

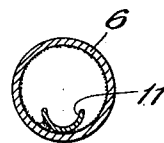
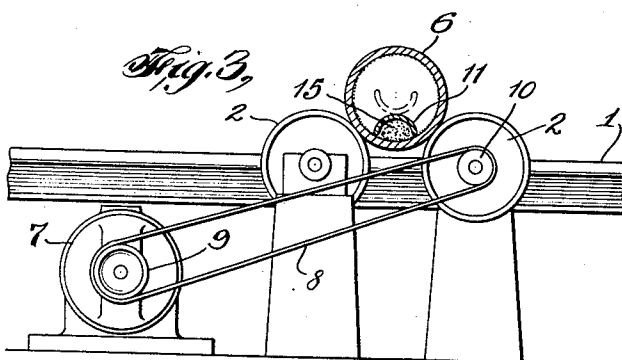
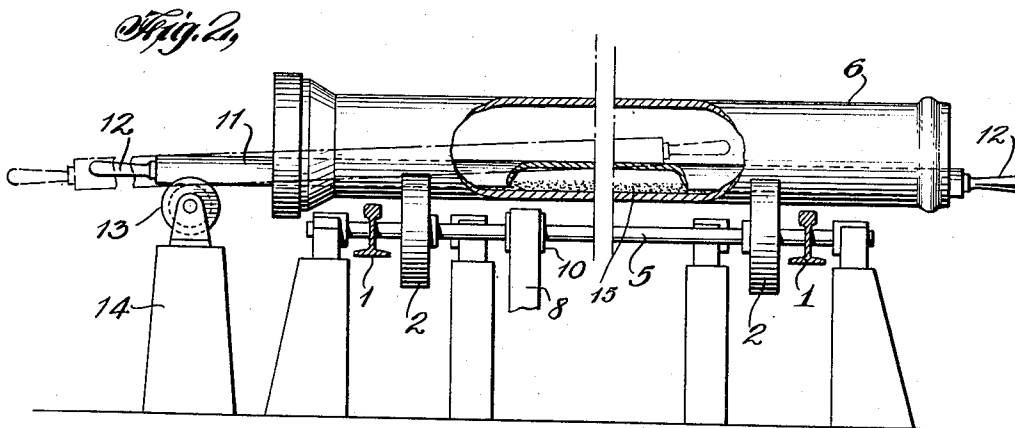
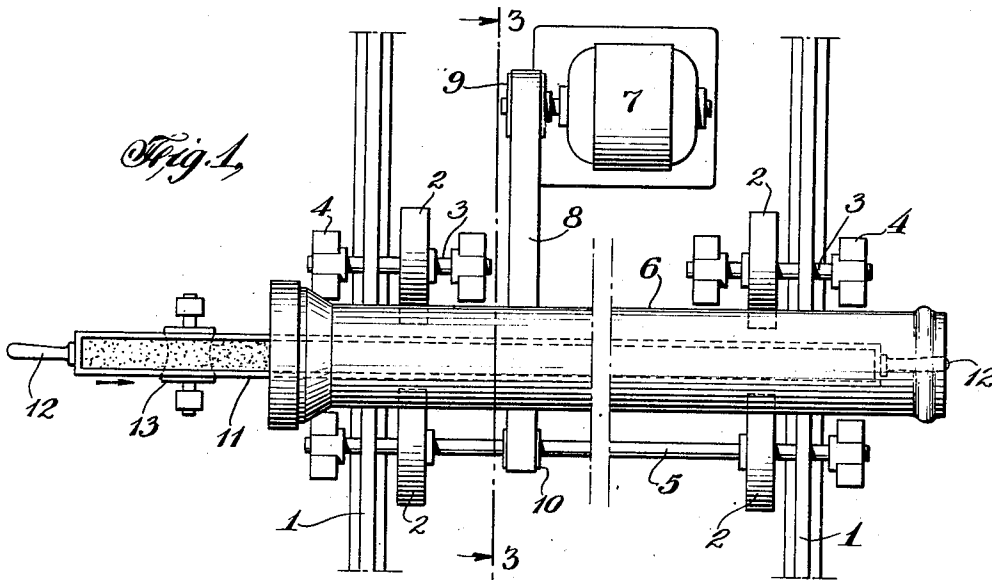
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METHOD OF AND APPARATUS FOR LINING PIPES

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METHOD OF AND APPARATUS FOR LINING PIPES.

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This invention is an improvement in methods of lining pipes and like hollow bodies with material, fluent or plastic at normal temperatures, or capable of being made fluent or plastic, and in apparatus for carrying out the improved method.

In the usual practice pipes and like hollow bodies are lined with fluent or plastic material, by molding or casting the lining in place, or by spreading the material with a spherical body or bullet drawn through the pipe.

The operation in either instance results in a layer of the material plastered on the inner face of the pipe. In neither instance is there the intimate bond between the material and the pipe, nor the consolidation of the material, nor the finish to the surface that is desirable.

In applying such materials to the interior of the pipe, it is exceedingly difficult to obtain close contact and union between the pipe surface and the lining, due to the lack of evenness and uniformity in the surface of the casting, and to the trapped air, which persists in a more or less complete film between the lining and casting wall.

One of the primary objects of the present invention is the provision of a method of applying the lining in such manner that the surface to which it is applied is thoroughly conditioned prior to the application of the lining material, and wherein the casting wall surface is substantially leveled by the filling of depressions prior to the application of the body of the lining.

