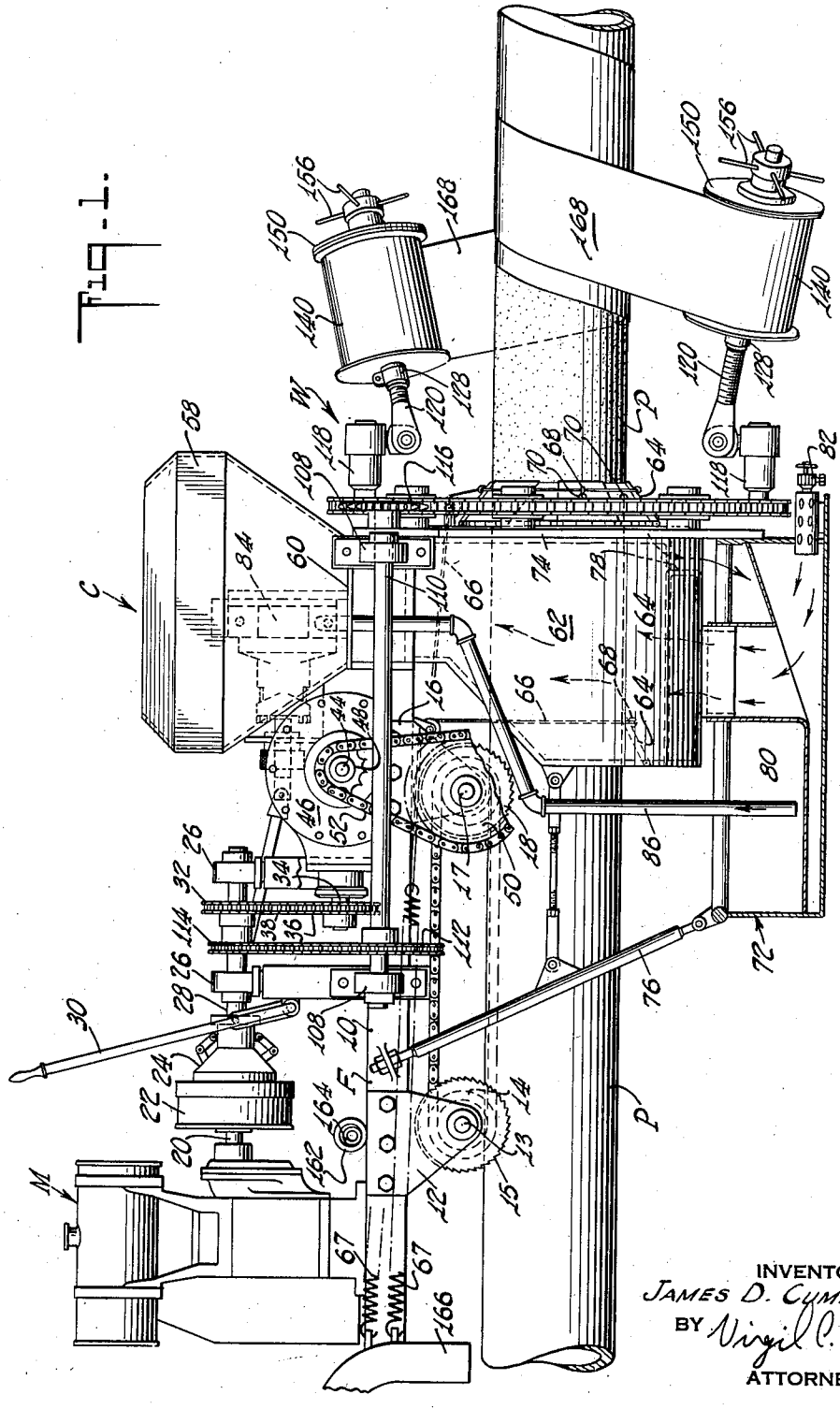
Aug. 26, 1941. J. D. CUMMINGS 2,253,848

PIPE COVERING MACHINE

Filed Nov. 5, 1938 4 Sheets-Sheet 1

Fig. 1.



