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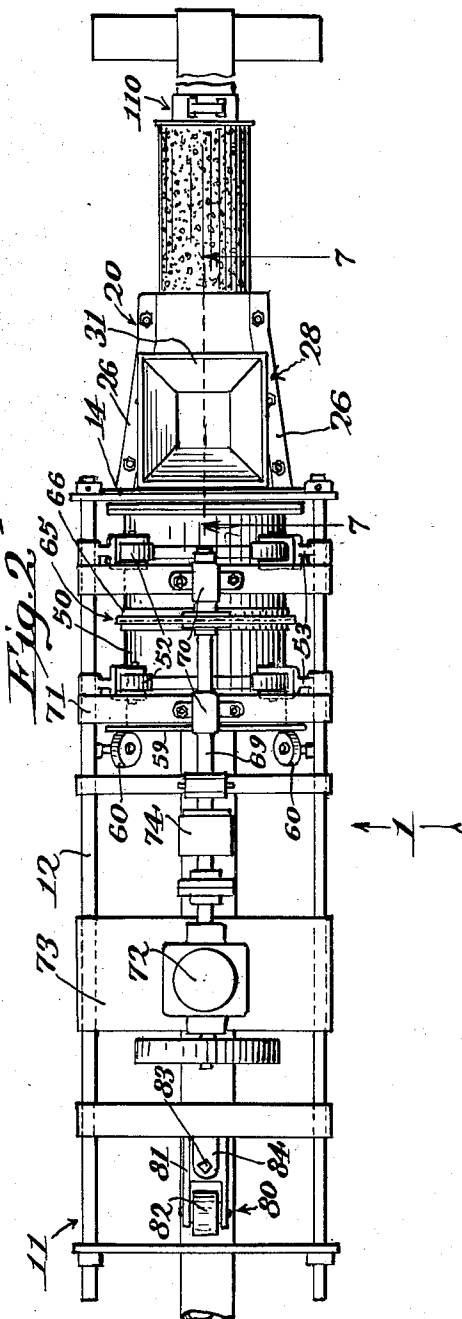
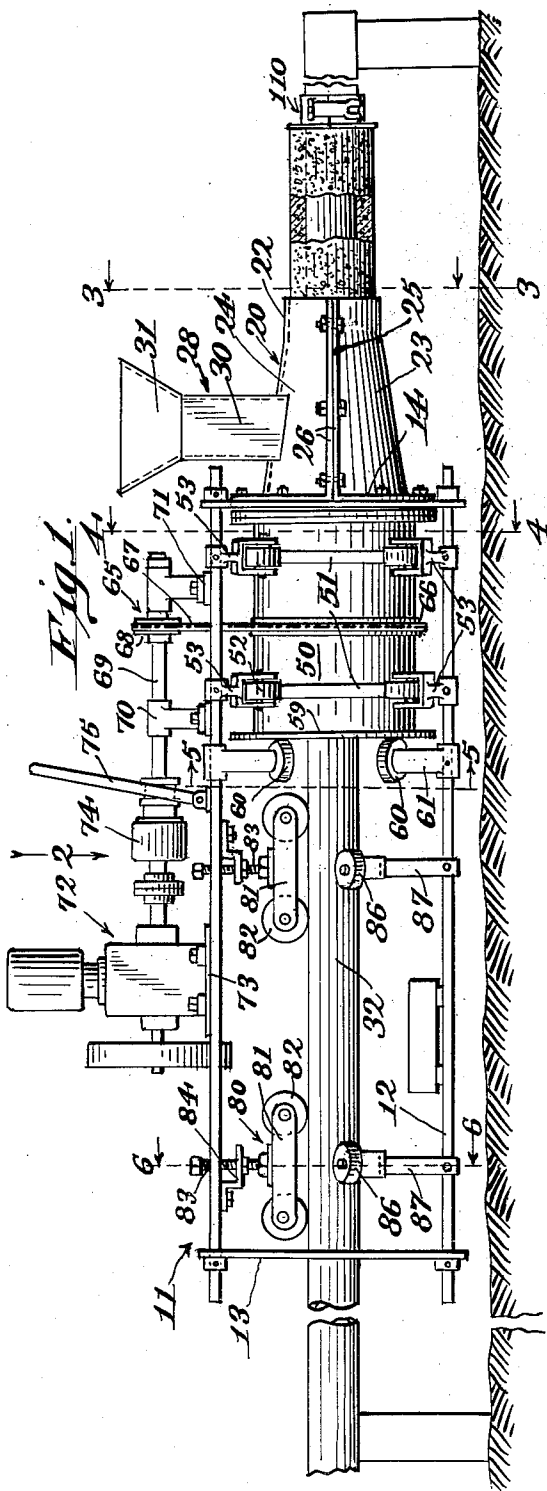
S. C. LINES

2,236,757

CONCRETE PIPE COATING MACHINE AND METHOD

Filed Dec. 28, 1936

3 Sheets-Sheet 1



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Fig. 3.

