns)	L/D	Minimum Matrix Shear Strength (psi)
Asbestos	0.02	5000	75
Sapphire	10	100	7,000
Graphite	15	67	11,000
Glass	10	100	1,600
Iron	13	77	6,300

This clearly shows that asbestos fibers, if reduced to their ultimate dimensions and incorporated as the reinforcement in a composite, would impose very small shear strength requirements on the matrix material. The other materials listed, on the other hand, would require the use of a high-

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strength matrix in order to fully develop their strength potentials.

Another factor of importance in connection with fiber fineness has to do with the stresses that are built up around the ends of fibers imbedded in a matrix. Photoelastic studies of fibers imbedded in a matrix shows areas of high stress around the ends of the fibers when they are stressed in the fiber direction. If the fibers are of relatively large diameter and the ends are blunt, the stress concentrations around the ends are of quite high magnitude and extend for a short distance along the length of the fiber. If, in addition to having a large diameter and blunt ends, the fiber is relatively short, the high stresses would extend over an appreciable length of the fiber, making it of somewhat dubious value as a reinforcement. With small diameter fibers having a high L/D ratio, these "end effects" are minimized and again we see the superiority of small diameter fibers having high L/D ratios as reinforcements.

Yet another factor affecting the strength of a composite is the interlaminar shear strength between the fiber reinforcement and the matrix. If the quality of the bond between fiber and matrix is poor, slippage of the fiber within the matrix will occur long before the fiber is stressed to the desired level and much of its reinforcing value will be lost. Studies of the properties of carbon and graphite-fiber composites have shown that some means of improving the fiber-matrix bond is essential if the potential physical properties of these fibers are to be realized. One approach has been to grow whiskers of silicon carbide on the individual filaments, resulting in fibers which, under the microscope, look ever so much like smoking-pipe cleaners. Such fibers have shown an improvement on the order of 300% or more in the fiber-matrix shear strength of certain composites.(1)

Fiber characteristics affecting the fiber-matrix shear strength are many and varied but surface geometry and chemistry are obviously of great importance. In the case of matrix materials of the resin type, which are liquid until chemically or otherwise "cured" into the solid state, their chemistry, viscosity and surface tension will all have some bearing on the achievement of an acceptably strong fiber-matrix bond as will the conditions such as temperature and

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pressure under which the composite is formed. So much work is being done on investigations of this complex subject that it is not practical, at this time, to publish any very meaningful data showing relative bond strengths of the many materials under study.

From a practical point of view, however, it may be interesting to examine some figures on bond strengths in composites formulated from materials readily obtainable and "within the state of the art." The matrix is polyester resin and the fibers are glass fiber, which shows a measured fiber-resin bond strength of 534 psi, and Blue Asbestos (Crocidolite), which shows a bond strength of 1161 psi under the same test conditions.(2) While the asbestos in this case is the result of commercial milling and carding practice and is therefore not a true "whisker," the figures do indicate a definite superiority of this material over glass fiber in respect to bond strength with a polyester resin matrix.

There is good reason for all the efforts being expended these days to develop high-strength, high-modulus fibers for reinforcing purposes and to develop methods of incorporating them into composites in such a way that their potential strengths can be most fully utilized. Whoever can develop a composite having the physical properties of our best metals with only one-third or one-fourth the weight would be in position to reap enormous economic rewards. Even in cases where the cost of such composites might seem prohibitive, they might make possible structures of a nature not even within the realm of possibility today, which might be well worth the additional costs.

For example, the theoretical strength of a sapphire reinforced resin containing 50% resin by volume would be about 1.4 million psi or about five times the strength of our finest commercially used steel and the weight would be only about one-quarter that of the steel. A similar analysis of a composite using asbestos fibers opened to their ultimate dimensions shows a theoretical tensile strength of about 700,000 psi might be achieved and, again the weight would be about one-fourth that of an equal volume of steel.

It is doubtful that fiber-reinforced composites will ever achieve these theoretical strengths, but there are reports that fiber-resin composites with strengths in excess of 300,000 psi and densities well below that of steel have al-

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ready been developed. High cost and difficulty of fabrication are the main reasons why quantity production of such composites is being delayed. The current cost of whiskers and other high strength synthetic fibers is extremely high. Table IV shows the current typical costs of such fibers. However, as noted in the Table, it is anticipated that these costs will drop by appreciable amounts during the next decade. On the basis of cost vs. strength, these fibers may well present a serious challenge to asbestos fibers in the future.

Table IV

Fiber	Cost per Lb. (Dollars)		Tensile Strength per Dollar (psi)	
	Now	Anticipated	Now	Anticipated
Boron Nitride	175	10	1,100	20,000
Silicon Carbide	200	10	8,000	160,000
Asbestos	0.24	0.24	1,200,000	1,200,000

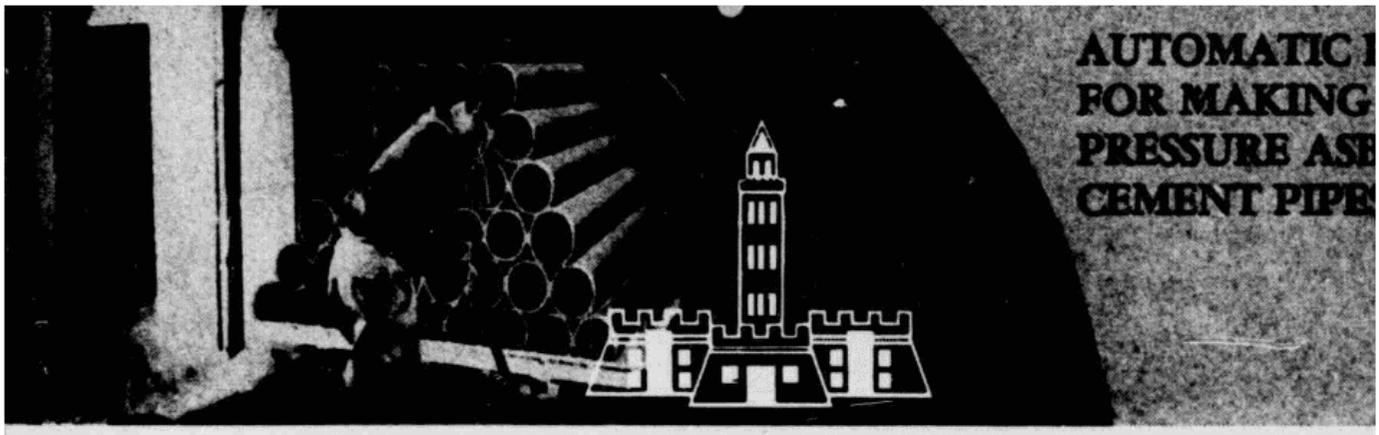
Asbestos should not have to take a back seat to any of these new synthetic fibers. When reduced to its ultimate dimensions, asbestos has a tensile strength estimated at about 1.5 million psi, an L/D ratio that is probably higher than any of the synthetics have or ever will achieve and, finally, a modulus that compares favorably with many of the synthetics, but the exploitation of these excellent properties will require research — vigorous and imaginative research — the kind of research now being pursued by the producers of the synthetic fibers. If asbestos is going to compete successfully in the field of reinforcements, it would seem that this research must be directed along three particular lines; namely, improvements in milling (or fiberization) techniques to make possible production of asbestos approaching in dimension the ultimate single crystal form, study of the interaction of asbestos with various matrix materials in an effort to understand and apply the principles that determine the high-strength bonding of asbestos fibers to other materials, and investigation into practical methods for selectively orienting asbestos fibers in a matrix to produce "structured" composites.

The rewards of such research, if successful, should be tremendous.

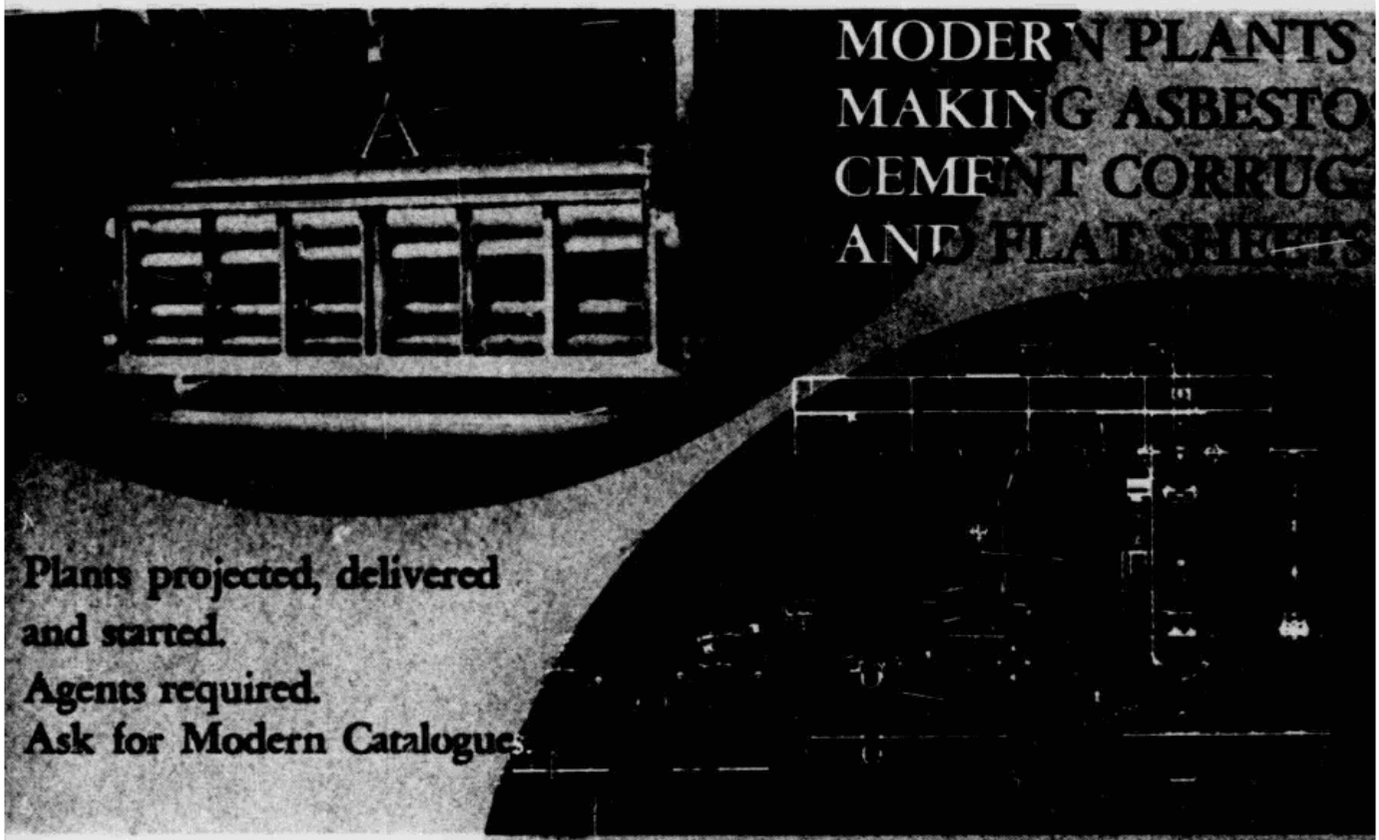
(1)Data excerpted from September/October 1967 issue of "Reinforced Plastics and Composites World," a Cahners Publication.

(2)Figures quoted were obtained from "Noramite Plastics Reinforcement Materials," published by Cape Insulation Limited, October 1966.