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PIPE COVERING MACHINE

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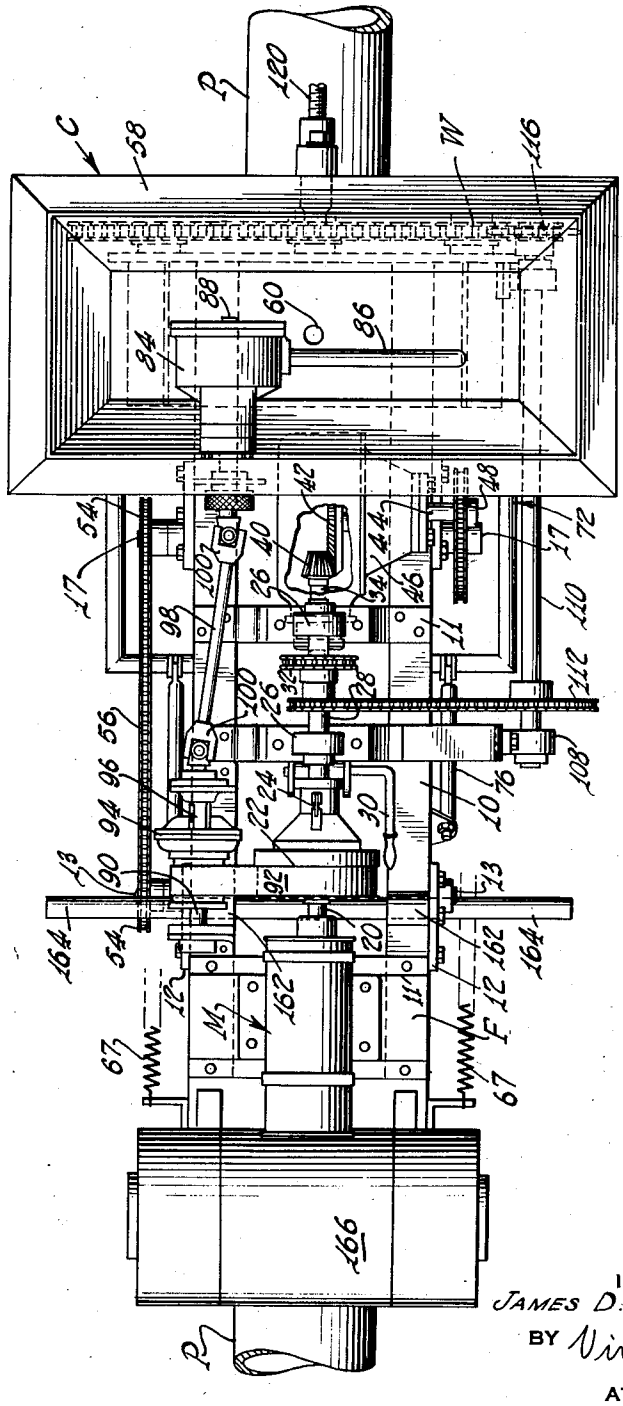


Fig. 2.

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PIPE COVERING MACHINE

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Fig. 3.

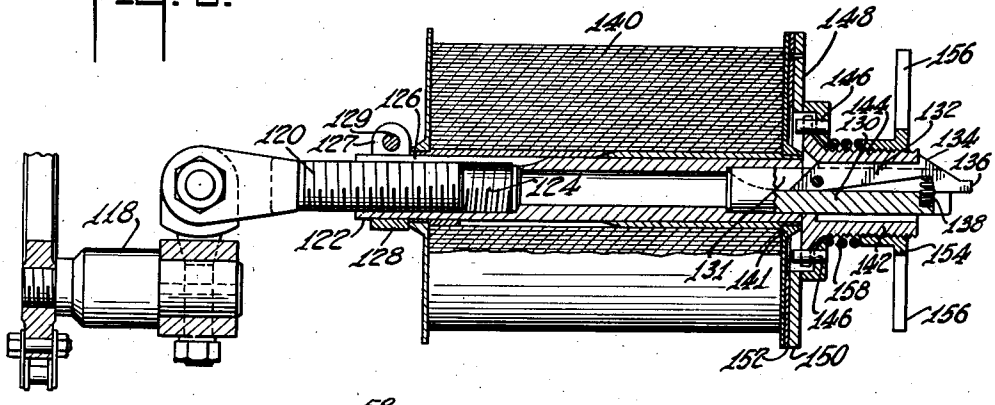
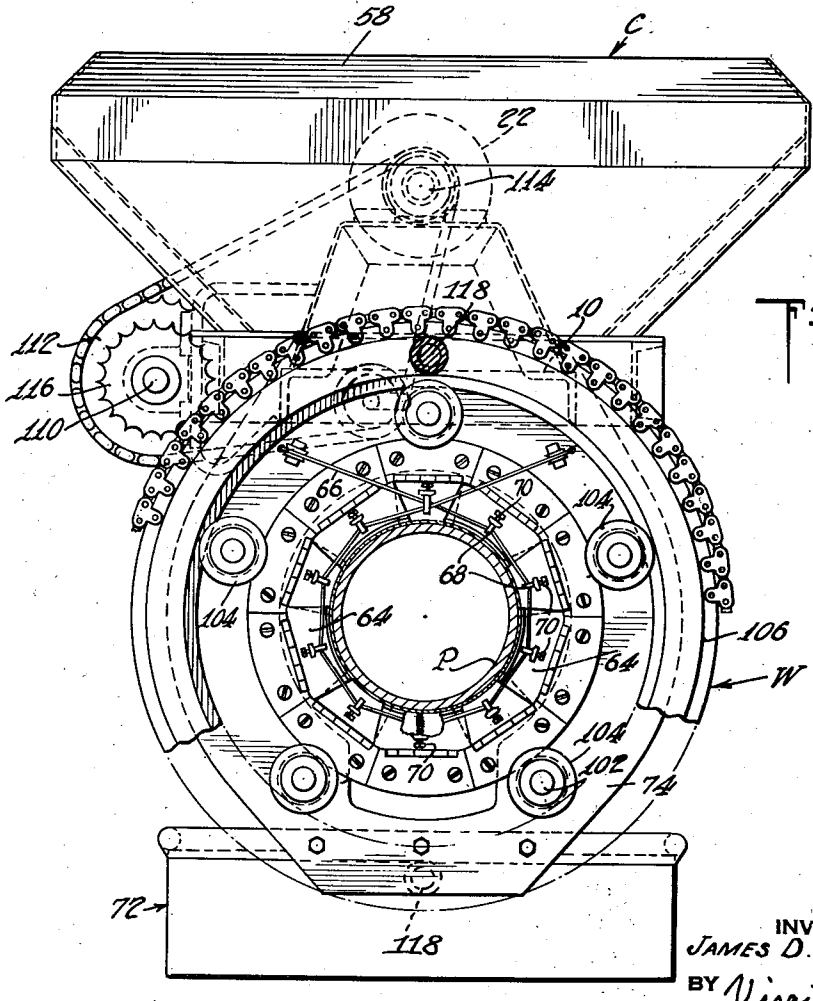