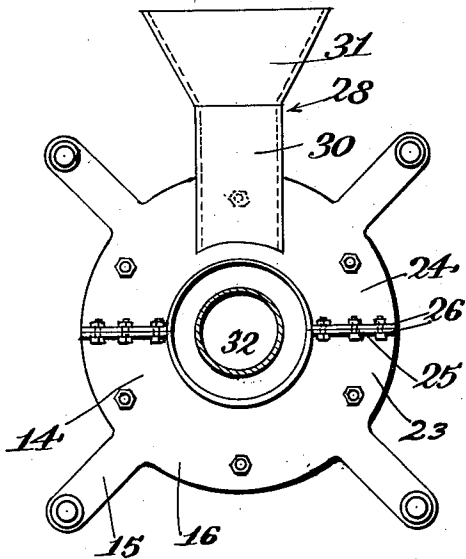


Fig. 4.

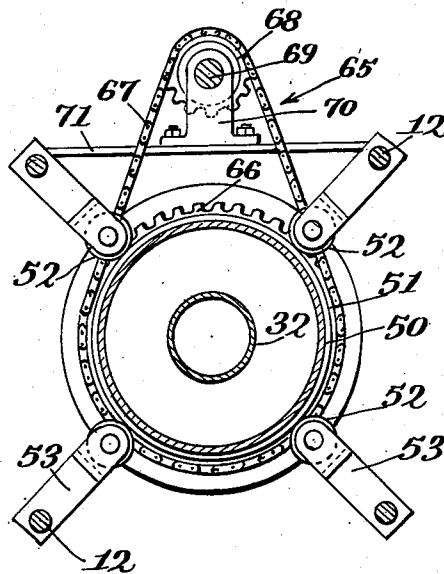


Fig. 5.

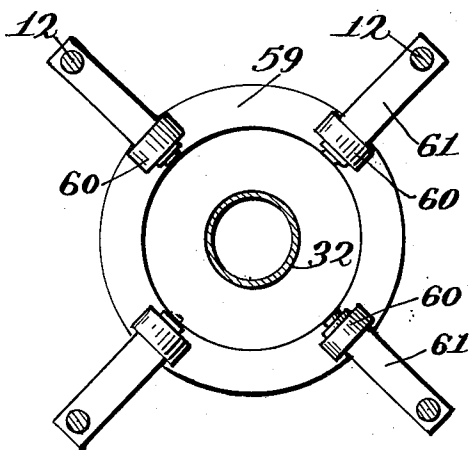
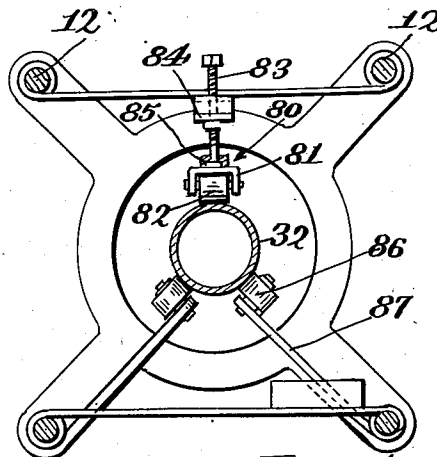


Fig. 6.



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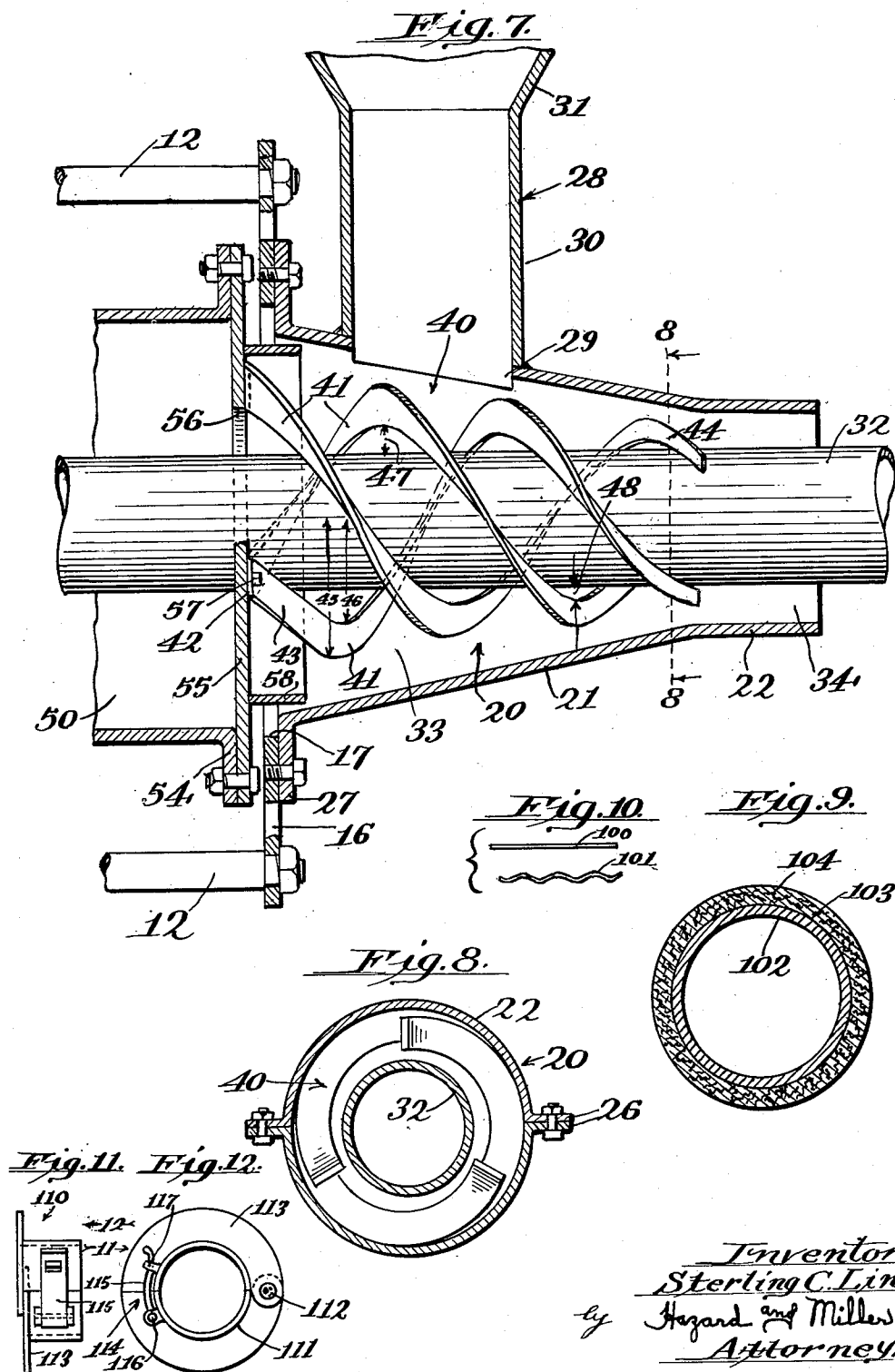
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,236,757