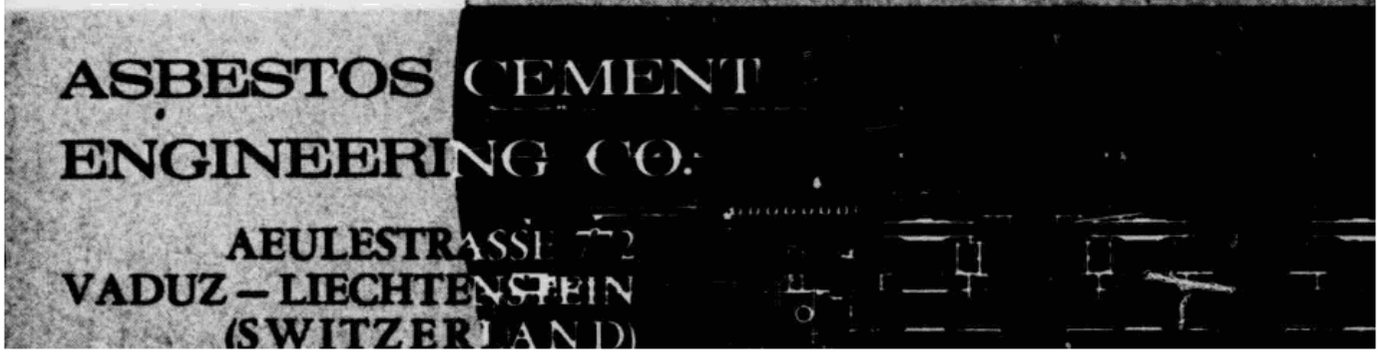
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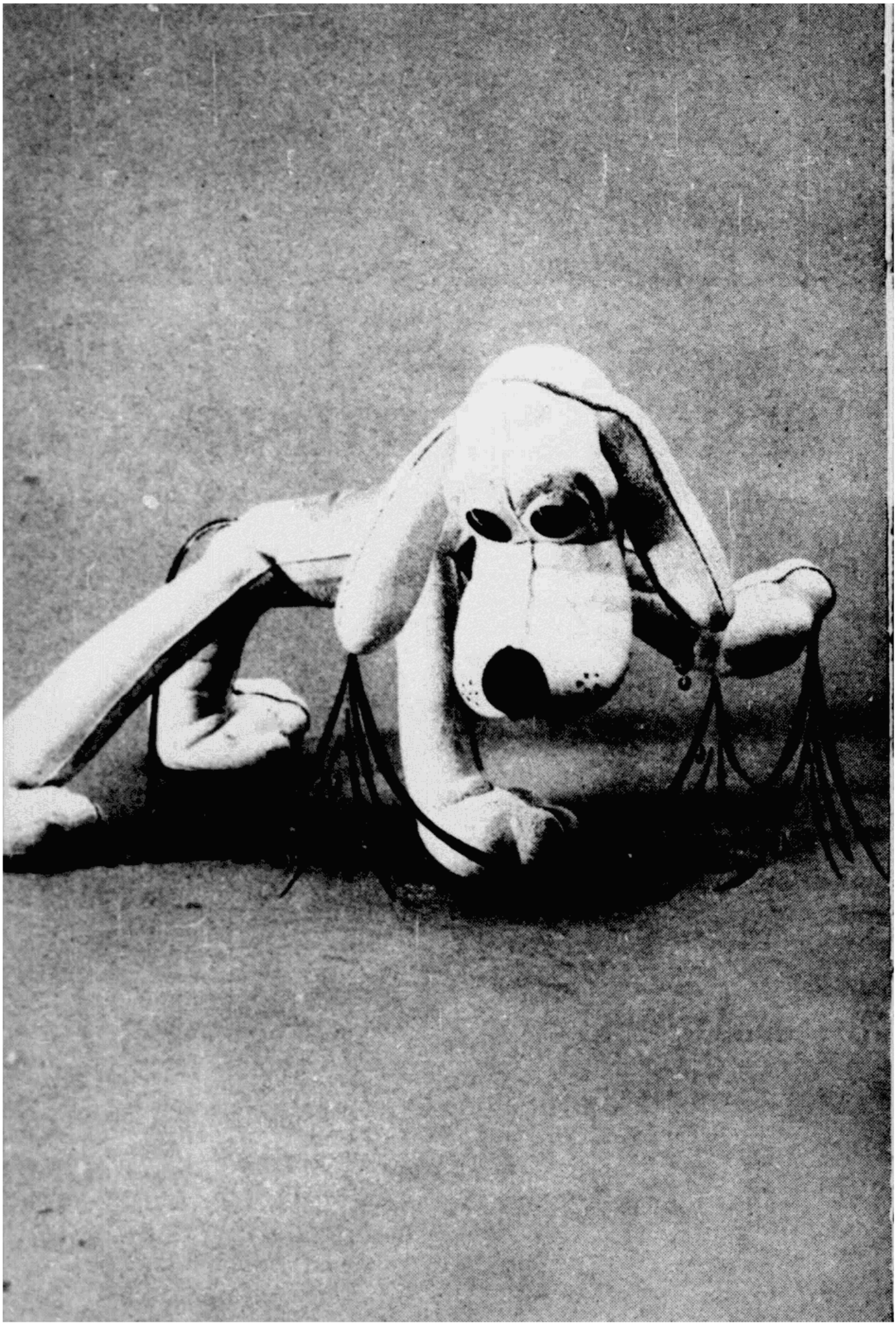
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Mining Technical Section
Asbestos Technical School

Since its beginning in September 1963, the Mining Technical Section of the Asbestos Technical School in Asbestos, Quebec, Canada, has contributed greatly toward the education of those interested in careers in the fascinating mineral industry. Its training program has two main objectives: to provide a broad course of study which will qualify graduates for employment in a variety of occupations in the field of mining and to prepare the most able students for further studies leading to degrees in higher educational institutions.

The Mining Technical Section offers a three-year course and although it does not lead to a degree, the course does provide a diploma in Mining Techniques which is given by the Quebec Department of Education. The students receive a basic education and also instructions in subjects directly related to the mining industry. The general courses combine studies in basic engineering subjects with French and English languages and general business subjects. The specialized mining courses cover surveying, geology, mineralogy, ore dressing and analysis and the mining of ore.

The Provincial and Canadian mining industries cooperate with the school and students have the opportunity of actually working in a mine. This collaboration permits the students to better understand the many different phases of mining. The Asbestos Technical School is very proud of the record it holds in that its graduate technicians are employed in responsible positions such as supervisors or assistants in geological, exploration and administrative departments, surveyors, mining laboratory technicians, assistant managers, assistant engineers and instructors in the mining school itself. Many graduates, after one or two years of experience in the mining industry, are furthering their education at various universities and are becoming full-fledged Mining Engineers.

The Administrative Officer of the Mining Technical Section is Mr. J. L. P. Lambert who is also Principal of the Asbestos Technical School. Members of the teaching staff on mining subjects are Mr. Henri Girard, B.Sc., Ch.Eng., Ecole Polytechnique; Mr. Gilles Lafontaine, B.Sc., M.Eng., Ecole Polytechnique; Mr. Guy Lapointe, B.A., B.Sc., M.Sc. (geology), Manitoba; and Mr. Rene Hinse, D. Tech. (mining), Sherbrooke Technical School.

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FRICTION MATERIALS STANDARDS INSTITUTE, incorporated in 1949, has been dedicated to establishing and maintaining a system for the identification of brake linings and other friction materials, the dissemination of that data to the trade and the general advancement of the automotive industry. The Institute is the successor to the "Brake Lining Manufacturers Association, Inc.," organized under the Membership Law of New York State in 1933.

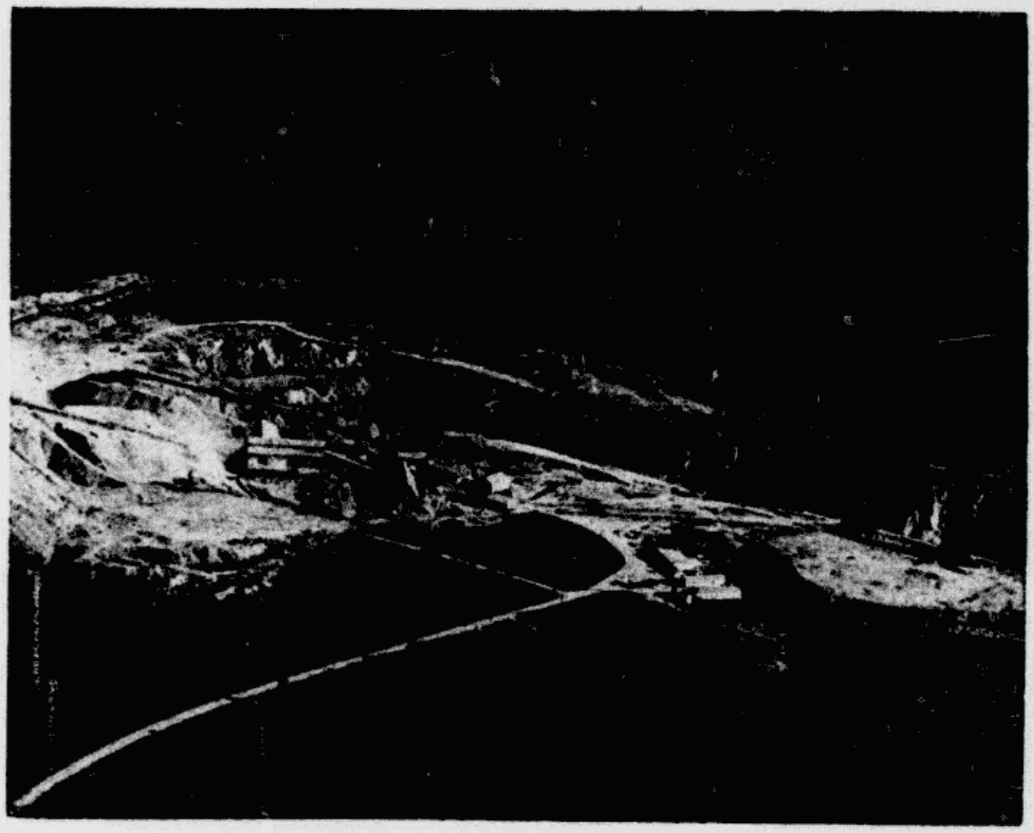
Concern over automotive safety standards was making headlines in 1964 and members of F.M.S.I. were in the process of accumulating important data, developing brake testing systems and carrying through evaluation tests of safety factors in brake linings. On May 17, 1965, New York became the first State to pass a law requiring brake lining standards. To assist in establishing the specifications and requirements, members of the Institute, normally vigorous competitors, formed research committees to exchange information and knowledge and to reach decisions to assure the public of safe braking results on their vehicles. Time, energy and funds expended by the Institute and its individual members involved in researching this technical project were self borne.

Brake lining standards established by New York have proved so meaningful that many other States now having brake lining standards, or contemplating establishment of such standards, are following the original guidelines developed through the efforts and cooperation of Friction Materials Standards Institute, Inc. and the State of New York.

RAPID TUNNELING TECHNOLOGY—Intensive development of rapid tunneling methods could result in benefits to the national economy of more than $10-billion in the next two decades, according to a report released by the *U.S. Bureau of Mines*. More than half of the projected savings would be in the mining industry from lower operating costs, use of deeper ore deposits and reduction in land-disrupting surface mining. Copies of the 184-page report, *"Projection of Applications and National Benefits of a New Rapid Excavation Technology,"* have been placed on open file in six locations throughout the country for public use.