Fig. 4.



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PIPE COVERING MACHINE

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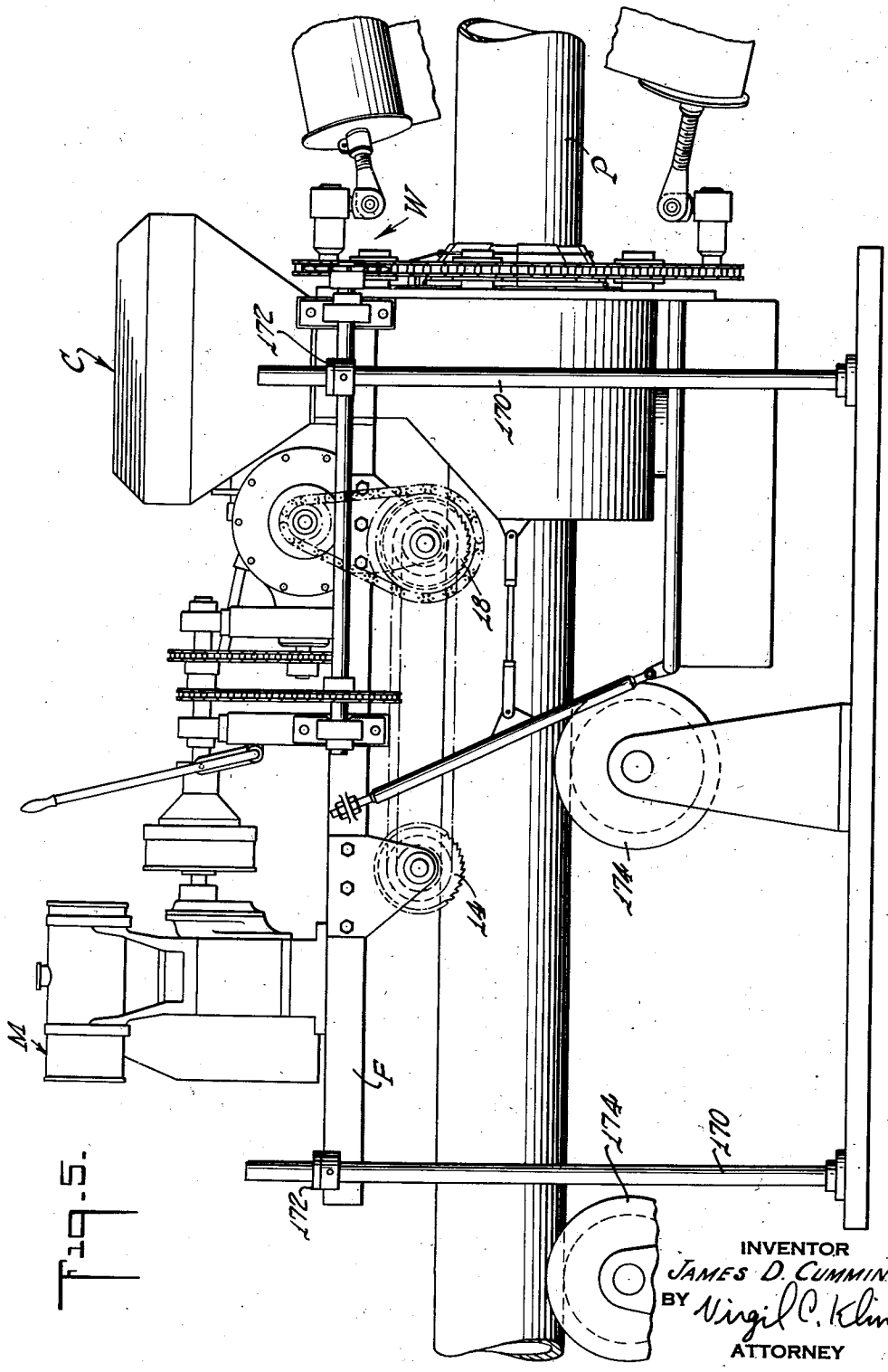


Fig. 5.