CONCRETE PIPE COATING MACHINE AND METHOD

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23 Claims. (Cl. 25—38)

My invention relates to a machine for applying a coating such as Portland cement concrete or other equivalent self-hardening composition to a pipe in a progressive manner to form a complete or annual coating or covering on the pipe. In this type of applying coatings, the machine with the applied coating may either advance along a stationary pipe or the pipe may be moved through the machine at the same rate that the coating is applied. My invention also comprehends the method of operation by which the coating material is poured around the pipe and then worked to thoroughly encircle such pipe and be compacted or compressed in a radial direction as well as longitudinally of the pipe so that the coating material will have a bond with the pipe and adhere thereto and the composition of the coating be bound and cemented together. One of the features of the present invention involves the thorough working and compressing of the material so that all air is forced away from the pipe to give a close contact of the coating with the pipe for obtaining the desired bond and also whereby the external atmospheric pressure is operative to retain the coating on the pipe while it is setting and hardening.

An object and feature of my invention involves the use of a hollow receptacle having a molding form open at both ends through which the pipe extends together with a hopper or equivalent structure by which the concrete or the coating composition is poured to surround the portion of the pipe within this hollow receptacle. My invention further comprehends the use of moving and operating devices working in the receptacle and the molding form and surrounding the pipe so that the concrete or other coating material is carried completely to the underside of the pipe and worked longitudinally towards a tapering molding form terminating in a cylindrical contracted throat. This throat regulates the thickness of the coating as to the pipe, the pipe being maintained centered with the molding form and the throat.

A further object and feature of my invention resides in working the concrete or other coating by means of a helical screw or a combined helix and spiral which is rotated and thus operates to assure a complete embedding of the pipe in the coating material and to work and thrust this coating material longitudinally of the pipe through the molding form and the throat. Another characteristic of my invention is that the helix is not connected to any rigid cylindrical structure surrounding the pipe and spacing the

helix from the pipe, but the inner edge of the helical screw is itself spaced from the outside or periphery of the pipe and hence at no point directly contacts the pipe. Although the inner edges of the helical screw are spaced from the pipe, the rotating action of the screw together with the tapering molding form and the throat cause a radial compacting of the coating material and a working of this longitudinally. This introduces an internal movement of the various portions of the composition thereby forcing any entrapped air outwardly and producing a dense mass of the coating material which adheres to the pipe which is preferably of metal and also to the portions of the coating which have already been forced through the molding form and the throat.

A further feature of my invention relates to the construction and mounting of the helical screws, these being arranged in a multiple number surrounding the pipe and preferably have a pitch greater than the diameter of the pipe so that each screw may be placed on the pipe crosswise and then turned to surround the pipe. Each helix preferably has slightly over one complete turn. The rearmost ends are secured to a rotating drum or the like which also surrounds the pipe and is driven from an engine.

Another feature of my invention relates to the general mounting of the machine in which a substantially longitudinally extending frame is utilized supported on the pipe by dollies or other equivalent devices. These give the complete support to the molding form, throat, hopper and the screws so that no steadying dollies or rolls operate on the finished coating on the pipe. Where the machine is made up to travel longitudinally on a stationary pipe reactive to the end thrust on the concrete coating is sufficient to give a forward motion to the machine as a whole.