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THE MINING ASSOCIATION OF CANADA has issued the 1968 edition of its very detailed booklet *"Mining: What It Means To Canada."* The booklet is available in French and English and states that for the ninth consecutive year, Canada's mineral industry set a new production record in 1967. Ten minerals accounted for about 79% of the total mineral production including asbestos valued at $163-million. The mining industry accounted for 30.8% of Canada's total merchandise exports. About 60% of the industry's output was sold in foreign markets. During 1967, at least 20 new mines, mills or processing plants came into production including one asbestos mine.

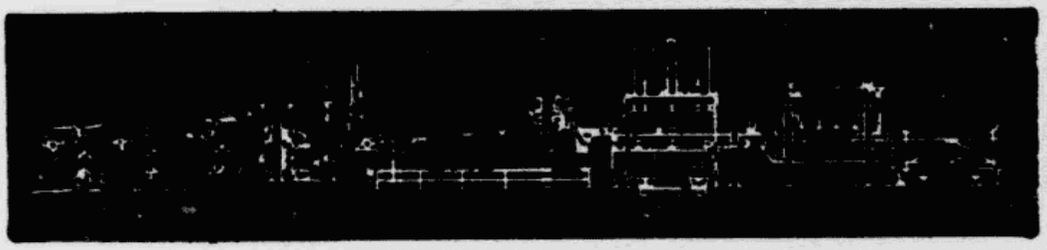
The Mining Association of Canada is the national organization of the mining industry and is composed of companies engaged in mineral exploration, mining, smelting and refining. Member companies account for more than 95% of Canada's output of metals and major industrial minerals. The association's main role is to project the views of the industry on a national scale and coordinate its efforts with those of government departments in regard to policies affecting exploration, mining and processing and the development of exports. It also coordinates research within the industry with emphasis on such matters as rock mechanics, metallurgy and other technological developments and the disposal of industrial wastes.

1968 AUTOMOBILE FACTS & FIGURES has just been issued by the *Automobile Manufacturers Association.* The motor vehicle manufacturing industry in the United States reached a special milestone in January, 1968, when it passed the 250-million mark for vehicles produced. This booklet provides some measures of the contribution the industry has made to the national welfare through the years in the form of direct and indirect employment and payrolls, as a source of taxes for all levels of government and the efficient movement of people and goods.

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Automobile Sales

JUNE 1968 motor vehicle factory sales from plants in the *United States* totaled 990,063 (passenger cars—813,659, trucks and buses—176,404). The total for June 1967 was 911,721. The total for the FIRST HALF OF 1968 was 5,788,237 which compares with 4,893,156 for the first six months of 1967.

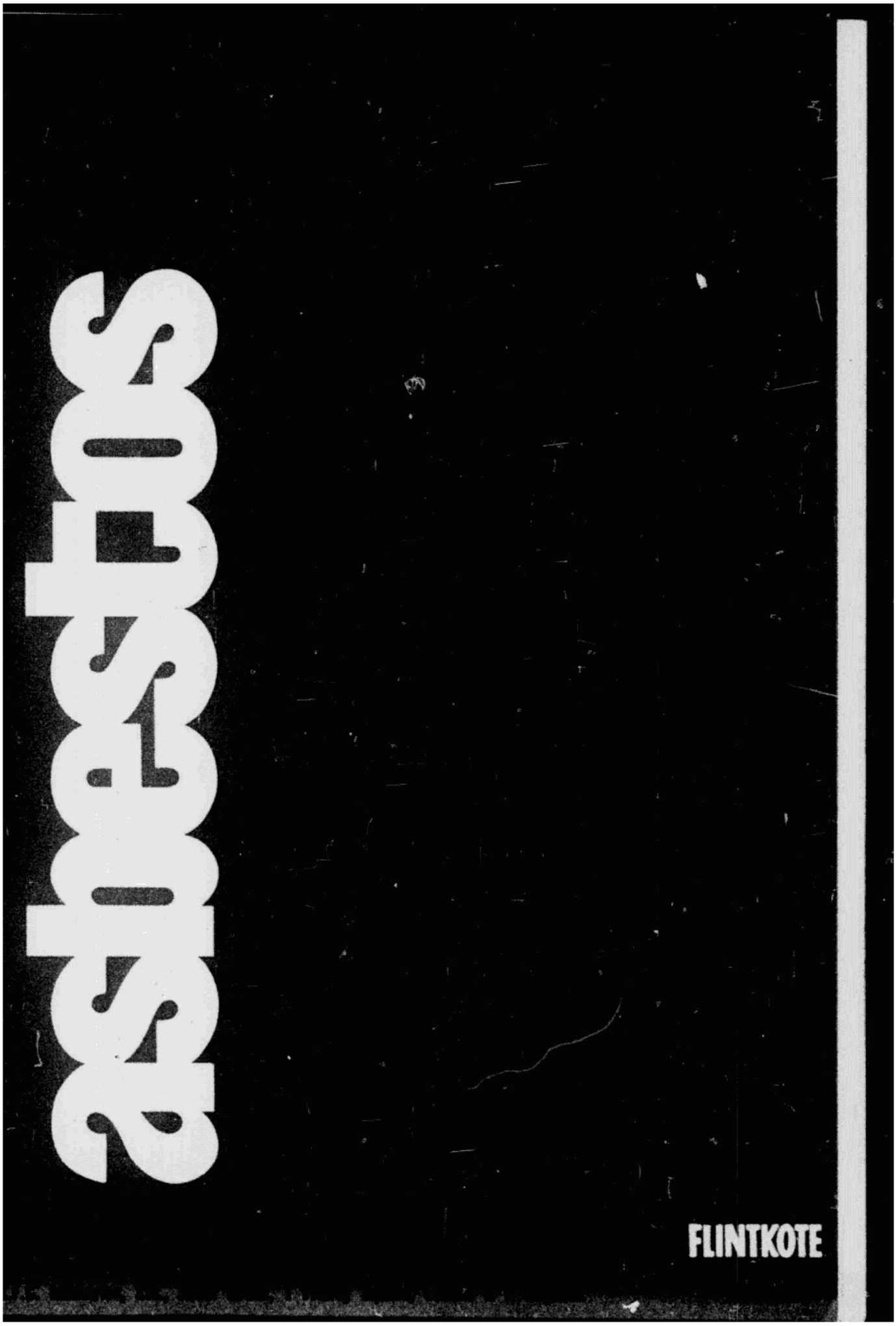
Motor vehicle factory sales from plants in *Canada* totaled 118,104 for June 1968 compared to 93,994 in June 1967. The total for the January through June 1968 period was 582,897 against 511,039 for the same period in 1967.

FIVE INTENSIVE SHORT COURSES are scheduled during November 1968 at the *Center For Professional Advancement,* Hopatcong, New Jersey. They are Managing the Research Laboratory—November 12 to 14, Engineering With Adhesives—November 13 to 15, Water Treatment and Waste Disposal for the Metal Finishing Industry—November 18 to 20, Temperature Measurement and Control—November 18 to 21 and Technical Sales Techniques—November 20 to 22.

ARCHITECTURAL & CONSTRUCTION DESIGN CENTER is nearing completion in the *Institutional Mart of America,* Memphis, Tennessee. IMA, a subsidiary of Holiday Inns of America, Inc., plans to show products and services for developers of every conceivable structure *outside* home building. Those interested will be able to visit the Center year-round and view industry innovations.

SWEET'S CONSTRUCTION CATALOG SERVICES has printed its first issue of *"The Second Story"*. Culled from many primary sources in the construction industry, this bi-monthly digest offers data concerning marketing developments, product changes and industry happenings and events.

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THE BAUER BROS. CO. describes its new *Hydrasieve* in Bulletin G-40. This unit was developed for dewatering and classifying low consistency slurries and the bulletin describes its construction and installation and includes specifications for the five models available. The simple and inexpensive Hydrasieve was originally designed as a thickener and classifier for the pulp and paper industry but can also be applied in many processes where dewatering and fractioning are necessary.

KELLER GLOVE MANUFACTURING COMPANY has a new series of *Kelnit asbestos gloves and mitts* for use in combination with cotton or wool inserts to provide safe handling of materials at temperatures to 1000°F. They are made separately from the inserts to allow economical replacement of worn components only. The gloves can be furnished with aluminized backs to provide additional protection and the inserts can be used with any approved standard asbestos gloves or mitts.

The new Kelnit asbestos gloves and mitts are made of *Polybestos,* a product of the Asbestos Textile Division of RAYBESTOS-MANHATTAN, INC.

FIBREBOARD CORPORATION has agreed to sell its Pabco Roofing Division to *Bird & Son, Inc.,* a roofing concern in East Walpole, Massachusetts. This division serves markets on the West Coast and in Hawaii from two plants in California and one in Oregon.

In addition, Fibreboard has sold its Pabco Paint Division to *Napko Corporation,* Houston, Texas, and has agreed to purchase the 50% of its outstanding stock now held by *Tennecco, Inc.*

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This is a customer's idea. Ordering his third Hurricane was practically a rubber stamp routine, he said, because of the excellent record established by his first two units. As most of the more than 100 Hurricanes now in use represent repeat orders, other customers apparently agree with his logic. Nearly 70 of these air attrition mills are processing nonmetallic minerals. One major asbestos producer now uses 21 units! Applications include opening shorter grades of fibre to controlled levels, processing groups 5, 6, 7, as well as floats and tailings, and extracting impurities from usable fibres. If you haven't ordered your first Hurricane yet, may we send you one . . . complete with rubber stamp for reordering? **The Bauer Bros. Co.**, Springfield, Ohio 45501, and Ontario, Canada.

BAUER A subsidiary of Combustion Engineering, Inc.



Building

From: McGraw-Hill Information Systems Company

JULY 1968—A surge in construction plans for factories, stores and office buildings pushed construction contract awards in July to $5,955,816,000, 18% higher than July 1967. The sharply higher construction awards were spurred by the largest gain in many months in industrial and commercial building and do not necessarily indicate an upsurge for the entire second half of 1968. As the Federal surcharge begins to restrain the economy, some slackening in the rate of industrial and commercial building is likely to take place.

Residential contracts rose 15% in value over last July and totaled $2,286,826,000. The value of one-family and two-family housing contracts advanced 9%, apartment awards were up 31% and non-housekeeping projects increased 30%. The tax surcharge should lead to a strong pickup in home-building as more money becomes available for mortgage lending.

Nonresidential contracts totaled $2,413,511,000, up 38% from July 1967. Although this segment of the construction market showed no evidence of a slowdown in the economy, many of the large office buildings, shopping centers and factories that reached the groundbreaking stage in July were already far along in architectural and financial planning several months ago.

Nonbuilding construction totaled $1,255,479,000 and showed a 4% decline from July 1967. Contract awards were depressed by a 5% drop in highway construction and a decline of over 25% in utilities projects.

" Tropag "

Hamburg —:— Ballindamm 6

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If you use asbestos for





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or just about any other product, we have the fibre grade you need. You can specify from 43 different grades, so you're sure of getting fibres of the correct length and with the proper degree of openness for your products.

Lake Asbestos fibre is supplied in pressure-packed bags which are easy to handle . . . occupy little storage space . . . save on shipping costs. For more information or test samples, write to: Asarco International Corporation, P.O. Box 608, Black Lake, Quebec, Canada—distributors for Lake Asbestos of Quebec, Ltd.

