

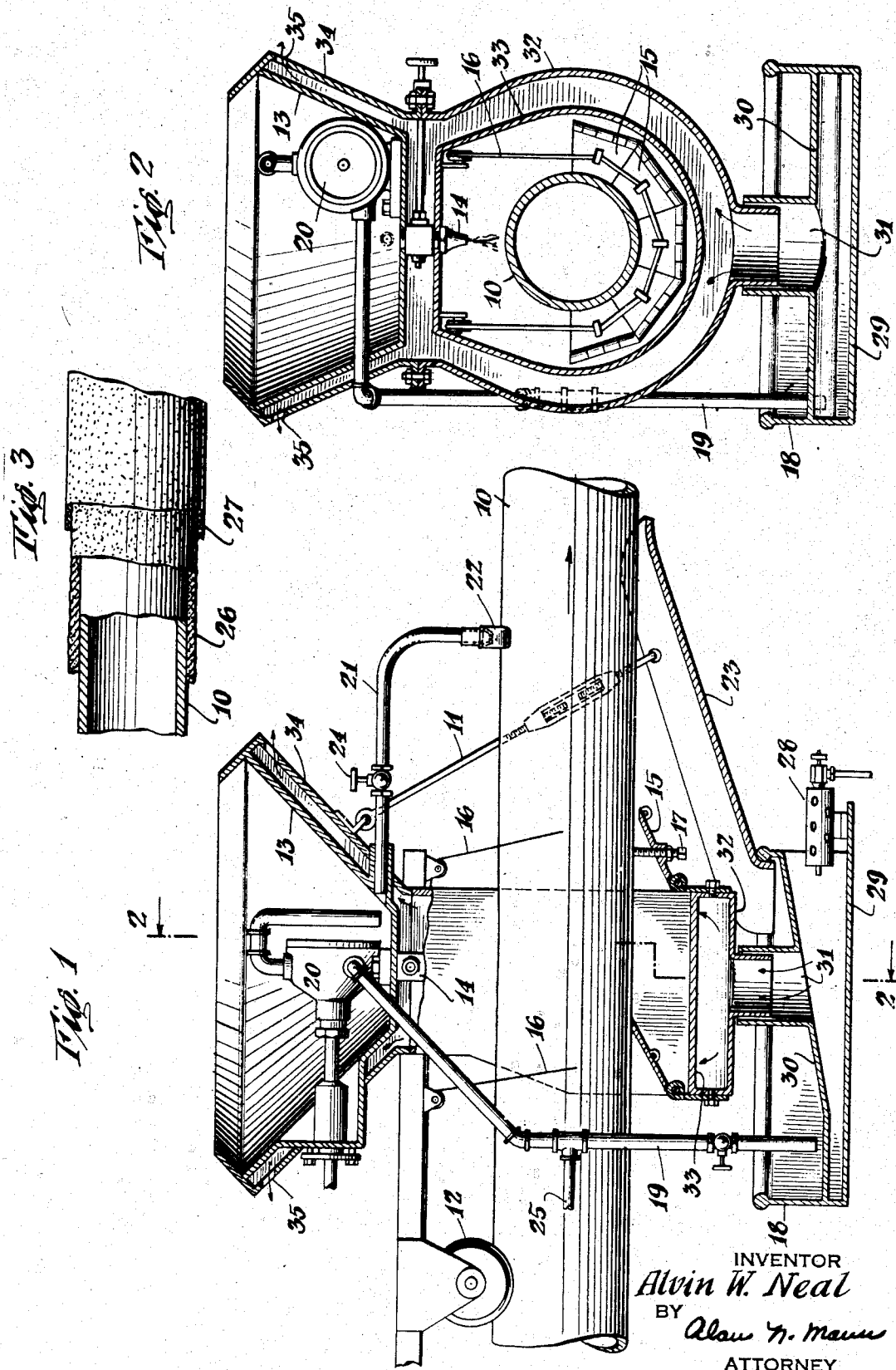
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MACHINE FOR COATING PIPE

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MACHINE FOR COATING PIPE

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This invention relates to a machine for coating a pipe and more particularly to the formation upon the pipe of a thick thermoplastic coating that has a satisfactorily smooth exterior surface and that is substantially free from pinholes and other flaws including those commonly known as "holidays."