A further object and feature of my invention comprises a manner of reinforcing the pipe coating while the plastic coating such as concrete is being applied to the pipe. This procedure consists of mixing with the batch of concrete short lengths either of straight or crimped wire of suitable gauge so that these are thoroughly mixed with the aggregate. The length of these wires depends on the size of the diameter of pipe and the thickness of coating but a length of 3 to 6 inches is usually satisfactory. The aggregate with the wires therein is deposited through the hopper and chute and thus falling into the receptacle where it undergoes the mixing action due to the rotating helical screws. The action

of these screws causes the short lengths of wire to be more or less directed into a circumferential arrangement that would be embedded in the composition of the coating between the pipe and the outside of such coating. These wires arrange themselves in a more or less irregular manner but have usually a considerable overlap between contiguous wires. This arrangement is probably due to a small combing action of the helical screws in catching for instance, the end portion of a wire and trailing this around the pipe while the composition with the wires is pushed towards the throat at the contracted end of the molding form. These short lengths of wires being positioned more or less circumferentially in the coating materially increase the strength resisting collapsing compression or bursting expansion. I find that however a small percentage of the wires are arranged more or less longitudinally of the coating and these tend to give a longitudinal strength. Where the coating is applied over old pipes which either have perforations or readily rust, through the reinforcing of this type materially adds to the strength of the coating. Of course it will be understood that a reinforcing fabric or the like may be placed around the pipe prior to such pipe passing through the machine and such fabric becomes embedded in the coating.

In my invention for putting a coating on a long length of pipe in field work where it is necessary to pass over connecting flanges, rivets or the like, it is necessary to have the material working screws spaced from the outside of the pipe. However in shop work where lengths of pipe are coated and these are of uniform diameter, the inner edges of the blades of the screws may contact the pipe. It is however only desirable to have the contact adjacent the outer end of the screws. Another characteristic of my invention is that the screws extend through the tapered molding form and carry the material into the cylindrical throat so that after the coating in a throat leaves the ends of the screws there is no further working or deformation of this coating.

My invention is illustrated in connection with the accompanying drawings in which:

Fig. 1 is a side elevation of the machine taken in the direction of the arrow 1 of Fig. 2, this showing the machine operating on a fixed pipe in which the machine moves longitudinally as the coating is applied.

Fig. 2 is a plan taken in the direction of the arrow 2 of Fig. 1.

Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 1 in the direction of the arrows.

Fig. 4 is a vertical transverse section on the line 4—4 of Fig. 1 in the direction of the arrows.

Fig. 5 is a vertical transverse section on the line 5—5 of Fig. 1 in the direction of the arrows.

Fig. 6 is a vertical transverse section on the line 6—6 of Fig. 1 in the direction of the arrows.

Fig. 7 is a detail vertical longitudinal section on the line 7—7 of Fig. 2 taken in the direction of the arrows, the helical screws being shown however in elevation.

Fig. 8 is a detail vertical transverse section on the line 8—8 of Fig. 7 in the direction of the arrows.

Fig. 9 is a diagram of a cross section of a pipe with the coating having a reinforcing of short lengths of crimped wire, the wire being indicated in an irregular manner.

Fig. 10 is an elevation showing two forms of

short wire reinforcing pieces, one being straight and the other crimped.

Fig. 11 is a side elevation taken in the direction of the arrow 11 of Fig. 12 of a clamping thrust collar which may be attached to a pipe against which the coating is compacted in starting a length of coating of a pipe.

Fig. 12 is an end elevation taken in the direction of the arrow 12 of Fig. 11.

In the machine assembly I employ a machine frame 11. This has longitudinal beam members 12 connected by straps 13 at the forward end and a rear closure plate 14 (note Fig. 3). This has radial arms 15 connected to the beams and a plate 16. This has a large circular opening 17 (note Fig. 7). A hollow receptacle designated 20 for the composition has a molding form structure 21 and a contracted throat 22 (note Fig. 7). The combined molding form and throat has a lower section 23 and an upper section 24 connected by a horizontal joint 25 with bolted flanges 26 (note Figs. 1, 2 and 3). These each have a flange 27 secured by bolts to the rear end plate 16. A hopper and chute assembly 28 for the composition is connected to the upper part 24 of the molding form, this having an opening 29 to which the chute 30 is connected, there being a flared hopper 31 at the top. It will be noted by reference to Figs. 2 and 3 that the chute may extend transversely, preferably beyond the diameter of the pipe, such pipe being indicated by the numeral 32. Thus the molding form forms a tapered annular space 33 surrounding the pipe so that concrete or other composition material when deposited through the hopper and chute spreads on both sides of the pipe and also spreads longitudinally of the pipe. The throat structure 22 is preferably cylindrical on the inside surface and thus forms an annular space 34 at the throat giving the finished thickness to the coating composition.

The working and compressing assembly 40 comprises centrally open helical screws 41 of which one or more may be used. These screws have a pitch greater than the diameter of the pipe to be coated. At the base end each screw is provided with a flange 42 and has the widest portion 43 adjacent the base and tapers to a narrower portion 44 adjacent the tip end. Also the radial distance of the outside edge 45 of the screw is greater adjacent the base than the tip portion, as is also the inner radius 46. This causes the portion of the screws adjacent the base to have a greater spacing indicated at 47 between the outside of the pipe and the inside of each screw than adjacent the end portion as indicated by the measurement 48. However it will be noted that these helical screws do not contact the pipe at any position. The curvature is a helix slightly spiraled inwardly, the inward spiraling thus conforming somewhat to the cone shape of the molding form 23.