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BELGIUM
Keyser & Mackay
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Guildford, England

LAKE ASBESTOS

ASARCO

ASARCO INTERNATIONAL CORPORATION
a subsidiary of American Smelting and Refining Company

Asbestos Magazine, 1968, September 1968
ACL Doc 12617 · Page 27 of 60
Published by AsbestosClaims.Law
asbestosclaims.law/library/12617/27

COOLING CEMENT as it is delivered hot from the grinding mill requires a dependable method for moving the cement through a cooling mechanism at a steady pre-determined rate. One manufacturer of cement cooling equipment, *F. L. Smidth & Company,* meets the high torque starting requirements of its vertical-type coolers by using worm gear speed reducers to drive the conveying systems. To drive the agitator, Smidth utilizes a standard "CLEVELAND 120 DF Series 25 Speed Reducer," manufactured by the *Cleveland Worm & Gear Division of Eaton Yale & Towne, Inc.* Another important design consideration that led to the selection of worm gear speed reducers is that the motor and speed reducer must be mounted horizontally on top of the cooler. Under this requirement the reducer must be capable of driving the vertical agitator shaft at right angles.

BULLETIN NO. 930A-FPP describes the complete line of pneumatic mechanical vibrating feeders of the Carrier Division of *Rex Chainbelt Inc.* These feeders provide variable capacity up to 1,000 tons per hour through the unique pneumatic control system. They have only two operating parts: a specially built motor which rotates two small weights on either end of an extended shaft and a set of pneumatic springs which vibrate the feeder trough. The troughs are easily adapted for screening, scalping or heat transfer operations. The feeders can be set up or hung on isolation springs which absorb the vibration thus eliminating the possibility of damage to the plant or other equipment. According to the company, the feeders performed well when they were tested for use by the Asbestos Industry.

VIBRATION MEASUREMENT ENGINEERS, INC. has issued a *bulletin* describing the *Seismolog*—a portable machine which records vibrations from blasting and other earth disturbances. The Seismolog photographically records evidence of earth tremors and is said to have the capacity to provide velocity, acceleration and energy ratio information.

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Plant Design —

F. L. Smidth & Co. A/S

77, VIGERSLEV ALLE . COPENHAGEN-VALBY . DENMARK

ALL TYPES OF ASBESTOS CEMENT MACHINERY

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REQUIREMENTS THROUGHOUT THE WORLD

LYNMACAP AND ASSOCIATES HAVE SUPPLIED THEIR CUSTOMERS DURING THE PAST 45 YEARS WITH MAJOR QUANTITIES OF ASBESTOS FIBRE PROCESSING PLANT MACHINERY.

LYNMACAP ALSO PROVIDES TECHNICAL AID FOR EQUIPMENT INSTALLATION SUPERVISION.

LYNMACAP CAN SUPPLY USED OR RECONDITIONED MILL EQUIPMENT.

LYNMACAP FURNISHES LATEST PILOT PLANT EQUIPMENT OR LABORATORY INSTRUMENTS FOR RESEARCH OR PRODUCTION CONTROL OF FIBRE QUALITY.

LYNMACAP AND ASSOCIATES PROVIDE ABRASION RESISTANT COMPONENTS AND SPARE PARTS FOR MILL MACHINERY.

LYNN, MACLEOD CAPITAL EQUIPMENT LIMITED

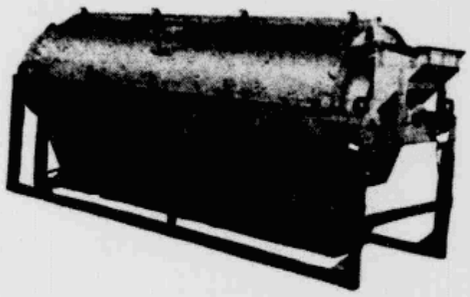
8400 Cote de Liesse Road
Montreal, Quebec
Canada

TELEX: LM. ENGR. MTL. 01-26131
PHONE: 514-636-1400

CABLE ADDRESS
LYNMACAP

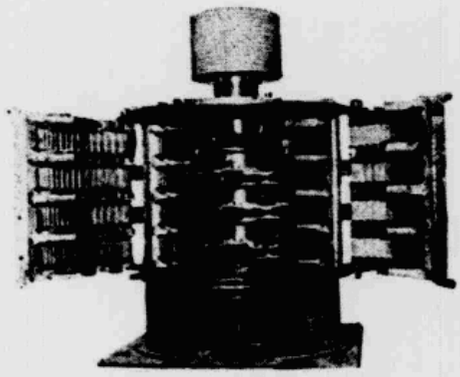
ADDITIONAL ASBESTOS MILLING EQUIPMENT

- Collectors
- Checkweighers & Classifiers
- Cranes
- Crushers
- Feeders
- Aspiration Hoods
- Lowerators
- Grinding Mills
- Fibre Precompressors
- Gluer-Sealers
- Rotary Valves
- Bag Flattener & Loaders
- Laboratory Equipment
- Drive Equipment
- Air Separators
- Motorized Floor Sweepers
- Bucket, Man Lift & Freight Elevators
- Rotary Aspirators
- Mechanical Separators
- Rotary Dryers
- Fibre Fluffers
- Quebec Standard Testing Machines
- Screens
- Pressure Packers
- Screw Graders
- Fibre Samplers
- Automatic Motor Bases



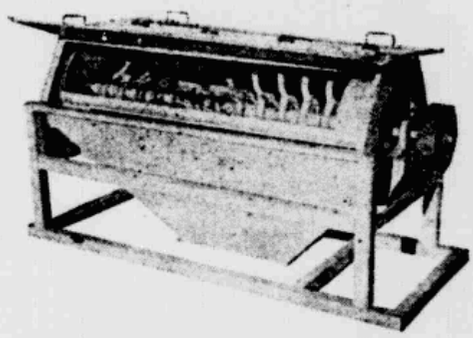
TROMMEL DUSTER

Removing dust and fine particles of impurities from Asbestos Fibre.



FIBERIZER

Releases fibre by impact in air.



GRADER

For grading all classes of fibre.

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MARKET CONDITIONS

General Business.

Business in general continues good but the rate of growth is slowing and predictions are that this situation will continue although a sharp decline is not expected. The normal summer slowdown due to vacations is coming to an end but many businessmen and investors are proceeding cautiously awaiting the outcome of the upcoming Presidential election. This is normal in an election year as is a somewhat sharp turn either upward or downward immediately following the election depending on which candidate is successful. Steel production is dropping rapidly as was predicted and will continue to do so until users are able to work off the excess inventories accumulated in anticipation of the "strike which didn't happen." Several Federal Reserve Banks have cut their discount rate one quarter of one percent, possibly to offset the deflationary effects of the tax increase and the cut in Government spending.

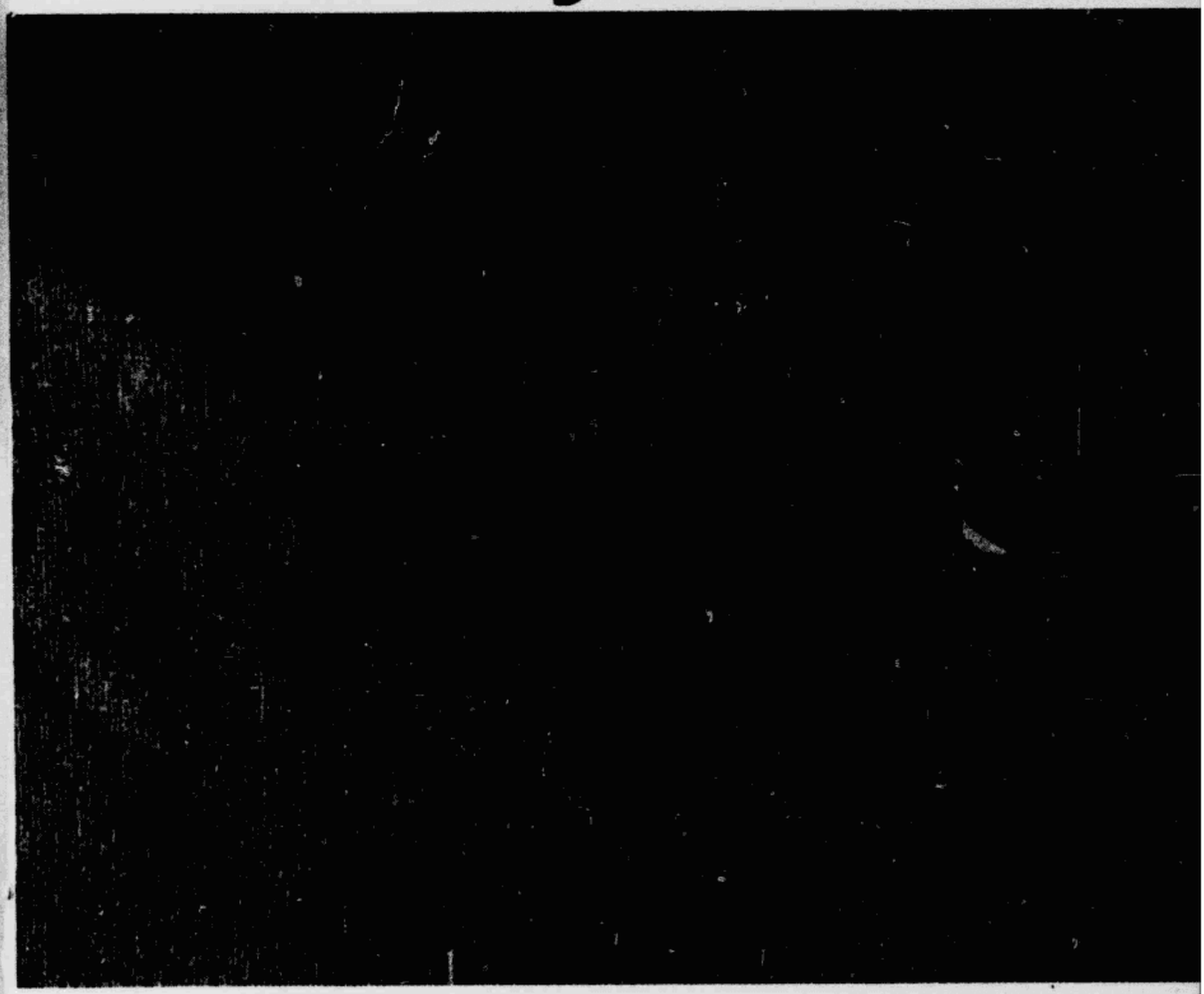
Biggest news of world-wide importance is the movement of armed forces of Russia and her satellites into Czechoslovakia. At this writing it is not possible to predict the repercussions which will arise from this move. Suffice it to say that it can only add further confusion and tension to the already muddled world political situation.

U.S. GOVERNMENT REPORT NO. N68-10506 on the *"Development of Non-Flammable Fabric Constructions For Space Flight"* has been prepared by G. R. Cuthbertson and G. C. Holroyd of the Fiber and Textile Division of UNIROYAL, INC. for the Manned Spacecraft Center of the National Aeronautics and Space Adminstration. This report concerns a fabric blended of asbestos and Nomex with an insert of "beta" glass filament yarn added at the spinning operation. A copy of this report is available from the Clearinghouse, U.S. Department of Commerce, Springfield, Virginia 22151 for $3.00 per paper copy or 65c per microfiche.

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UNIROYAL

Asbeston is not like ordinary asbestos.



Asbeston® is ordinary asbestos, except that it's been spun and woven, brushed and calendered, to get a smoother, fuller fiber cover. It's stronger per pound, lighter per yard and easier to work with.

As yarn or fabric, Asbeston comes in the widest variety of weights and sizes for every application. For details, write: Uniroyal Fiber and Textile, 350 Columbia Road, Winnsboro, South Carolina 29180.