In the art of the coating pipe, such as that to be used in underground pipe lines, it is customary to employ a machine which is supported by rollers resting upon the pipe and which, as the machine moves along the pipe, supplies the coating material at a position behind the supporting rollers. As the coating material, there is used ordinarily a thermoplastic material including as the base asphalt, pitch, tar, or the like, the coating sometimes including fillers, plasticizing agents, or other admixtures.

When such material is applied, imperfections appear in the layer of coating material. Thus, numerous pin-holes, air bubbles, or thin spots are frequently found in the coating layer. In fact, these imperfections are so common that there has been recommended the electrical testing of coated pipes, to show the positions of the imperfections by arcing through weak spots in the coating.

There has long been need of a convenient method of applying a two-layer coating, without the need of an intermediate layer of felt or other means to protect the coating first applied from injury by the supports for the machine, as the machine is again moved over the pipe in supplying the second coating.

Also, there has been need of a simple manner of smoothing the exterior of the material, to eliminate striations, grooves, or other irregularities of surface introduced during the application of the coating composition.

The present invention provides a machine for overcoming these difficulties and disadvantages in a machine for coating pipes with compositions of the kind described.

The invention makes possible flowing and spreading heated coating composition before it hardens over a previously applied layer of the composition and into flaws therein. In the preferred embodiment, the invention provides means for applying heated coating composition over a portion of an unheated pipe, spreading the resulting layer of applied material mechanically over at least the lower portion of the pipe, and then applying additional flowable coating composition, at a position removed from the place of application of the first layer, so as to allow some cooling

of the first layer before the additional material is applied.

The additional material readily wets the surface of the layer first applied and is quickly drawn thereover by the forced of surface tension and gravity. The layer of material first applied, having been cooled somewhat by the cold pipe, cools in turn the additional material and thus decreases the flowability before an excessive amount of the additional material drains away. As a result there is obtained not only penetration of the additional material within or spreading over the flaws of the original coating but also a relatively smooth exterior surface of the final layer of coating material.

The invention will be illustrated by description in connection with the attached drawing.

Fig. 1 is a side elevation of my machine partly in section;

Fig. 2 is a sectional view on line 2—2 of Fig. 1; and

Fig. 3 is a side elevation partly broken away for clearness of illustration of a pipe coated in accordance with the invention.

The present machine represents an improvement upon the machine described in U. S. Patent No. 2,194,268 issued to James D. Cummings on March 19, 1940, and entitled "Pipe coating device." Parts and details are the same as described in the said patent to Cummings, except as noted herein. The present machine differs from the machine of Cummings particularly in the provision of supplementary means, to the right in Fig. 1, for applying additional coating composition and means for collecting the drippings and run-off of the additional material and returning them to a receiver from which they are elevated to a position above the pipe, for re-use as coating material.

In the drawing, there are shown a section of pipe 10 to be coated and the pipe coating machine mounted upon the pipe.

The coating machine includes a supporting frame work mounted upon rollers 12 which rest upon the top of the uncoated portion of the pipe. The machine includes also a hopper 13 for the coating material, a nozzle 14 with suitable connections for delivering coating material from the hopper to the upper portion of the pipe 10, a spreading member or shoe 15 including a series of frusto-conical segments of rigid material, and a support 16 for the various parts of the spreading member.

The upper edges of the several segments of the spreading member are spaced at a predeter-

mined distance from the pipe 10, as by means of pins or screw bolts 17, the inner ends of which rest against the pipe; by their setting, these pins control the space between the pipe and the edges of the spreading elements, thus determining the thickness of the coating which is left on the pipe after the shoe has passed the position of coating. It will be noted that the shoe or spreading member extends only around the lower part of the pipe. If desired, however, the spreading member may constitute a ring (not shown) extending completely around the pipe, in accordance with the conventional construction of spreaders that are sometimes used.

Disposed below the spreader member is a receiver 18 constituting a reservoir for collecting material which overflows from the sides of the spreading member or otherwise passes downwardly. A tube in the form of pipe line 19, opening at its lower end in the reservoir and connecting at its upper end with pump 20, provides means for returning the liquid from the reservoir to the hopper 13 above the pipe 10.

The present improvement comprises supplementary means for supplying additional coating material. These means include the tube or pipe 21 for delivering the additional coating material, as from the reservoir 13 and through the spreading nozzle 22, to the upper side and mid-portion of the pipe. A drip pan or apron 23 extends on both sides of the position of application of the additional coating. This apron 23 receives the drippings and run-off from the additional coating and returns them, as illustrated, to the reservoir 13, so that they are combined with the material which is delivered through pipe 19 and pump 20 to the upper part of the machine. Valve 24 disposed in the tube 21 provides means for controlling the flow of the coating composition through the tube.