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UNITED STATES PATENT OFFICE

2,253,848

PIPE COVERING MACHINE

James D. Cummings, Houston, Tex., assignor to Johns-Manville Corporation, New York, N. Y., a corporation of New York

Application November 5, 1938, Serial No. 238,951

12 Claims. (Cl. 242—11)

The present invention relates to a combination pipe coating and wrapping machine, and more particularly, to a machine of this type designed to apply a layer of coating material and a spiral wrapping of protective material about an object such as a pipe while the same is in position in an extended pipe line, or while in the form of a relatively short section.

An object of the present invention is to provide an improved combination pipe coating and wrapping machine of a character that it may be advanced along an extended pipe line to apply a protective coating and wrapping thereto or be supported in a stationary position to apply the coating and wrapping to sections of pipe passed therethrough.

It is another object of the present invention to provide a combination pipe coating and wrapping machine, as referred to above, which is capable of applying an even layer of coating material to the surface of the pipe and a tight and smooth spiral wrapping of protective material in the layer of coating.

A further object of the invention is to provide an improved combination pipe coating and wrapping machine in which the wrapping device includes a multiplicity of wrapping spools supported for rotation about the pipe in a manner to permit adjustment of the same to obtain any desired overlap between the wrappings supplied from the several spools.

A further object of the invention is the provision of a combination pipe coating and wrapping machine in which the driving of the machine along the pipe, the rotational movement of the wrapping head about the pipe, and the mechanical operation of driven parts of the coating device are derived from a single power source and in a manner to maintain the operability of the machine at all times.

Another object of the invention is the provision of an improved wrapping head for a combination pipe coating and wrapping machine, the wrapping head including spools of the wrapping material supported in a manner to permit their rapid removal and renewal, whereby interruptions in the operation of the machine are reduced to a minimum.

My invention will be fully understood and further advantages and functions thereof will become apparent when reference is made to the detailed description thereof which is to follow and to the accompanying drawings which depict a preferred embodiment thereof and in which

Fig. 1 is a side elevational view of a machine constructed in accordance with the present invention and illustrating the machine mounted in coating and wrapping position on a pipe for traveling operation;

Fig. 2 is a plan view of the machine illustrated in Fig. 1;

Fig. 3 is a detail view of the preferred wrapping spool mounting employed in the device of Fig. 1;

Fig. 4 is a rear elevational view with parts broken away of the machine disclosed in Fig. 1; and

Fig. 5 is a side elevational view of the machine of Fig. 1 modified for stationary operation.

Referring now to the drawings, and particularly to Figs. 1 and 2, the combination coating and wrapping machine disclosed comprises a frame F formed of channel members or other suitable sections 10 connected at intervals by cross members 11 to provide a relatively rigid structure. The members 11 may be secured to the channels 10 by bolts or rivets, as illustrated, or by welding or the like, if desired. A substantially rectangular frame is shown, but it will be understood that the same may be given other shapes if desired, it only being required that the frame be of such character as to constitute an adequate supporting structure for the operating elements of the machine.

Adjacent the end of the frame, to the left of the device shown in Figs. 1 and 2 (the front end), there are provided traction wheel brackets 12 secured by bolts, rivets, welding, or the like, to the outer face of each of the channels 10, the brackets being in alinement transversely of the machine. Journaled in the brackets 12 is a shaft 13 which carries traction wheels 14 fixed to the shaft for rotational movement therewith. The traction wheels 14 are preferably beveled in substantial conformity with the curvature of the pipe so that each provides a substantial line of contact therewith and are also provided with toothed or serrated peripheries, as indicated at 15, to insure against slippage of the rollers relatively to the pipe. Spaced a suitable distance from the brackets 12 a second set of brackets 16 are secured to the channels 10 at opposite sides of the frame. Journaled in the brackets 16 is a shaft 17 which carries traction wheels 18 affixed to the shaft for rotation therewith, the traction wheels 18 preferably being similar in all respects to the traction wheels 14. If desired, each of the pairs of traction wheels 14 or 18 may be replaced by a single traction wheel suitably shaped to fit the curvature of the pipe.

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Mounted on the frame F adjacent the forward end of the machine (the end at the left of Figs. 1 and 2) is a power source M which may be any known type of internal combustion engine, an electric motor, or other prime mover, all of which are hereinafter designated by the term "motor." The motor M includes a power output shaft 20 supporting a belt pulley 22. Journaled in alinement with the shaft 20, in suitable bearings 26 supported from the frame F, is a second shaft 28. A clutch 24 of any suitable type is mounted on the adjacent ends of shafts 20 and 28, engagement of the clutch connecting the shafts 20 and 28 for rotation in unison. A suitable hand lever or the like 30 may be employed for shifting the clutch from engaged to disengaged position.