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U. S. BUREAU OF MINES BULLETIN 644 entitled *"Tunneling: Recommended Safety Rules"* outlines ways to achieve safer and more healthful working conditions in tunneling. The report includes 675 recommended rules to assist safety personnel who are responsible for the working conditions in conventional tunneling where rock is broken by drilling and blasting. It does not cover tunneling with continuous boring machines or with caissons where all air at the working face is pressurized. The Bureau is preparing separate safety guidelines for these specialized operations. Copies of this report are obtainable at 40 cents each.

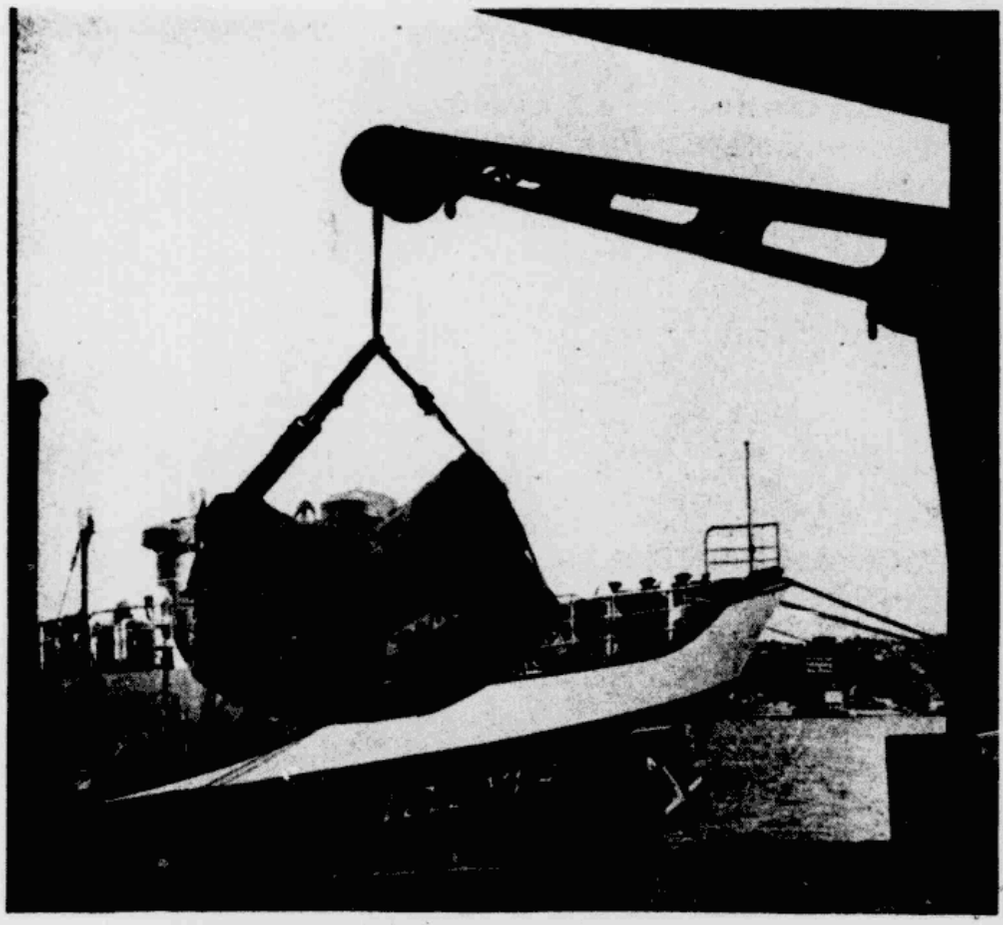
MICROWAVE INSTRUMENTS COMPANY is the manufacturer of the new *Model 633 Microwave Moisture Gauge*. Microwaves passing through the material sense moisture by either transmission or reflection, depending on the type of material and the choice of sensing head. Heads are available for installation on conveyor belts, bins, chutes, flow-through cells, pipelines, tanks, machines, etc. Water content is electronically gauged from approximately 0.5% to 90% with accuracies as high as ±0.1% in the lower moisture ranges. Instantaneous readings are continuously indicated on a meter or on an optional strip chart recorder. By means of an optional controller, this gauge can be linked into a process control loop for immediate correction of out-of-tolerance moisture content.

Initial tests made in Microwave's laboratory have indicated that Model 633 can be used to determine the moisture content in asbestos fabric and in bulk forms of asbestos fiber.

NFPA STANDARDS MAKING SYSTEM, newly published by the *National Fire Protection Association,* is a concise, readable description of the processes involved in developing standards for fire prevention and protection. This 16-page booklet is available without charge from the Association.

FIRE PREVENTION WEEK, internationally sponsored by the *National Fire Protection Association,* will be October 6 to 12, 1968.

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Gold Bond
ASBESTOS FIBRES

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VIBRA SCREW INCORPORATED has issued a new color brochure on its *controlled vibration equipment* for accurate, dependable feeding and hoppering of dry bulk materials from storage into process. The new literature, Bulletin V-5, explains the function and use of the equipment and gives detailed specifications and dimensions of Vibra Screw Bin Activators, Live Bin Feeders, Counterflow Screw Feeders, Heavy-Duty Screw Feeders, Belt Feeders, Heavy-Duty Belt Feeders and Live Bottom Bin Feeders.

BISON INSTRUMENTS INC. has announced a new precision multi-range *seismic timer* for applied earth engineering use. The new lightweight solid-state *Bison Model 1501* offers three timing ranges which allow for investigation of minute layer problems and non-destructive testing of soils and rock in compaction. It is available for use with sledge hammer impactor, drop weight, explosives or other seismic shock sources.

DATA SHEET, Reference Number 02.09, entitled "Ceiling Infil Panels and Tiles" appeared in the November 1967 issue of "Insulation" magazine. It specifically reviews ceiling infil panels and tiles of varying types, purposes and modules and includes paragraphs on the Composition of Asbestos Insulating Board, Gyptone Acoustic Tiles and Mineral Board Panels and Tiles.

ASTM STANDARD C619-68T, "Method of Test for Chemical Resistance of Asbestos Fiber Reinforced Thermosetting Resins Used in Self-Supporting Structures," is available from the *American Society for Testing and Materials* at $1.00 per copy. This method is intended for use as a relatively rapid test to evaluate chemical resistance of asbestos fiber reinforced, thermosetting, resin plastics under anticipated service conditions. The test provides for the observation of changes in the following properties of the specimens and reagent after immersion of the specimens in the environment: weight of specimens, appearance of specimens (visual inspection), an-

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* **SUPPLY** the felts best suited for your asbestos-cement production . . . Batt-on-Base . . . Needle Reinforced . . . Scapa Needled . . . whether you require smooth surface or the greatest knuckles

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U.S.S.R. ASBESTOS—The following papers concerning asbestos in the U.S.S.R. were listed in the July-August 1968 issue of the "Asbestos Bulletin": Genesis of Asbestos Veins in Yaltinsk Deposits, Kazakhstan; Asbestos Mineralization in Carbonate Deposits in the Upper Region of the Rivers Vangyr and B. Patok (Subarctic Ural); Preliminary Communication on Amphibole Asbestos Occurrence in North-Western Caucasus; Hydrothermal Synthesis of a Fibrous Na-Co Amphibole; and Certain Types of Zonality in Asbestos-Bearing Formations.

SPRAYED MINERAL FIBER BOOKLET—Description, uses, and properties of sprayed mineral fiber are covered in a new booklet "Fireproof . . . Insulate . . . Control Sound," published by the *Sprayed Mineral Fiber Manufacturers Association.* The publication is the first ever issued on the product generically. Membership in the recently established association consists of all companies that both manufacture and market the material. Among the uses of sprayed mineral fiber are fireproofing of cellular steel floors and structural members, thermal insulation of corrugated metal roofing or siding, and acoustical control of interiors. The material is suitable for buildings of all occupancies. Fire-retardant ratings meet all codes and standards. Sprayed mineral fiber with a thermal conductivity of 0.26 is a standard product. The brochure includes a guide specification that is adaptable to various requirements and applications.

PART 1: 1968 ASBESTOS CEMENT has been published by the *British Standards Institution* as part of the code of practice "CP199: Roof Deckings." This part of the code deals with the design and construction of both the interlock and composite types of asbestos-cement roof deckings. Its four main sections cover materials and components, design, work on site and inspection and maintenance.

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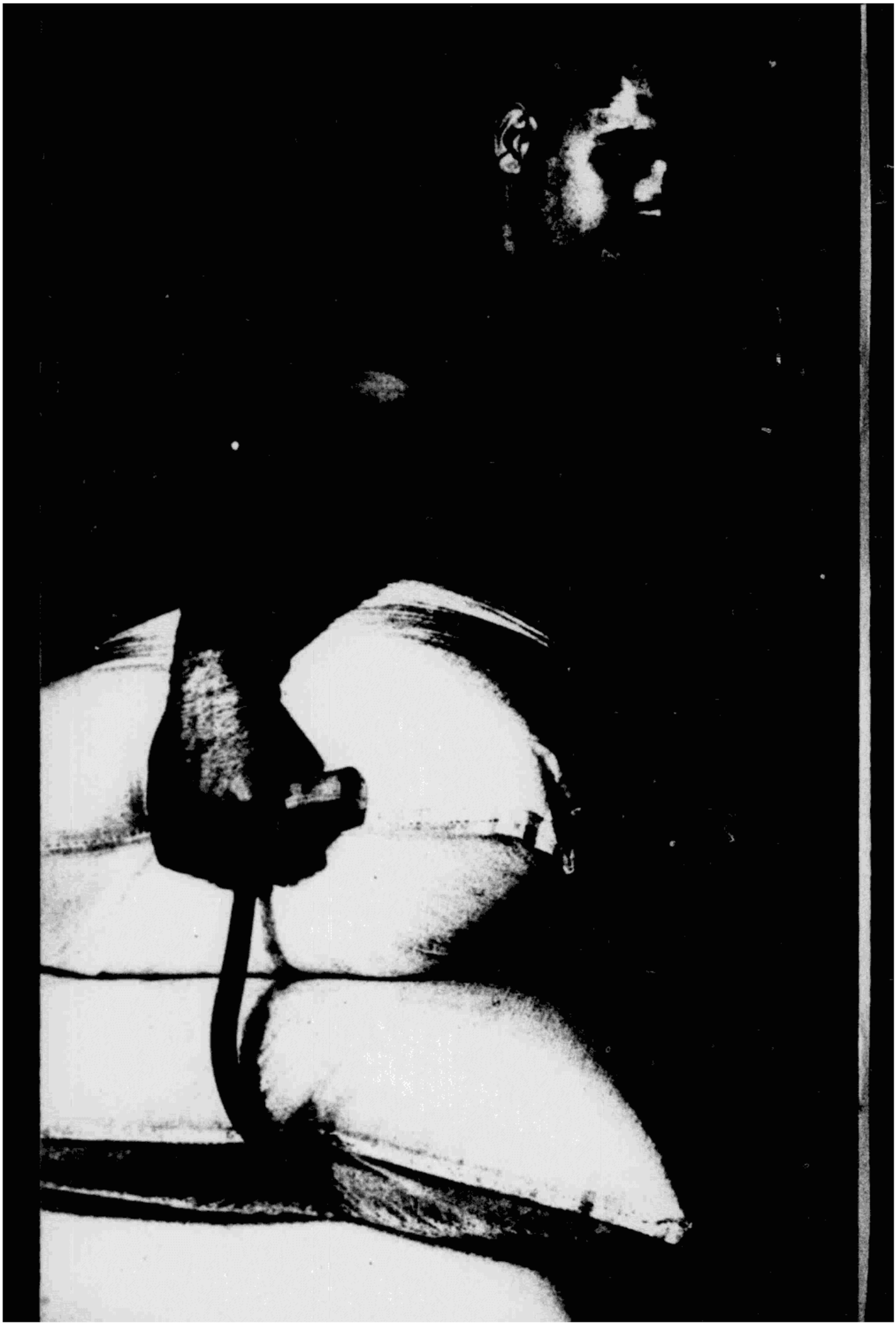
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'FABRENE' PASSES THE TORTURE TEST.