The driving mechanism for the screw utilizes a drum 50. This has annular tracks 51 supported on rollers 52 mounted on radial arms 53, the arms being attached to the beams 12. These arms may be adjustable longitudinally of the beams and also radially to properly center the drum. The drum is illustrated as having an outwardly turned flange 54 at its rear end (note Fig. 7) to which is connected a head plate 55, such plate having a circular opening 56 to accommodate the pipe to be coated and it is to this plate that the helical screws are bolted as indicated by the bolts 57. A cylindrical neck 58 extends from the head plate 55 across the vertical joint where

the flanges 27 are bolted to the plate 16 and inwardly in the molding form a sufficient distance to prevent any of the composition charged into this molding form from working outwardly at the joint. A thrust end 59 is formed by an outwardly extending flange at the forward end of the drum and this is engaged by thrust rollers 60 mounted on radial arms 61, these arms being adjustably connected to the beams 12 and take up the end thrust due to the reaction of the screws on the material being worked.

The drive assembly designated by the numeral 65 employs a sprocket gear wheel 66 encircling the drum 50 and over this operates a sprocket chain 67 actuated by a driving sprocket 68. This is mounted on a drive shaft 69 supported in journal brackets 70 mounted on cross plates 71 secured to the two upper pair of longitudinal beams 12. An engine 72 is shown as mounted on a bed plate 73, also mounted on the upper beams 12, that is, on the frame 11. This is preferably of an internal combustion type and has a drive through a clutch 74 with a clutch control lever 75. The engine has the usual throttle and spark control and by means of the clutch, the drive may be transmitted or cut-off from the drum 50.

The machine frame as a whole is mounted on the pipe 32 by means of supporting dolly carriages 80. These are shown as two in number as to the main carriages and have a longitudinal frame member 81 with the dolly wheels 82 at the ends. An adjusting screw 83 extends downwardly through an adjusting bracket 84 connected to the frame 11, preferably the two upper beams 12, this screw having a socket connection 85 to the dolly carriages. These two upper carriages carry most of the weight of the machine frame, the drum, molding form, etc. There are steadying angular positioned dolly rollers 86 mounted on radial arms 87, these extending upwardly from the lower beams of the frame 11 (note particularly Figs. 1 and 6).

My invention also includes the manner of reinforcing the coating by incorporating short pieces of wire therein, such short pieces having been mixed with the aggregates. In Fig. 10 two forms of this wire are illustrated in which a short straight piece of wire 100 may be used or a short length of crimped wire 101. The length and the gauge of these wires depends manifestly on the diameter of the pipe being coated and the thickness of the coating together with the strength required of the coating and also the tensile strength of the wire. Wires of this type in comparatively short lengths as from 3 to 6 inches are mixed with the aggregates, as for instance when a concrete coating is being placed on a pipe and no particular attention is paid to their even distribution as when concrete is mixed in batches the distribution is substantially even in a batch.

The concrete with the wire reinforcement pieces is deposited through the hopper 31, the chute 30 into the molding form surrounding the pipe. The action of the helical screws is operative to carry portions of the aggregate around the pipe and manifestly convey the wires with the aggregates. This action on the wires causes their arrangement generally in a circumferential direction as to the coating. The short lengths overlap more or less and while a portion of a wire may be in contact with the pipe and perhaps portions of other wires may show with a portion exposed at the outside of the coating after it has passed through the throat space 34, nevertheless the main bulk of these short wires is embedded in

the coating and they occupy, as above mentioned, a more or less circumferential relationship. Of course some of the wires become embedded in the concrete running lengthwise but these are a small number compared with the arrangement of the above of the reinforcement. The amount of wires to be inserted may be computed by placing a somewhat greater weight of wire in a batch to cover a particular length of the pipe than would be used if a made up reinforcement were used built around the pipe but this procedure involves no extra work in applying the reinforcement over that of applying concrete without any reinforcement. In Fig. 9 the coated pipe is indicated at 102, the outside surface at 103 and the general direction of the wires somewhat as indicated at 104.

In Figs. 11 and 12 I illustrate a thrust collar 110 which has a cylindrical divided sleeve 111 hinged together at 112, thus forming substantially half sleeve sections, each of which is provided with a radial flange 113. These flanges preferably overlap as shown in Fig. 11. A clamp 114 is formed by a clamping hook 115 pivoted at 116 to one of the half sleeves, the opposite part engages a lug 117. This lug gives a wedging action with the clamp so that the sleeve is tightly clamped around a pipe, the sleeve being made for different sized pipe. The flanges on the two half sleeves thus form an annular thrust surface for the end of the concrete coating on the pipe, where this is started from a position on a pipe and the thrust is not at a formerly formed section of the coating. A thrust collar such as this may be placed on the pipe adjacent a connecting joint or the like, the coating of the joint being finished by hand troweling or by a small mold.