The apron 23 is supported upon the frame work of the machine, as by braces 11.

The pipe 25, which is shown only in part, provides an inlet for additional coating material as needed for the operation of the machine or an outlet from the reservoir 13.

A pipe coated by the machine described is shown in Fig. 3. The layer of coating material applied by nozzle 14 and spreader member 15 is indicated at 26, whereas the additional coating flowed upon layer 26 is denoted by 27.

Burner 28 is arranged to deliver a flame into a chamber defined by the metal member 29 disposed below the burner and the bottom 30 of the reservoir 18 previously described. This bottom 30 is provided with an outlet 31 for the products of combustion which rise between an outer casing member 32 and an inner casing member 33 of the machine, these casings being arranged suitably as illustrated and the space between the two casings being in communication with a space defined between an outer wall 34 of the said hopper and the inner wall of the hopper 13. Finally, the heated gases from the burner escape through spaced openings 35 adjacent to the top of the said hopper.

The operation of the coating machine will be largely evident from the description that has been made. At the start there is chosen the coating composition to be applied. The coating composition should be one that is flowable as applied but adapted to be hardened quickly by contact with the cold pipe 10. For this purpose there are used thermoplastic compositions that are applied in the heated or warmed condition

to the pipe in substantially unheated condition.

Among such compositions that are suitable are those having the general properties stated and that are commonly used in the coating of pipes to prevent corrosion, as for example, the so-called pipe coating enamels. These enamels ordinarily have asphalt, tar, or pitch, as the base or major ingredient with the admixture of a binder or filler material and suitably also a plasticizer.

The by-product tar from the manufacture of illuminating gas or wood pitch are preferred as the base materials, because of the relative toughness and other desirable properties of coating compositions including such tar or pitch.

As the filler, there may be used any of those solid materials that are usual in pipe coating enamels, as for example, mica, slate powder, or asbestos fines.

If a plasticizer is used, it is a material adapted to extend the range of flowability of the base material, so that there is avoided a rather sudden change from a non-flowable almost solid material to a free-flowing liquid. If asphalt is used as the base, the addition of a plasticizer is not so important, because the asphalt alone softens gradually, over a wide range of temperature. With tar or pitch, on the other hand, the change from practically non-flowable solid to a thin liquid is relatively sudden, so that the use of a plasticizer is important, to widen the temperature range during which the material is a viscous liquid. The plasticizer used is one of those that is conventional for the purpose.

The proportions of materials, if any, added to the asphalt, tar, pitch, or like base may be varied in accordance with the consistency desired in the coating material and in accordance with usual practice.

The coating composition to be used is placed, either in the cold or preheated condition, upon the member 30 of the receiver at the bottom of the machine, or in preheated condition in the reservoir 13. The pump 20 is started and the burner 28 placed in operation.

Relative motion between the coating machine and pipe 10 is initiated, longitudinally with respect to the pipe 10, the coating machine during this motion being supported upon the bare pipe by rollers 12 and others (not shown).

The movement of the pipe with respect to the machine is to the right in Fig. 1, ordinarily the pipe being supported in fixed position and the machine being pushed along the pipe.

During this movement and the operation of the machine as described, the coating material is delivered by nozzle 14 to the pipe and allowed to flow downwardly around the pipe and into the shoe 15 including the spreader elements. The shoe soon becomes filled with the composition and spreads it over the lower portion of the pipe.

The heated coating composition so applied is cooled by the contact with the pipe 10, as the relative motion between the machine and pipe proceeds.

The line 21 delivers additional coating material to the pipe, by nozzle 22. No spreading member is necessary here, the additional coating composition under the influence of surface tension and gravity spreading readily over the layer first applied, the excess of the additional composition appearing as run off or drippings and being collected in the apron 23 below the pipe 10.

The apron delivers material falling on the apron to the reservoir 13. The run off and drippings from both the first and the second coat-

ing operations are returned from the reservoir through the pipe 19 to the pump 20, for re-use.

After the application of the second coating, the coated pipe is ready for use. The coated pipe may be wrapped, however, with felt as by means of a conventional pipe wrapping machine (not shown), if the wrapping is desired.