'Fabrene' won't tear like ordinary polyethylene. It's polyolefin fabric, made from oriented polyethylene drawn to maximum strength individual tapes, then woven (which itself greatly increases tear resistance) and finally, for weatherproof applications, given a melt-bonded coating of 'Sclair' polyethylene.

Unlike paper or ordinary poly, 'Fabrene' will not rip out or propogate tears. These are limited to the ⅛" width of an individual tape. 'Fabrene' Type B (3.2 oz) has tear strength of 100 lb/in warp and 100 lb/in weft (ASTM D 1682-64), compared to 84-84 lb/in for 10 oz jute.

Coated 'Fabrene' industrial bags are completely moisture-proof, rot resistant and weigh about ½ as much as comparable jute or cotton. Yet they are designed and priced to compete with these.

Do you want more information? 'Fabrene' industrial bags are available from Thomas Bonar & Co. (Canada) Limited and Bonar & Bemis Ltd. Or write Du Pont of Canada Limited, Dept. A-SP-6, P.O. Box 660, Montreal 3, P.Q.

'Fabrene' is a trademark of Du Pont of Canada Limited for its woven polyolefin fabrics and 'Sclair' is the registered trademark of Du Pont of Canada for its polyolefin resins.



'FABRENE'

DU PONT CANADA

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PRODUCTION

Canada—MAY 1968 asbestos production amounted to 129,009 short tons (Quebec—122,475; Newfoundland, Ontario and British Columbia—6,534). This compares with the May 1967 total of 119,158.

JUNE 1968 asbestos production amounted to 111,252 short tons (Quebec—105,014; Newfoundland, Ontario and British Columbia—6,238). This compares with the June 1967 total of 137,305. (Dominion Bureau of Statistics, Ottawa.)

Canada—According to the Dominion Bureau of Statistics, Ottawa, 44,110 tons (96,001,225 square feet) of *vinyl-asbestos floor tile* were produced in Canada during the FIRST HALF OF 1968 compared to 49,954 tons (109,341,305 square feet) during the same period in 1967. Shipments during the January through June 1968 period totaled 40,836 tons (91,052,925 square feet).

Swaziland produced 40,154 short tons of asbestos fiber in 1967 compared to 36,142 in 1966. The value of exports in 1967 amounted to R5,858,028 against R4,986,802 the previous year.

Havelock Asbestos Mine is the only asbestos producer in Swaziland. This underground mine was served by a three-compartment shaft inclined at 40° but in 1964 a 20-foot-diameter vertical shaft was sunk. The ore is transported to the shaft orepasses and hoisted to the surface for complex treatment in the milling plant. The Chrysotile fiber is extracted by means of several stages of crushing and screening. Air is utilized for fiber removal and a second air system prevents dust pollution. Air used in both systems is filtered to prevent atmospheric contamination in the vicinity of the mill. Finally, the fiber is graded in a separator mill and mechanically bagged in 125-pound polyethylene-lined hessian bags.

Canadian Mines Handbook, 1968-1969 edition, reveals that the continuing quest for mineral discoveries is adding new dimensions to exploration in Canada. This Handbook offers Corporate information as well as data on the activities of individual mining companies, including more than 200 new companies. It also records statistical data, names and addresses of producers and producing mines, mill capacities and products and an eight-year range of stock prices for shares registered on the Toronto, Vancouver and Canadian Stock Exchanges. A new section to this Handbook is a list of Securities Commissions, Federal and Provincial Mines Departments and Professional, Trade and Mining Associations.

The Handbook is published by *Northern Miner Press Limited* and is priced at $6.00 per paper-bound copy and $7.00 for a bound copy.

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IMPORTS & EXPORTS

Imports Into U.S.A.

(Figures from U.S. Bureau of the Census) Short Tons

Unmanufactured Asbestos:	MAY 1968	JUNE 1968
Amosite, Mozambique	60	60
South Africa	2,400	1,384
Crocidolite (Blue), South Africa	1,331	2,092
Chrysotile, Crude, Canada	..	10
Rhodesia	..	85
South Africa	..	345
Chrysotile, Spinning Fibers, Canada	1,331	986
South Africa	..	5
Yugoslavia	826	..
Chrysotile, Other, Canada	48,868	47,397
South Africa	85	..
Asbestos, Other, Canada	1,866	1,519
Finland	441	864
Rhodesia	50	..
South Africa	82	270
	57,340	55,017

May 1968 valued at—$5,642,194
June 1968 valued at—$5,017,108

Manufactured Asbestos Goods:			MAY 1968
Asbestos Yarn, Slivers, etc.	Lb	230,059	$116,865
A-C Pipes, Tubes & Fittings	Lb	6,076,311	251,480
Asbestos-Cement Articles, Other	Lb	1,196,165	142,059
Asbestos Articles, Other		..	96,043
			$606,447

			JUNE 1968
Asbestos Yarn, Slivers, etc.	Lb	161,472	$107,359
A-C Pipes, Tubes & Fittings	Lb	6,524,386	268,743
Asbestos-Cement Articles, Other	Lb	1,258,941	162,444
Asbestos Articles, Other		..	48,252
			$586,798

Cyprus Report—The "Annual Report of the Geological Survey Department for the Year 1967" has been prepared by Y. Hji Stavrinou, Director. This very complete report contains a Table

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AMMANN Asbestos Mill



The *ONLY DISINTEGRATOR* treating the asbestos fibres without breaking them. Disintegrator used so to say by the most important Asbestos Mines of the whole world.

The above illustration shows a large plant comprising several AMMANN disintegrators. This plant works in an asbestos mine in South Africa.

U. AMMANN Ltd.

Engineers **CH 4900 Langenthal** **Switzerland**

Cables: Ammannag Langenthal — Telex: Nr. 68446

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Exports From Canada

(Published by Dominion Bureau of Statistics) **JUNE 1968**

Unmanufactured Asbestos:

Short Tons

	Crude	Milled Gp 3	Milled Gp 4&5	Shorts Gp 6-9
United States	10	942	12,385	31,714
United Kingdom	..	251	5,316	6,554
South America	..	5	4,191	692
Central America & Mexico	..	87	2,068	561
Europe	2	809	14,756	10,880
Japan	..	58	1,733	3,144
Other Countries	..	88	6,971	1,933
	12	2,240	47,420	55,478

Total Unmanufactured Asbestos—105,150 Valued at—$13,538,000

Manufactured Asbestos Goods:

Asbestos Brake Linings & Facings	$ 33,000
Asbestos-Cement Building Materials	61,000
Asbestos Basic Products, Other	53,000
	$147,000

Producers and Exporters

of

SOUTH AFRICAN RAW ASBESTOS FIBRES

VALLEY ASBESTOS (PTY) LTD.

P. O. BOX 9131

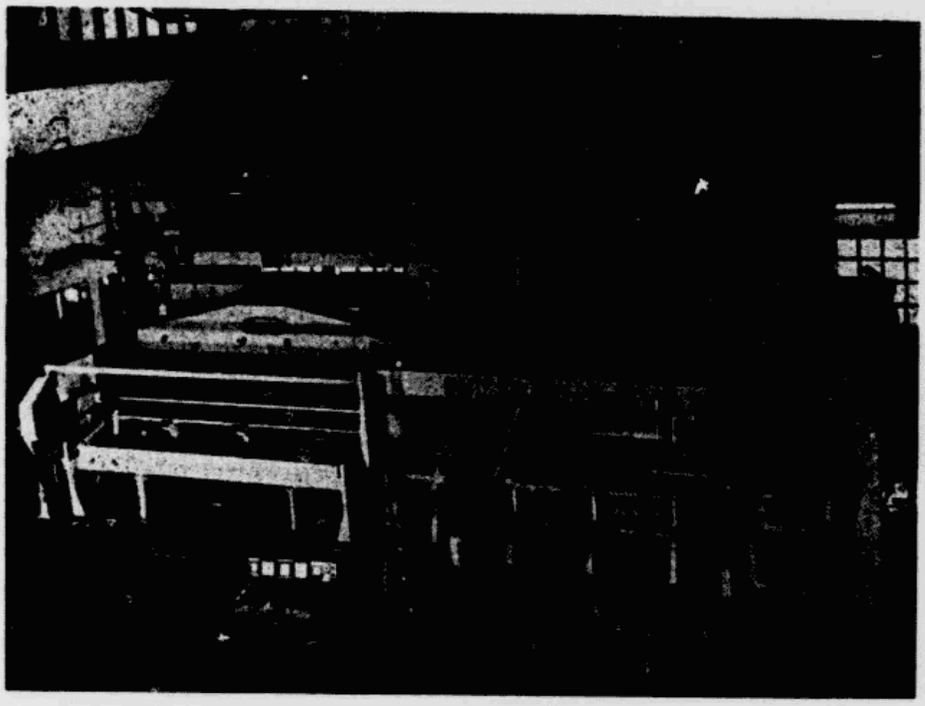
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CALZONI

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INDUSTRY NEWS

HAPPY BIRTHDAY

W. John Scotford, Technical Director, Wunderlich Limited, Sydney, N.S.W., Australia, September 15.

William L. VanDerbeek, Vice President for Production & General Manager of the Fiber Glass Division, Johns-Manville Corporation, New York City, September 15.

Jack L. Neal, President, Metate Asbestos Corporation, Globe, Arizona, September 16.

Albert Strodtbeck, Secretary, The Clark Asbestos Company, Cleveland, Ohio, September 17.

Walter F. Marcuse, President, Canadian Asbestos Company, St. Laurent, Montreal, Canada, September 18.

J. D. Christian, President & General Manager, Cassiar Asbestos Corporation Limited, Toronto, Canada, September 19.

W. W. Oughtred, President & Chief Executive Officer, Asbestos Corporation Limited, Thetford Mines, Canada, September 19.

S. Ralph Zimmerman, Jr., Executive Vice President, U. S. Asbestos—Grey-Rock Division, Raybestos-Manhattan, Inc., Manheim, Pennsylvania, September 19.

William R. Whitener, Vice President & General Manager, Pacific Asbestos Corporation, San Francisco, California, September 20.

Philip M. Malouf, President, United Asbestos Corporation Limited, Montreal, Canada, September 21.

Victor J. Laskoski, Manager, Asbestos Fibre Sales, GAF Corporation, New York City, September 22.

Jay P. Nicely, Vice President-Sales, National Gypsum Company, Buffalo, New York, September 22.

Jack B. Stiles, Works Manager, Wunderlich Limited, Rosehill, N.S.W., Australia, September 24.

Win Brown, Vice President, MacArthur Company, St. Paul, Minnesota, September 25.