A characteristic of my invention is that the helical screw blades 41 extend through the tapered molding form designated by the structure 21 and have their operating ends terminate slightly inside of the contracted cylindrical throat 22. This causes the blades to work and thrust the material into the throat but where the coating composition passes beyond the ends of the blades there is no working action on the coating either by the pressure of the blades or by the contraction due to the conical shape of the molding form but the coating conforms on the inside to the pipe with which it is relatively stationary and the outside is cylindrical due to the cylindrical throat 22.

For operating on a long length of pipe in field work where it is necessary to pass the machine over flanges, rivets or the like, it is necessary to have the inner edges of the blades spaced from the outside of the pipe to give sufficient clearance. However it sometimes happens that it is desired to coat definite lengths of pipe in shop work which are uniform in diameter from end to end. In this case the inner edges of the blades may contact or scrape on the pipe. This contact is preferably adjacent the end portions 44. It will be apparent that various modifications in construction can be used. For instance the rollers 52 instead of running on tracks such as 51 may operate in channel-like tracks and function therefore as thrust elements as well as supporting means for the drum in reference to the frame. It is also apparent that the dolly rollers 86 may be positioned to engage the side of the pipe so that the machine may be lifted over and lowered on the pipe to be coated. When this procedure is used to place the machine on the pipe, the drum may be made in two sections

and bolted in place after the machine frame is fitted over the pipe. This procedure can likewise be carried out in connection with the molding form, hopper and throat.

Various changes may be made in the details of the construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A pipe coating machine comprising in combination a molding form having an opening for reception of the coating composition, a throat structure connected to the molding form, the molding form and throat having an opening completely therethrough adapted for passage of a pipe to be coated, an extrusion means with radial openings in the molding form adapted to surround the pipe and to be embedded in the coating composition deposited through the opening of the molding form and means to operate the extrusion means to positively work and press the composition into contact with the pipe inside of the extrusion means and into the throat and means permitting relative movement of the molding form with the throat and the pipe to form a coating on the pipe.

2. A pipe coating machine as claimed in claim 1, the extrusion means being rotatable to have a rotating action around the pipe between the pipe and the molding form and thereby exert a working action on the composition circumferentially of the pipe inside of the extrusion means as well as exerting a pressure to force the composition into the throat.

3. A pipe coating machine comprising in combination a non-rotatable molding form having a tapered wall, a throat structure connected to the smaller end of the molding form, the wall of the molding form having an opening for depositing of the composition, the molding form and throat having an opening from end to end to accommodate the pipe to be coated, a rotatable extrusion means with radial openings secured to a rotating structure and being in part located within the molding form, there being a space when a pipe extends through the molding form and throat between the walls of the form and the pipe with the extrusion means located in said space whereby on depositing a coating composition in the molding form such composition contacts the walls of the molding form, the section of the pipe therein and embeds the extrusion means, said extrusion means having a construction to work the coating in a circumferential direction relative to a pipe and in a longitudinal direction into the said throat and a means for mounting the pipe relative to the molding form and the throat to permit a relative longitudinal movement whereby the coating pressed through the throat remains stationary as to the pipe and adheres thereto.

4. A pipe coating machine as claimed in claim 3, the extrusion means comprising a helical type of screw connected at one end to the rotatable structure, said radial openings being between the convolutions of the screw.

5. A pipe coating machine comprising a non-rotatable molding form having a conically tapered wall with an opening at one side for depositing the coating composition, a throat forming structure at the small end of the molding form, the molding form and the throat having an opening from end to end to accommodate the pipe to be coated, a rotatable structure located at the large end of the molding form, a centrally

open screw of a helical type having one end secured to the rotatable structure, the molding form when a pipe extends therethrough being adapted to have an annular space between the pipe and the wall of the molding form whereby a coating composition deposited through the opening in the molding form wall substantially fills the molding form embedding the section of the pipe therein and the helical screw, the helical screw being adapted to work the composition circumferentially and longitudinally of the pipe and to force the composition into close engagement with the portion of the pipe extending through the throat and means to mount the pipe relative to the molding form and throat whereby a relative movement is developed between the molding form, the throat and the pipe whereby the composition at and beyond the throat remains stationary as to the pipe and adheres thereto.

6. A pipe coating machine as claimed in claim 5, the helical screw when supported on the rotatable structure having its inner edge at the central opening spaced from a pipe extending through the molding form.

7. A pipe coating machine as claimed in claim 5, the helical screw being in the form of a strip of metal with various portions of the strip being located in radial lines from the axial center of a pipe extending through the molding form and throat and the screw having a pitch and limited length such that the screw may be inserted as to its axis over the pipe in a transverse direction and then turned for attachment to the rotatable structure with the axis of the screw and the axis of the pipe coinciding.

8. In a pipe coating machine the combination of a stationary molding form having an approximately uniform taper of a conical form from a larger to a smaller end and having an opening in one side for deposit of the coating composition, a rotatable structure located at the large end of the molding form, said structure and the molding form having an opening from end to end for accommodation of the pipe to be coated, a centrally open helical screw secured at one end to the rotatable structure and adapted to have at least a partial turn around a pipe but to be spaced from a pipe extending through the molding form, the relation of the screw to the molding form and pipe being such that a composition deposited through the said opening is adapted to fill the molding form to contact the portion of the pipe extending therethrough and to embed the screw in such composition whereby on rotation of the rotatable structure the composition is worked circumferentially of the pipe and at the same time forced longitudinally of the pipe towards the small end of the molding form.