Secured to shaft 28 for rotation therewith is a gear or sprocket wheel 32. Below the shaft 28 a stud shaft 34 is journaled on a frame member and carries a sprocket wheel 36 in the vertical plane of the sprocket wheel 32, the gears or sprocket wheels 32 and 36 being connected by a sprocket chain or other positive link drive 38. The end of the shaft 34 remote from the sprocket wheel 36 carries a pinion gear 40 in meshing engagement with a ring gear 42 carried by a transverse shaft 44 suitably journaled on the frame, the pinion 40 and ring gear 42 being preferably enclosed in a housing 46.

An end of the shaft 44 extends from the housing 46 and carries a sprocket wheel 48. A sprocket chain or the like 52 is provided to drive a sprocket wheel 50, fixed to an extending end of shaft 17, from the sprocket wheel 48. Carried by the ends of the shafts 13 and 17 on the other side of the machine are sprocket wheels 54 connected by a sprocket chain or the like 56.

In the operation of the machine drive, above described, engagement of clutch 24 connects shaft 28 for direct driving from the motor M, shaft 28, through the several driving connections shown, causing the rotation of all four of the traction wheels 14 and 18. The provision of the drive for all four traction wheels and the toothed or serrated engagement faces of the traction wheels insure against any possibility of slippage of the traction wheels relatively to the pipe, whereby positive movement of the machine is insured.

Supported on the frame F adjacent the end thereof remote from the motor is a pipe coating device indicated generally at C. The coating device is preferably of the type disclosed and claimed in my Patent No. 2,194,268, issued March 19, 1940, although other types of coating heads employing the general features of the same may be substituted if desired. For the purposes of the present description, it may be stated that the coating device, in its preferred form, comprises a hopper 58 adapted to receive a supply of the coating material and including an outlet 60 through which the coating material is allowed to fall or flood onto the pipe P.

The coating device is provided with a housing indicated generally at 62 surrounding the pipe and including hinged flaps 64 which form end closures for the housing. The hinged flaps 64 (see particularly Figs. 1 and 4) are arranged in a manner to form yieldable closure members extending completely around the pipe. The flaps are held in their assembled relationship about the pipe preferably by means of cables or the like 66 passing through eyelets 68 formed in the individual flaps, the cables 66 having their ends connected to suitable springs 67 secured to the forward end of the frame F, whereby the closure members, formed by the flaps, may expand under the resistance of the springs to permit obstructions on the pipe, such as pipe joints, or the like to pass therethrough. Suitably, the flaps 64 at the rear end of the coating device are provided with adjusting screws 70 to maintain the free ends of the same a predetermined distance from the pipe, whereby these flaps serve to spread the coating material on the surface of the pipe in a layer of a predetermined thickness.

Below the housing of the coating device, there is supported a drip pan 72 connected at one end by bolts or the like to a substantially annular ring piece 74 carried adjacent its upper portion by the frame F. The other end of the drip pan is suitably supported as by tie rods 76 from the frame F. An opening 78 is provided (see Fig. 1) whereby excess coating in the housing 62 may pass into the drip pan 72, and by reason of the inclined bottom thereof, flow into a sump 80. The hopper 58, housing 62, and drip pan 72 are all suitably jacketed to permit, if desired, the circulation of a heating medium therearound as illustrated. A heating device 82 of any suitable type such as blow torch or the like may be provided to supply a hot blast within the jacket of the drip pan 72, the heated air rising and passing through the jackets of the housing 62 and hopper 58.

Preferably located in the hopper 58 is a pump 84 including an intake pipe 86 extending downwardly and having its inlet end within the sump 80. The pump includes a discharge outlet 88 located within the hopper, whereby excess material drawn from the sump through the line 86 will be again discharged into the hopper. The driving means for pump 84 (see Fig. 2) comprises a shaft 90 driven by a belt 92 from the pulley 22 on motor shaft 20. A clutch 94 of any suitable type is located between shaft 90 and a stub shaft 96 supported by the frame. The stub shaft 96 is connected to a shaft 98 and the shaft 98 to the pump 84 by universal joints 100.

Referring now particularly to Figs. 1 and 4, the wrapping head indicated generally at W will be described. Secured at suitable intervals on annular member 74 are stub shafts 102. Journaled on the stub shafts are preferably grooved rollers 104. Mounted for rotation on the rollers 104 is a ring gear 106 of any suitable type, but which may preferably comprise a sprocket chain gear as illustrated in Fig. 4. Supported from elements of the frame are bearings 108 (see Fig. 1) in which is journaled longitudinally extending shaft 110. Shaft 110 carries a sprocket wheel 112 connected by a sprocket chain with a sprocket wheel 114 on main shaft 28. A wheel 112 of suitable diameter may be employed to provide the desired relationship between the speeds of shafts 110 and 28, or, if desired, a conventional speed change device may be employed to provide the desired speed relationship between these shafts under varying conditions. The end of the shaft 110 remote from sprocket gear 112 carries a gear 116 in meshing engagement with the sprocket chain or other toothed construction of the ring gear 106.