H. E. Martin-Leake, Managing Director, Kismet Limited, Fenlake Works, Bedford, England, September 25.

H. Leonard Falle, Vice President-Marketing, Atlas Asbestos Company, Montreal, Canada, September 26.

D. W. Jaquays, President, Jaquays Mining Corporation, Phoenix, Arizona, September 27.

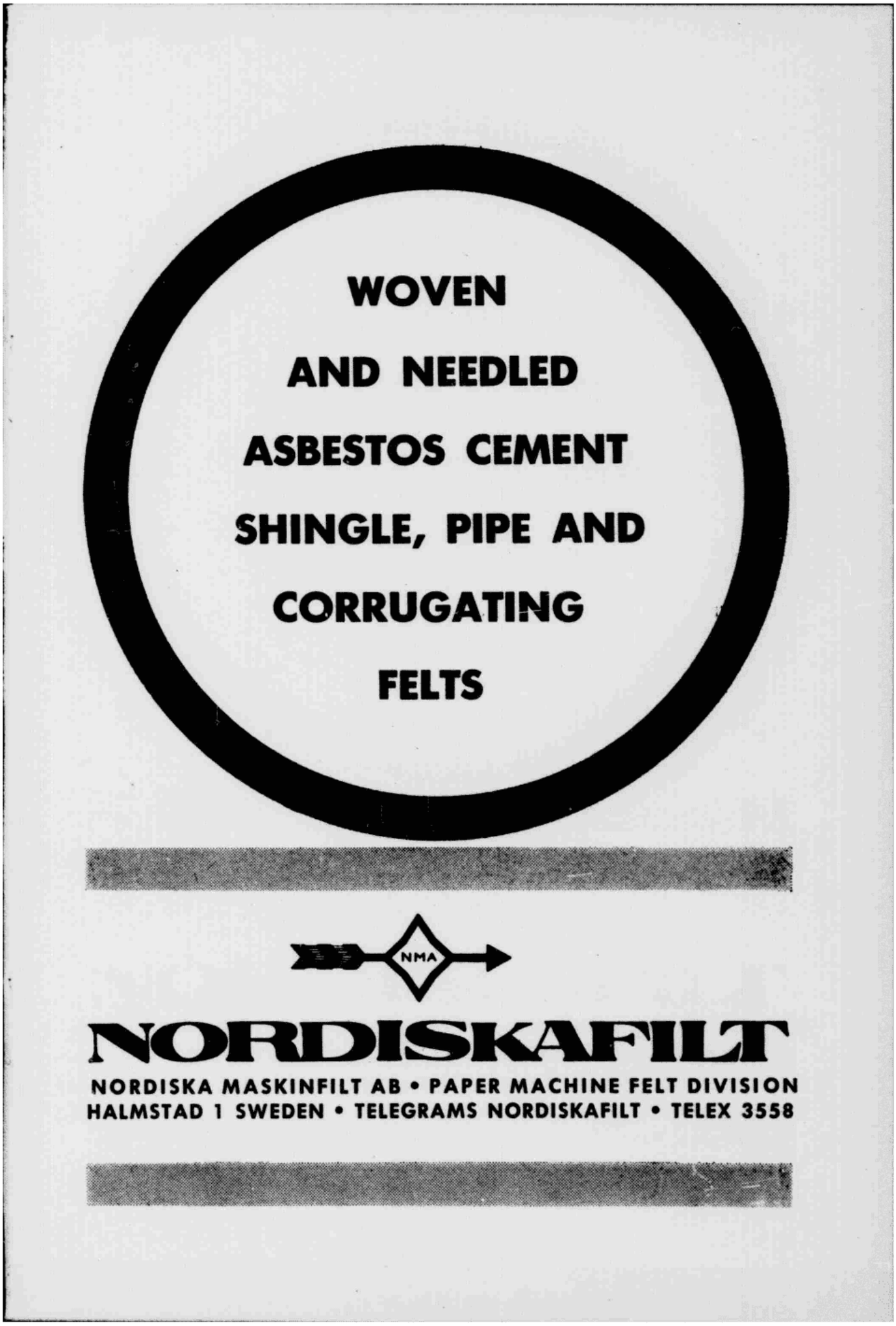
John W. Humphrey, Chairman of the Board, Philip Carey Corporation, Cincinnati, Ohio, September 28.

Sir William C. Fenton, Chairman, BBA Group Limited, Cleckheaton, Yorkshire, England, September 29.

J. M. Bell, Mill Superintendent, Clinton Mine, Cassiar Asbestos Corporation Limited, Yukon Territory, Canada, October 1.

Wolf E. Lehmann, Director for Europe, Africa and the Middle East, Johns-Manville Corporation, New York City, October 1.

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Donald A. Bain, Sales Manager, Asbestos Erectors of Canada Limited, Montreal, Canada, October 3.
C. M. Fox, Director, The Cape Asbestos Company Limited, London, England, October 3.
William P. Raines, Director of Public Relations, Johns-Manville Corporation, New York City, October 3.
R. A. Denovan, President, Denovan Limited, Dalkeith, Ontario, Canada, October 4.
Dr. Eugene P. Stefl, Vice President & General Manager, U.S. Asbestos—Grey-Rock Division, Raybestos-Manhattan, Inc., Manheim, Pennsylvania, October 6.
J. S. Munro, President, Raybestos-Manhattan (Canada) Limited, Peterborough, Ontario, Canada, October 7.
F. A. Cunnington, Vice President-Operations, Asbestos Corporation Limited, Thetford Mines, Canada, October 8.
J. G. Berry, General Manager, Cassiar Asbestos Corporation Limited, Toronto, Canada, October 11.
David L. Neil, Director of Manufacturing for Building Products, GAF Corporation, New York City, October 11.
A. L. Penhale, Chairman of the Board of Directors, Asbestos Corporation Limited, Thetford Mines, Canada, October 11.
Gordon, G. Hazell, Manager, Technical Sales & Field Engineering, GAF Corporation, New York City, October 13.

To all these gentlemen we extend congratulations and best wishes on the occasion of their birthdays.

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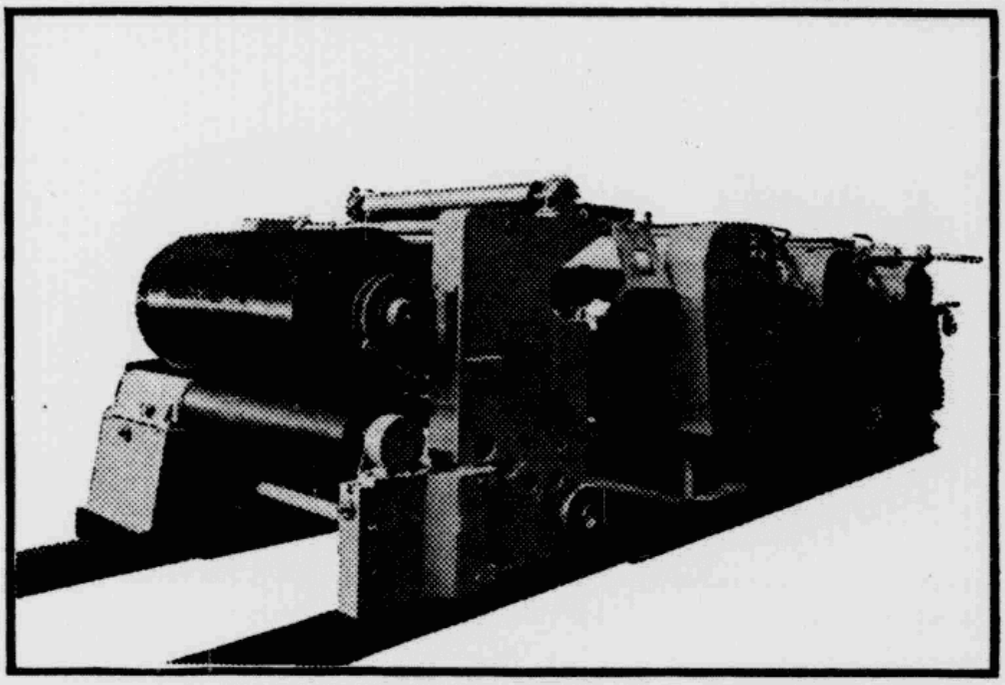
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PERSONNEL NEWS

ARMSTRONG CONTRACTING & SUPPLY CORPORATION

GEORGE B. HETRICK, JR.—Vice President (is St. Louis District Manager), ARTHUR G. KLEIN—Vice President (is Cleveland District Manager), RICHARD A. SIGEL—Vice President (is Detroit District Manager), ALEXANDER V. STOYCOS—Assistant Treasurer (is Credit Manager).

PHILIP CAREY CORPORATION

PAUL F. THEOBALD—Director of Manufacturing, J. T. DERRICK—Vice President-Industrial Relations, ARTHUR ROSENBAUM—Vice President-Administration and Finance, ALFRED A. BOWE—Sales Administrator of Carey-Canadian Mines, Ltd., LEE R. RIDGEWAY—Research Department Manager of New Products and Asbestos-Cement Products, FRANK R. HAWKINS—Boston District Sales Manager, THOMAS W. FARRELL—Staff Power Engineer, THEODORE J. ALTENAU—Insurance Manager.

CERTAIN-TEED PRODUCTS CORPORATION

M. STANLEY DAVIS, JR.—Vice President—Manufacturing, BYRON C. RADAKER—Vice President and General Manager of the Pipe Division, M. WILLIAM BLAKE—Marketing Manager of Non-Pressure Pipe, WILLIAM R. KRAUSE—Industrial Relations Manager and Manager of Industrial Engineering, EDWARD J. LAWLESS—Field Merchandising Manager of Asbestos-Cement Pipe.

H. K. PORTER COMPANY, INC.

C. P. STEWART, JR.—Vice President—Marketing, LAWRENCE E. MOODY—Manager of Manufacturing—Asbestos Textiles for the Thermoid Division, HAROLD F. JONES—Works Manager for the Charlotte, North Carolina, Works of the Thermoid Division, ALEXANDER SMITH—General Sales Manager of the Thermoid Division in charge of the asbestos textile products manufactured by Porter, WILLIAM L. RANKIN, JR.—Engineering Manager of the Thermoid Division in charge of Porter's Asbestos Textile Plants located in North and South Carolina.

TURNER & NEWALL LIMITED

C. W. NEWTON—appointed to the Board, G. S. SUTCLIFFE—non-executive Chairman of Turner Brothers Asbestos Co. Ltd. (is Deputy Chairman of T&N), D. W. HILLS—Managing Director of Turner Brothers Asbestos Co. Ltd.

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ILLUSTRATED: New Plant of Johns-Manville Mining & Trading Ltd., Reeves Township, Ont.

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ASBESTOS STOCK QUOTATIONS

Close—August 30, 1968

Abex	36⅛	Glen-Alden	15½
Advocate	*$3.25	G-Alden (pfd 3.15)	120
Asarco	59⅜	G-Alden (pfd 3)	107½
Armstrong Cork	76⅝	G-Alden (pfd 2.25)	.55
Armst. Cork (pfd 3.75)	68½	Grace	43⅞
Asbestos Corp.	*23⅛	Gulf & Western	40¼
Bendix	40½	G&W (pfd 1.75)	127
Bendix (pfd 3)	69¼	G&W (pfd 3.50)	159⅛
Cassiar	*$16.37	G&W (pfd 3.87)	75¼
Certain-teed	35¼	G&W (pfd 5.75)	75¾
Certain-teed (pfd .90)	.35	Johns-Manville	71⅞
Conwest	*$13.00	National Gypsum	67⅜
Flintkote	33⅝	Natl Gypsum (pfd 4.50)	.76
F-kote (pfd 4.50)	.97	Patino	*$43.00
F-kote (pfd-B 2.25)	43¼	Porter (pfd 5.50)	82¾
F-kote (4-pfd 4)	.67	Raybestos	54⅜
GAF	.25	Unarco	13½
GAF (pfd 1.20)	33¼	Union Carbide	42¾
Garlock	.24	Uniroyal	59⅞
		Uniroyal (pfd 8)	131½

*Canadian currency

PUBLICATIONS AVAILABLE FROM ASBESTOS MAGAZINE

Asbestos Mining Methods, by C. V. Smith—a 16-page pamphlet describing the various methods employed in the mining of asbestos fibers (25c per copy).