9. In a pipe coating machine as claimed in claim 8, the molding form being constructed of removable sections with a longitudinal joint and the screw having a pitch and limited length whereby the screw may be inserted over a pipe with the axis of the screw transverse to the axis of the pipe and then turned for attachment to the rotatable structure with the axis of the screw and the axis of the pipe coinciding.

10. In a pipe coating machine the combination of a stationary molding form having an approximately uniform conical taper from a larger to a smaller end, the form having an opening in one side with a hopper connected thereto, a rotatable structure located at the large end of the molding form, said structure and the molding

form having an opening from end to end for a pipe to be coated, a centrally located helical screw of an open ribbon type having a relatively wide base end secured to the rotatable structure, the tip end being positioned towards the small end of the molding form and being of narrower width than the base end, the screw being slightly spiralled inwardly whereby the distance from the inner edge of the screw adjacent the base to a pipe is greater than the distance from the inner edge to the pipe adjacent the tip end of the screw, the said hopper and molding form forming a receptacle for concrete with short lengths of reinforcing wire mixed therein with the concrete contacting the pipe extending through the molding form and embedding the screw, the said screw in rotation being adapted to work the concrete in a circumferential manner in reference to the pipe and lay the wires with the majority of such wires arranged in a somewhat circumferential manner around the pipe, the said screw also being adapted to exert a longitudinal pressure on the concrete at the small end of the molding form whereby the concrete coating leaving the molding form is stationary as to the pipe and adheres thereto and means to relatively advance the molding form with the rotatable structure relative to the pipe.

11. In a pipe coating machine as claimed in claim 10, the rotatable structure having one or more additional helical screws all of substantially the same shape secured thereto, each screw having a pitch and limited length of such relationship to the pipe whereby each screw may be inserted over the pipe with its axis transverse to the axis of the pipe and then turned to align the axis of the screw with the axis of the pipe.

12. A pipe coating machine having a machine frame, a carriage structure adapted to operate on a pipe to be coated and forming the full support for the machine frame on the pipe, said frame having a molding form fixed to one end of the frame, the molding form terminating in a cylindrical throat, such molding form having an opening on the upper side with a hopper connected thereto, a drum mounted in the frame for rotation, an engine on the frame, a drive from the engine to the drum, a central helical screw of an open ribbon type connected to one end of the drum and positioned in the molding form, the drum molding form and throat having an opening from end to end for passage of the pipe to be coated, the said screw being out of contact with the pipe, the said hopper and molding form forming a receptacle for coating material such as concrete with the screw embedded in the composition in the molding form whereby on rotation of the drum and the screw the composition in the molding form is worked circumferentially of the pipe and longitudinally thereof and extruded through the throat whereby the rate of advance of the machine frame relative to the pipe is such that the coating applied to the pipe remains stationary as to such pipe and adheres thereto.

13. In the method of coating a pipe with self-hardening cementitious composition comprising encasing a relatively short section of the pipe with a thick annular body of the coating composition, such composition directly contacting the pipe at such short section and being confined at its outer portion surrounding the pipe, working and pressing the thick annular body in a direction longitudinally of the pipe to be coated by pressures applied mainly from the portion

of the body remote from the place of adherence to the pipe, contracting said annular body in diameter and reducing its thickness by inward radial pressures substantially evenly distributed around the coating of the pipe and compacting the reduced annular body on the surface of the pipe, advancing the coating and the pipe at the same speed whereby the applied coating remains stationary as to the pipe and adheres to the pipe and maintaining the coating of substantially uniform thickness on the pipe.

14. In the method of coating a pipe as claimed in claim 13, while pressing the thick annular body longitudinally of the pipe working such body in a circular manner around the pipe whereby portions of the composition of the thick annular body are worked from their original position around the pipe and compacted against the surface of the pipe.

15. In the method of coating pipe with a self-hardening cementitious composition including a reinforcement of a multitude of short lengths of wire comprising embedding a relatively short section of the pipe in a relatively thick annular body of the coating composition with the wires included in such composition, the composition and the wires being in contact with the short section of the pipe and confined around the periphery of the pipe but said thick body with the wires forming a comparatively loose mass, working in such mass in a circumferential manner around the peripheral surface of the pipe and at the same time pressing the mass longitudinally of the pipe to be coated by pressures applied mainly from the portion of the annular body remote from the place of adherence to the pipe but also by pressures in the thick annular body, contracting said annular body in diameter and reducing its thickness by inward radial pressures substantially evenly distributed around the coating and the pipe and compacting the reduced annular body on the surface of the pipe, the circumferential working of the mass of the body positioning the wires mainly in a more or less circumferential direction around the pipe in the coating, advancing the coating and the pipe at the same speed whereby the applied coating remains stationary as to the pipe and adheres to the pipe and maintaining the coating of substantially uniform thickness on the pipe.