Connected to the ring gear at equally spaced points are a multiplicity of pins 118 comprising wrapping spool mounting devices, two preferably being provided, although a greater number may be employed if desired. The pins 118 are secured by universal connections to threaded stub

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spindles 120. The universal connections between the stub spindles and the pins 118 are such that the stub spindles may be adjusted to extend in any desired direction and be secured in such adjusted position by suitable clamping bolts or the like.

Referring now particularly to Fig. 3, a spool holder which may preferably be employed comprises a sleeve 122 threaded at 124 adjacent one end for engagement with a threaded end of the spindle 120. The threaded end of the sleeve is suitably split, as indicated at 126, and is encircled by a clamping ring 128. This construction permits the sleeve to be threaded on the stub spindle 120 to any desired extent and secured in such position by tightening of the bolt 129 passing through the ears 127 of the clamping ring 128. The end of the sleeve remote from the stub spindle 120 includes an extension 130 fixed in and forming a part of the sleeve and provided with a grooved portion 131 in which is hingedly mounted a trigger member 132 provided with a locking shoulder 134 and an operating handle 136. A coil spring or the like 138 is so located as to constantly press the trigger member upwardly as viewed in Fig. 3.

A spool 140 carrying convoluted wrapping material is supported on sleeve 122, the clamping ring 128 serving as an end or thrust bearing for the end of the spool. Non-rotatably mounted on the extending part 130 of sleeve 122 is a member 142 having an externally threaded portion 144. The member 142 carries, by means of pins 146 or the like, a brake member 148 comprising an annular flange 150 to which is affixed a brake shoe 152 of any suitable material. The pins 146 are suitably fixed to either the member 142 or brake 148 and slidable in openings in the other to permit axial movement of the brake relatively to the member 142. Mounted on the member 142 is a tension adjusting member 154 having an internally threaded portion engaged with the threaded portion of member 142. Suitable operating means or handles 156 are provided to rotate member 154. Between the innermost edge of the tension adjusting member 154 and brake member 148 there is confined a coil spring or other resilient means 158.

In the operation of the wrapping spool mounting means the spool is first mounted on sleeve 122. Member 142 is then slipped onto sleeve 122 to bring its inner end into engagement with an extending portion 141 of the spool and to confine its outer end behind shoulder 134 of trigger member 132. Adjustment of the tension on the wrapping material drawn from the spool is secured by threading the tension adjusting member 154 to a greater or less extent on the member 142, whereby brake shoe 152 under the pressure of spring 158 exerts a greater or less braking resistance on the head of the spool 140. When the spool is to be removed, for example, when the wrapping material thereon is exhausted and a fresh spool is to be supplied, trigger member 132 is depressed by a downward movement of the handle 136 until the shoulder 134 moves out of engagement with the end of member 142. Member 142, adjusting device 154, and the brake means 148 are then removed as a unit, the spool slipped off the sleeve 122, and a fresh spool mounted thereon. The brake device 148, member 142, and tension adjusting device 154 is then slipped onto sleeve 122 until the trigger 132 snaps into place with its shoulder 134 in engagement with the end of the member 142. The device is then ready to resume operation with the wrapping material being supplied at the same tension as that previously employed, inasmuch as the removal and replacement of the spool required no change in the adjustment of the tensioning device.

In the preparation of the combination coating and wrapping machine as described above, for traveling operation the same is mounted on an extending pipe line in any suitable manner, for example, by threading the end of the pipe line through the coating and wrapping devices, the traction wheels 14 and 18 being brought into engagement with the pipe. To prevent possible lateral tipping of the machine, sleeves 162 (see Figs. 1 and 2) may be secured on the frame, the sleeves accommodating an extending balancing rod 164. The balancing rod 164 may be manually supported by a person walking along beside the machine as the same travels along the pipe, or by a wheel or the like. Suitable means are also provided to counterbalance the weight of the coating and wrapping devices. Such means may, for example, comprise weights 166 supported on a bracket or the like (not shown) on the forward end of the machine. In lieu of positioning the weights in the manner illustrated, the same may be supported by a suitable bracket below the pipe, the bracket being connected to the frame F of the machine. The latter method of mounting the weights has the advantage that it lowers the center of gravity of the entire machine to offset any tendency of the machine to tip laterally as well as longitudinally, the use of the balancing rod 164 being unnecessary.