Milling Asbestos, by J. C. Kelleher—a companion booklet to "Asbestos Mining Methods" (25c per copy).

Recovery of Raw Asbestos, by Roland Starkey—supplement to "Milling Asbestos;" concerns the recovery of raw asbestos at Havelock Mine, Swaziland (25c per copy).

The Asbestos Factbook—a 20-page pamphlet which gives pertinent facts concerning the origin, locations, uses, analyses and qualities of asbestos (25c per copy).

Canadian Chrysotile Asbestos Classification—includes a description of the method of testing with the Canadian Standard Testing Machine (35c per copy).

Processing Asbestos Fibers, by Albert Allwood—describes the processing of asbestos fibers prior to spinning into yarn (25c per copy).

Tests for Cotton Content—concerns the methods of testing asbestos textiles to determine their cotton content (10c per copy).

Chart for figuring the dollars cost of uninsulated pipe (20c per copy).

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ASBESTOS PRICES

ARIZONA— Per Ton of 2,000 lbs., f.o.b. Globe, Arizona

(As of August 1, 1968) U. S. Dollars

No. 1 Crude	$1,410.00	to	$1,650.00
No. 2 Crude	700.00	to	950.00
AAA	..		800.00
Group No. 3 (non-ferrous filtering-plastic)	425.00	to	700.00
Group No. 4 (non-ferrous filtering-plastic)	400.00	to	500.00
Group No. 5 (non-ferrous filtering-plastic)	385.00	to	425.00
Group No. 6 (non-ferrous plastic)	..		250.00
Group No. 7 (white shorts)	65.00	to	90.00

CANADA— Per Ton of 2,000 lbs. f.o.b. Mine

(As of April 1, 1968) Canadian Currency

Crude No. 1	$	..	$1,410.00
Crude No. 2	..		760.00
Group No. 3 (spinning fiber)	367.00	to	600.00
Group No. 4 (shingle fiber)	201.00	to	341.00
Group No. 5 (paper fiber)	143.00	to	169.00
Group No. 6 (waste, stucco or plaster)	..	to	104.00
Group No. 7 (refuse or shorts)	45.00	to	87.00

CASSIAR— Per Ton of 2,000 lbs., f.o.b. North Vancouver, B.C.

(As of January 1, 1968) Canadian Currency

AAA grade (non-ferrous spinning fiber)	$	810.00
AA grade (non-ferrous spinning fiber)		643.00
A grade (non-ferrous spinning—Canadian Group 3)		484.00
AC grade (asbestos-cement—Canadian Group 4)		345.00
AK grade (shingle fiber—Canadian Group 4)		241.00
CP grade (shingle fiber—Canadian Group 4)		220.00
AS grade (shingle fiber—Canadian Group 4)		200.00
CT grade (shingle fiber—Canadian Group 4)		195.00
AX grade (shingle fiber—Canadian Group 5)		177.00
CY grade (shingle fiber—Canadian Group 5)		126.00
AY grade (shingle fiber—Canadian Group 5)		126.00

VERMONT— Per Ton of 2,000 lbs., f.o.b. Morrisville, Vermont

(As of August 1, 1968) U. S. Dollars

Group No. 3 (spinning & filtering)	$ 319.00	to	$ 342.00
Group No. 4 (shingle fiber)	186.00	to	296.00
Group No. 5 (paper fiber)	132.00	to	156.00
Group No. 6 (waste, stucco or plaster)	..		96.00
Group No. 7 (shorts & floats)	41.50	to	80.00
Group No. 8 (shorts)	..		26.50

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BUILT ON A ROCK

Crude Asbestos is the rock on which our business is built. In the Scandura Factories at Cleckheaton and West Auckland it is used to manufacture everything for which asbestos is best, from yarns and cloths to all types of jointings and packings. Our Research Laboratories keep us at the head of development; Asbestos is *our* subject.

THE ASBESTOS DIVISION OF **SCANDURA LIMITED**

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ASBESTOS PATENTS

U.S. Patents on Asbestos and Asbestos Products, by Oliver S. North.

U.S. Patents may be purchased from The Commissioner of Patents, Washington, D.C. 20231, at a cost of 50c each. Remittance should be in coin, currency, or check and the number of the patent, name of inventor and date of issue should be shown.

U. S. Patents issued from June 18 through August 6, 1968.

3,394,913—Insulating Riser Sleeve Composition, M. E. Binkley (assigned to Johns-Manville Corporation, New York City), July 30, 1968.

3,395,068—Laminated Heat Insulating Product, J. P. Rex, Jr. (assigned to Rex Roto Corporation, Walled Lake, Michigan), July 30, 1968.

3,395,071—Method of Preparing Asbestos Sheets from Aqueous Slurries Containing Silicone Resin Emulsions, S. Nitzsche, E. Pirson and E. Schmidt (assigned to Wacker-Chemie G.m.b.H., Munich, Bavaria, Germany), July 30, 1968.

3,395,793—Method of Ore Sorting Based on Differential Infrared Emissions, R. L. Thompson (assigned to The Colonial Sugar Refining Company Limited, Sydney, N.S.W., Australia), August 6, 1968.

3,396,045—Sealing Compound for High Temperature Use, K. Bysath (assigned to Sulzer Bros. Limited, Winterthur, Switzerland), August 6, 1968.

3,396,139—Asbestos-Modified Thermoplastic Polyhydroxyethers, R. H. Snedeker (assigned to Union Carbide Corporation, New York City), August 6, 1968.

U.S. Documents—The following reports are available at $3.00 per paper copy and 65c per microfiche from the Clearinghouse, U.S. Department of Commerce, Springfield, Virginia 22151:

AD-656 088—Fiber Reinforced Borane-Based Resin Composites: A New Approach To Oxidative Thermal Stability, by H. A. Schroeder & J. T. Trainor;

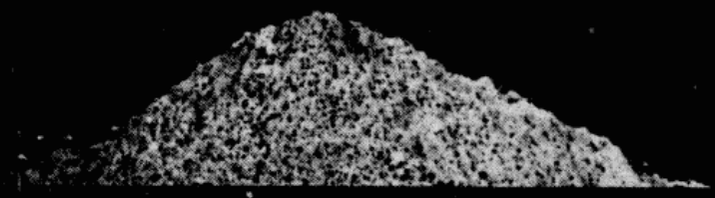
PB-178 036—Tunneling, The State of the Art, by R. S. Mayo, et al;

AEC-TR-6723—Radioactive Isotopes in Mining and Ore Beneficiation, by A. A. Rudanovskii;

TID-23668—Neutron Activation Techniques for Mineral Exploration, by F. Senftle, et al.

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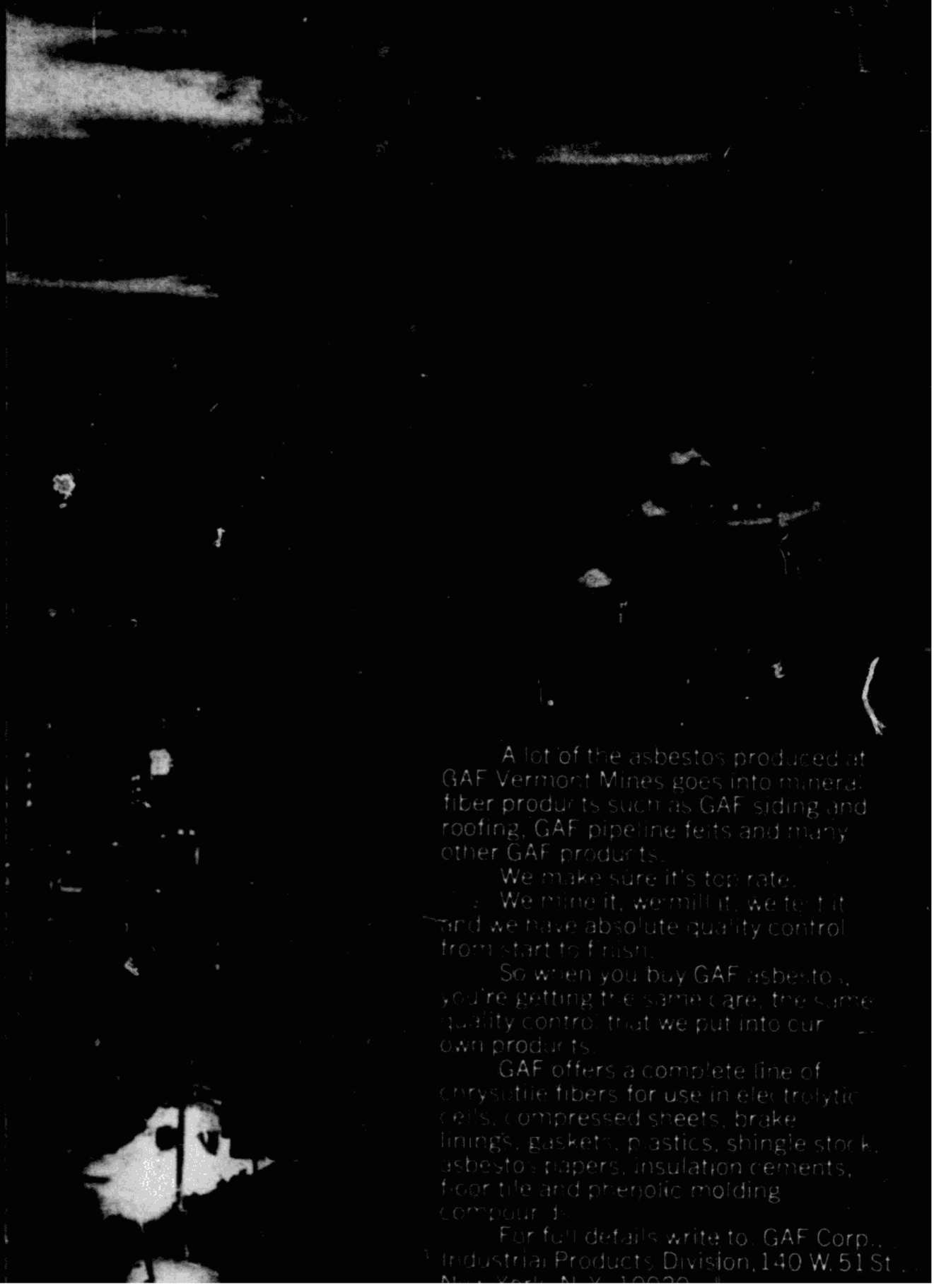
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Brooklyn ..... Smith Chem. & Color Co.	Minneapolis ..... Thompson-Hayward Chem. Co.
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Davenport, Iowa... Thompson-Hayward Chem. Co.	Omaha ..... Thompson-Hayward Chem. Co.
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Garwood, N. J. ..... Asbestos Corp. of America	St. Louis ..... Thompson-Hayward Chem. Co.
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Huntsville, Ala. ..... Wittichen Chem. Co.	Trenton, N. J. ..... H. M. Royal, Inc.
Indianapolis ..... Thompson-Hayward Chem. Co.	Tulsa ..... Thompson-Hayward Chem. Co.
Kans. City, Mo. ... Thompson-Hayward Chem. Co.	Wichita ..... Thompson-Hayward Chem. Co.
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For full details write to: GAF Corp., Industrial Products Division, 140 W. 51 St., New York, N.Y. 10020

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