16. In the art described in which an open ended molding form has a pipe to be coated extending therethrough comprising embedding a relatively short part of the pipe located between the ends of the molding form with a self-hardening composition arranged in a relatively loose annular body around the pipe, by a rotating action concentric with the axis of the pipe compacting the composition immediately adjacent the pipe against such pipe and causing a circumferential packing and trowelling action of the composition more remote from the pipe, at the same time exerting a longitudinal working of the portion of the composition spaced from the pipe and decreasing the radial thickness of the annular composition body, reducing the thickness to a constant radius as to the pipe and evenly distributed around and longitudinally of such pipe, the operation continuing while the pipe advances at the same speed at which the coating packs thereon at one end of the confining structure, the applied coating remaining stationary as to the pipe and adhering thereto.

17. A pipe coating machine comprising in combination a molding form, there being a lon-

itudinal opening through the molding form for a pipe to be coated, a relatively rotatable supporting structure having its axis concentric with the molding form, one or more cantilever mounted open centered helical screws connected to said rotating supporting structure and having the inner edge at the central opening spaced from the pipe to be coated whereby a coating composition is worked circumferentially of the mold form and pipe as well as longitudinally to form a coating on the pipe, the pipe and the molding form being adapted for relative advancement for coating the pipe.

18. A pipe coating machine comprising in combination a molding form, there being a longitudinal opening through the molding form for a pipe to be coated, a relatively rotatable supporting structure having its axis concentric with the molding form, one or more cantilever mounted open centered helical screws connected to said rotating supporting structure and having the inner edge at the central opening spaced from the pipe to be coated whereby a coating composition is worked circumferentially of the mold form and pipe as well as longitudinally to form a coating on the pipe, the pipe and the molding form being adapted for relative advancement for coating the pipe, the helical screw or screws having a pitch and a limited length of about one convolution and of such relationship to the pipe whereby each screw may be inserted over the pipe with its axis transverse to the axis of the pipe and then turned to align the axis of the screw with the axis of the pipe.

19. A pipe coating machine comprising in combination a molding form with a throat structure connected thereto, there being a longitudinal opening through the molding form and the throat for a pipe to be coated, a rotatable head assembly, one or more helical screws attached thereto in a cantilever manner, there being a central opening through the screws, each screw having a pitch and a limited length of such relationship to the pipe whereby each screw may be inserted over the pipe with its axis transverse to the axis on such pipe and then turned to align the axis of the screw with the axis of the pipe prior to attachment to the head assembly.

20. In a pipe coating machine, the combination of a stationary molding form having a taper from a larger to a smaller end with an opening in one side for deposit of a coating composition, there being an opening through the molding form from end to end for passage of a pipe to be coated, a rotatable structure located at the large end of the molding form, one or more helical screws attached in a cantilever manner to the rotatable structure, the molding form being constructed of removable sections with a longitudinal joint and the screw having a pitch and limited length whereby the screw may be inserted over a pipe with the axis of the screw transverse to the axis of the pipe and then turned for attachment to the rotatable structure with the axis of the screw and the axis of the pipe coinciding.

21. In a pipe coating machine, the combination of a stationary molding form having a taper from a larger to a smaller end, the form having an opening in one side for deposit of the coating

composition, a rotatable structure located at the large end of the molding form and having an opening for the pipe to be coated, one or more centrally open helical screws attached to the rotatable structure in a cantilever manner, the screw being slightly spiralled inwardly from its base to its tip, all of the screws being of substantially the same shape and each screw having a pitch and limited length of about one convolution and of such relationship to the pipe whereby each screw may be inserted over the pipe with its axis transverse to the axis of the pipe and then turned to align the axis of the screw with the axis of the pipe.

22. In a method of coating pipe with a self-hardening composition comprising substantially embedding a relatively short section of the pipe with a relatively loose thick annular body of the coating composition, such composition directly contacting the pipe at said short section, confining such composition at outer annular portions except from one side continually feeding additional composition thereto, working the material of the loose annular body by a compressing action on the outer portions thereof with an annular motion around the axis of the pipe to move a portion of such loose body towards the surface of the pipe completely around its periphery and developing a compacting action of such pressed portions of the body on the pipe, in the same action moving particles of the composition circumferentially of the pipe and circumferentially of the particles compacted thereon, in the same operation and at the same time directing a longitudinal pressing motion of the composition and in the action contracting the annular body in diameter, reducing its thickness as it is compacted and evenly distributing the coating around the pipe to have a uniform thickness from the periphery of the pipe, advancing the coating and the pipe at the same speed whereby the applied coating remains stationary as to the pipe and adheres thereto.

23. In the method of coating a pipe having a thrust collar attached thereto with a self-hardening cementitious composition comprising encasing a relatively short section of the pipe with a thick annular body of the coating composition, such composition directly contracting the pipe at such short section and being confined at its outer portion surrounding the pipe, working and pressing the thick annular body in a direction longitudinally of the pipe to be coated by pressures applied mainly from portions of the body remote from the place of adherence to the pipe, contracting said annular body in diameter and reducing its thickness by inward radial pressure substantially evenly distributed around the coating of the pipe and compacting the reduced annular body on the surface of the pipe, developing an initial longitudinal pressure of the compacted coating on the thrust collar attached to the pipe to thereby advance the pipe with its coating at the same speed that the coating is applied and applying the coating at such a rate that when adherent to the pipe, such coating remains stationary as to the pipe and maintaining the coating of substantially uniform thickness on the pipe.

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