When the machine is in position upon the pipe, the flaps 64 of the coating jacket are drawn into their proper relationship to the pipe by securing the ends of cables 66 to the springs 67. The flaps 64 to the rear of the coating device are suitably adjusted by means of the set screws 70 to clear the surface of the pipe a sufficient distance to provide a coating layer of the desired thickness.

Spools of wrapping material 168 are mounted upon the wrapping spindles 122. The positions of the spool supporting spindles are then adjusted on the stub spindles 120, for example, as illustrated in Fig. 1, so that the wrapping material drown from one spool leads the material drawn from the other by a distance slightly greater than the width of the wrapping material. When the above adjustments are made each spool of wrapping material will apply successive overlapping convolutions of the wrapping material to the pipe and the wrapping material supplied from one spool will entirely overlie that supplied from the other spool.

The amount of overlap between adjacent convolutions of the wrapping material supplied from each spool may, of course, be predetermined by proper selection of gear 112. For each adjustment of the speed of movement of the machine relative to the speed of rotation of the wrapping head it will be understood that the axes of the wrapping supply spools should be angularly adjusted, as permitted by the universal connections between the pins 118 and stub spindles 120, to properly direct the wrapping material to the pipe.

After the machine is mounted upon the pipe and the adjustments of the coating and wrapping devices are made to secure the desired thickness of coating and type of wrapping, the motor M is started and coating material is supplied to the hopper C. Engagement of the clutch 24

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causes rotational movement of the traction wheels 14 and 18 and also rotation of the wrapping head about the pipe. Coating material flows from the hopper through the orifice therein and floods onto the pipe where it is smoothed to a desired and predetermined thickness by the flaps 64, the wrapping material being laid directly in this coating. Upon exhaustion of the wrapping material on the spools, the machine is stopped by disengagement of the clutch 24 and the exhausted spools removed and new spools supplied without changing the previously determined tension on the wrapping. It will be noted that due to the driving of the pump 84 from the main shaft 20 of the motor, disengagement of the clutch 24 will not affect operation of the pump, and consequently, coating material, flowing from the hopper 58 to the bottom of the coating housing 62 and from thence to the sump 80, will be returned by the pump to the hopper 58. Thus, stoppage of the machine in its traveling and wrapping operations does not result in exhaustion of the coating from the hopper, irrespective of the length of the stoppage, the machine being in readiness for continued operation at all times.

The provision of driving means for all four of the driving traction wheels 14 and 18 insures against slippage of the traction wheels relative to the pipe, whereby the desired relationship between the travel of the machine and the rate of wrapping will be maintained and a tight and smooth wrapping be applied.

Referring now to Fig. 5, a pipe coating and wrapping machine of the present invention arranged for stationary operation is illustrated. The pipe coating and wrapping machine is in all substantial details identical with that previously described, except in this instance the balancing devices may be omitted and the machine supported in fixed position by means of standards or the like 170 suitably adjustably secured, as at 172, to the frame F of the machine. Roller supports 174 are supplied for the pipe. In the operation of the device, the standards 170 are adjusted to bring the traction wheels 14 and 18 into contact with the surface of the pipe, the latter resting on the supports or cradles 174. The pipe is supplied in relatively short lengths and is pulled through the machine by the action of the traction wheels 14 and 18. In this operation the coating and wrapping heads operate in precisely the same manner as when the machine is traveling along the pipe.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves to those skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. A combination pipe coating and wrapping machine adapted for longitudinal movement relatively to a pipe or the like, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with a pipe, a motor on said frame and arranged to drive said traction wheels, means for applying a coating material in a uniform layer to said pipe, said means including a pump driven from said motor and independently of the drive of said traction wheels for returning coating drained from the pipe to a coating supply, means for applying wrapping material to said pipe over said coating layer, and means operable from said motor for driving said wrapping means around said pipe in timed relationship to the movement of said frame on said pipe.

2. A combination pipe coating and wrapping machine adapted for longitudinal movement relatively to a pipe or the like, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with a pipe, a motor on the frame, a shaft driven from said motor under clutch control, means for driving said traction wheels from said shaft, a wrapping head carried by said frame for rotation around said pipe, means for rotating said wrapping head in timed relationship to the drive of said traction wheels, said last-named means being driven from said shaft, a coating applying device supported on said frame and including a pump for returning coating drained from the pipe to a coating supply, and a drive for said pump, said drive being operated from said motor independently of the operation of said clutch control.

3. A combination pipe coating and wrapping machine adapted for longitudinal movement relatively to a pipe or the like, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with a pipe, a motor on said frame, a shaft driven from said motor under clutch control, means for driving said traction wheels from said shaft, a wrapping head carried by said frame for rotation around said pipe, means for rotating said wrapping head in timed relationship to the drive of said traction wheels, a coating applying device supported on said frame and including a pump for returning coating drained from the pipe to a coating supply, a second shaft driven directly from said motor and independent of the operation of said clutch control, and an operating connection between said second shaft and said pump.