To understand the advantages obtained by the application of the flowed-on or additional coating material, there should be appreciated some of the weaknesses and disadvantages of single layer coatings on pipes, applied, for example, with means similar to the nozzle 14 and spreading member 15.

In applying the first and usually the only layer of coating material, the thickness of coating is controlled as stated by the spacing pins 17. As the machine moves along the pipe, these pins bear upon the pipe. The spreading elements following these pins tends to close up and heal the grooves which are necessarily formed in the coating layer by the pins. This closing up and healing of the grooves is not always completely effective.

Furthermore, other irregularities or striations are present in the layer of coating material. Most important are "holidays." These take the form of pin-holes, due, for instance, to the initial inclusion and subsequent breaking of air bubbles or to thin spots in the coating introduced accidentally by other means. Since these holidays ordinarily require hand retouching of the coating, a ring electrode has been used to detect the positions of them. Thus, a ring electrode is moved over the coated pipe, at a predetermined spacing from the pipe, the metal of the pipe and the electrode being maintained at a very high potential difference. Indicating means, such as a light, signal the position of dielectric weakness and consequent arcing between the electrode and the metal of the pipe.

When the additional coating material is applied by tube 21, this material quickly wets and spreads over the first coating which has then become somewhat hardened by partial cooling, as the position of application of the initial layer and the additional material are spaced at substantial distances apart and there is an appreciable though short interval of time between the moments of application of coating material at the two positions. The additional coating material flows into or over the holidays, closes the grooves, and spreads as a relatively smooth coating over the exterior of the layer first applied.

The result is a pipe coating that contains relatively few if any holidays and that is satisfactorily thick and of desirably smooth exterior.

It will be understood that the details given are for the purpose of illustration and that variations within the spirit of the invention are intended to be included within the scope of the appended claims.

What I claim is:

1. A pipe coating machine comprising means for applying a layer of a flowable and quickly hardenable coating composition to a pipe, means for causing relative motion between the said machine and pipe, longitudinally with respect to the pipe, and supplementary means for applying additional coating composition over and directly upon that first applied, the said supplementary

means including a source of supply of the coating composition and a tube connected with the source of supply, the tube opening above the mid-portion of the said pipe at a part thereof subsequent to the position of application of the said layer, so that the coating composition is delivered by the said tube upon the layer first applied immediately after said first layer hardens to cling to the pipe, flows downwardly therearound, and forms a smoothing coat over the said layer.

2. In a pipe coating machine comprising means for applying a layer of heated thermoplastic flowable coating composition to a pipe, a spreading member for distributing the applied composition over the lower portion of the pipe and means for causing relative motion between the said machine and pipe, longitudinally with respect to the pipe, the improvement comprising supplementary means for applying additional heated coating composition over the layer first applied, the said supplementary means including a source of supply of the heated coating composition and a tube connected with the source of supply and opening above the mid-portion of the said pipe, at a part thereof subsequent to the position of emergence of the pipe from the action of the spreading member, so that the coating composition is delivered by the said tube upon the layer first applied, immediately after said first layer hardens to cling to the pipe, flows downwardly therearound, and forms a smoothing coat over the said layer.

3. A pipe coating machine comprising means for applying a flowable thermoplastic coating composition as a layer around a cold pipe, means for supporting the machine upon the pipe in such manner as to make the machine movable lengthwise of the pipe, means for delivering additional coating composition of the kind described upon the upper part of the layer of composition first applied immediately after said first layer hardens to cling to the pipe, so that the additional coating composition flows downwardly around the said layer, a catch member disposed below the pipe and extending on both sides of the position of dripping of the applied additional composition, means for returning the collected drippings to a receiver, and means for returning the collected material from the receiver to a position above the pipe, for application to the pipe.

4. A machine as described in claim 3 including means for heating the coating composition to be applied to the pipe, the position of application of the additional coating being spaced a substantial distance from the position of application of the original layer, so that there is cooling of the layer by the cold pipe and attendant hardening of the coating composition before the additional composition is applied.

5. A machine as described in claim 3 including spreading means acting upon the said layer of coating material first applied, so as to spread the said composition over the lower portion at least of the pipe, the means for applying additional coating composition including a tube delivering the additional composition through a spreading nozzle upon the pipe to be coated so that the additional composition flows downwardly around the said layer and to the said catch member for collecting drippings.

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