4. A combination pipe coating and wrapping machine adapted for longitudinal movement relatively to a pipe or the like, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with a pipe, a motor on said frame, a shaft driven from said motor under clutch control, a driving connection between said shaft and said traction wheels, a wrapping head carried by said frame for rotation around said pipe, a driving connection between said shaft and said wrapping head, a coating applying device supported on said frame and including a pump for returning coating drained from the pipe to a coating supply, a second shaft driven independently of said first-mentioned shaft from said motor and under clutch control, and an operating connection between said second-mentioned shaft and said pump.

5. A combination pipe coating and wrapping machine adapted for longitudinal movement relatively to a pipe or the like, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with a pipe, a motor on said frame, a shaft driven from said motor under clutch control, a driving connection between said shaft and said traction wheels, a wrapping head carried by said frame for rotation around said pipe, a driving connection between said shaft and said wrapping head, a coating applying device supported on said frame and including a supply hopper, a coating chamber, a sump arranged to receive drainage from said coating chamber, and a pump having

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an intake side in communication with said sump and an outlet side in communication with said hopper; and a drive for operating said pump from said motor, said drive being independent of the operation of said clutch control.

6. A wrapping head for pipe wrapping machines adapted for longitudinal movement relatively to a pipe or the like, said head comprising a ring gear to be mounted for rotation around a pipe, a plurality of substantially equally spaced stub spindles supported from said ring gear by means constructed and arranged to permit their angular adjustment relative to a face of the ring gear, extending threaded portions on said stub spindles, wrapping material supporting sleeves including internally threaded sockets receiving said threaded portions to adjustably position said sleeve relatively to said ring gear, and means for locking said sleeves in adjusted position.

7. A wrapping head for pipe wrapping machines adapted for longitudinal movement relatively to a pipe or the like, said head comprising a ring gear to be mounted for rotation around a pipe, a plurality of pins carried by said ring gear, stub spindles connected by universal joints to said pins and each including an extended threaded portion, wrapping material spool supporting sleeves adjustably threaded on said threaded portions, and means for locking said sleeves in adjusted position, whereby wrapping material spools mounted on said sleeves may be adjusted angularly and axially relatively to said pipe.

8. A wrapping head for pipe wrapping machines adapted for longitudinal movement relatively to a pipe or the like, said head comprising a ring gear to be mounted for rotation around a pipe, a stub spindle carried by the ring gear, a sleeve adjustably mounted on said stub spindle, a spool for wrapping material on said sleeve, and means for applying adjusted resistance to the rotation of the spool and permitting the removal and replacement of said spool without alteration of said adjustment, said last-named means comprising a member mounted on an end of said sleeve, a retractable latch secured to the sleeve confining the member on the sleeve, a brake shoe carried by the member and axially movable thereon, spring means for urging said brake shoe against an end of said spool, and an adjusting nut mounted on said member controlling the compression of said spring means.

9. A wrapping head for pipe wrapping machines adapted for longitudinal movement relatively to a pipe or the like, said head comprising a ring gear to be mounted for rotation around a pipe, a stub spindle carried by the ring gear including an extended threaded portion, a wrapping material supply spool sleeve mounted for longitudinal adjustment on said threaded portion, means for locking said sleeve in adjusted position on said stub spindle, a wrapping supply spool removably and rotatably mounted on said sleeve, and means for applying adjusted resistance to the rotation of the spool, the mounting for the spool being constructed and arranged to permit removal and replacement of the spool without altering the adjustment of said resistance applying means.

10. A wrapping head for pipe wrapping machines adapted for longitudinal movement relatively to a pipe or the like, said head comprising a ring gear to be mounted for rotation around a pipe, substantially equally spaced stub spindles carried by the ring gear, sleeves adjustably mounted on said stub spindles, spools of wrapping material on said sleeves, and means for applying adjusted resistance to the rotation of each spool, the last-named means comprising a brake carrying member detachably mounted on an end of said sleeve, a retractable latch confining said member on the sleeve, an axially movable brake shoe on said member, and spring means for urging said brake against an end of said spool.

11. A wrapping applying device to be rotated around a pipe comprising a spool of wrapping material, a mounting for said spool comprising a sleeve, a member mounted on an end of said sleeve and retained thereon by a retractable latch, a brake shoe carried by the member and arranged for limited axial movement thereon, an adjusting nut threadedly mounted on said member, and a spring confined between said brake shoe and said nut.

12. A pipe wrapping machine for traveling movement on an extending pipe, said machine comprising a frame, traction wheels carried by said frame and arranged for driving engagement with the pipe, a motor on said frame, means for driving said traction wheels from said motor, a relatively narrow gear in the form of a ring, a plurality of rollers supported from said frame and located interiorly of and carrying the gear, cooperating means on said gear and rollers to maintain said gear in operative position on said rollers, a mounting for a supply of wrapping material, said mounting being supported at one end by said gear and projecting from a face thereof and including an unsupported end, and means driven from said motor for rotating said gear on said rollers.

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