Another object is the provision of a method by the practice of which substantially all of the air lying close to the surface of the casting, and trapped by the lining and casting in the usual methods of applying, is broken up and eliminated prior to the application of the body of the lining.

Another object is the provision of a method wherein the casting wall is first coated with a relatively thin layer of the lining material thoroughly worked into the wall prior to the application of the body of the lining, thereby to provide a surface of like material for the application of said body.

Another object is the provision of a method by the practice of which a uniform depth or thickness of layer is attained, and where-

in the material is closely consolidated and intimately bonded with the pipe, while at the same time a finish and polish is imparted to the surface of the lining.

Another object is the provision of a new and improved form of apparatus for carrying out the method.

With these and other objects in view, the invention consists in the method, the steps thereof and the relation of the steps one to another, and in the apparatus for carrying out the method, it being understood that various changes in the form, proportion, size and minor details of machine construction within the scope of the claims, may be resorted to without departing from the spirit of the invention.

In the drawings forming a part hereof:

Fig. 1 is a plan view of the improved machine, with parts broken away.

Fig. 2 is a side view with parts in section.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view of the casting showing the third step of the method.

In the form of apparatus shown, suitable means is provided for conveying the pipe sections to and from the place where they are coated, the said means in the present instance comprising a pair of T rails 1, arranged in the same plane, spaced apart a suitable distance, and supported in a suitable manner. During the coating or lining operation, the pipe is supported by pairs of rollers 2, a pair being arranged adjacent each rail, and at the inner side thereof, and the members of each pair rotate on parallel axes transverse to the rails.

The members of one pair are secured to stub shafts 3, journaled in bearings 4, while the other members of the pair are secured to a shaft 5 parallel with the shafts 3, which are in alinement. The shafts 3 are so arranged with respect to the shaft 5, and the rollers 2 are of such size, that the pipe sections 6 to be lined will rest upon the rollers and between the members of the pairs, as clearly shown in Figures 1 and 3.

The shaft 5 is rotated thereby to rotate the pipe section during the lining operation, and any suitable mechanism may be utilized for this purpose. In the present instance an electric motor 7 is provided. A belt 8

connects a pulley 9 on the motor shaft with a pulley 10 on the shaft 5, and the shaft 5 should be driven at a speed such that the pipe section will rotate slowly during the conditioning of the pipe wall and afterward at a higher speed, as for instance about 200 R. P. M. The rollers 2 are so arranged that the pipe will be supported just above the rails 1 while it is being rotated, and will be conveniently positioned for return to the rails after lining.

The charge of lining material is introduced into the pipe by means of a trough 11, which is of a length somewhat greater than the length of the pipe, and the trough is provided at each end with a handle 12 for convenience in manipulating the same in a manner to be presently described. The trough is of such length that a charge of material sufficient to line the pipe may be held therein. That is, it is of a length and capacity to hold a mass of lining material of substantially uniform cross section which when dumped into the pipe and distributed circumferentially thereof will provide a lining of the desired depth. The arrangement is such that the charge is introduced into the pipe in a manner to require no further longitudinal distribution.

Preferably some means is provided for supporting the trough during its introduction, as for instance the grooved roller 13 shown in Figures 1 and 2. This roller is journaled in a support 14, which if desired may be of a movable character, or the roller may be at a somewhat lower level than the lowest part of the pipe when on the roller, so that it will not interfere with the manipulation, to be presently described, of the trough.

When the trough has been fully introduced, so that the charge registers with the length of the casting, the trough is inverted as indicated in Figures 2 and 3 with the edges engaging the inner surface of the casting, and with the charge indicated at 15 still within the trough, and held in a substantially compact mass between the trough and the casting wall. During this time the casting is rotated at a relatively low speed, and with the parts in this position (Figures 2 and 3), the rotation is continued for some length of time.

During this rotation, the inner surface of the casting moves in contact with the material and receives a light coating thereof, which is thoroughly worked into the casting wall by the trough edges. The film of air closely adjacent to the wall is broken up and worked out, and the lining material is thoroughly worked into the wall, providing a smooth substantially even and uniform surface closely united to the casting wall, and to which the body of the lining material may be easily joined.

After the interior of the casting has been treated in this manner, thoroughly conditioned and lightly coated with the material, the trough is restored to the position of Fig. 4, leaving the material free upon the casting wall and the rounded bottom thereof is utilized to spread the material onto the casting wall, and to thoroughly rub and knead the body of the lining into intimate union with the light coating already applied, and which has in turn been intimately united with the casting wall.

The method and apparatus may be used to coat the casting with any material, fluent or capable of being made fluent as for instance by heating or adding water. To line a pipe with cement for instance, a formula which gives good results is Atlas Portland cement 75%, clean sharp screened sand to pass a 20 mesh screen, 25%. The two are mixed to the consistency of ordinary mortar for brick work. When a charge of this material, or any other similar material has been introduced and applied as above indicated, the lining is compressed closely against the interior of the pipe by centrifugal action. The water because of its low specific gravity comes to the surface, and imparts to the inner face of the cement a scouring, polishing action, resulting in a close grained highly polished surface. By the method set forth a pipe may be lined with cement of any thickness from practically paint thickness, 1/64 up to 1/4 of an inch or greater.

Any material capable of being made fluent may be applied in accordance with the improved method, as for instance, asphalt, coal tar, pitch and the like. Such materials are first heated to be fluent to a certain degree of fluency, as for instance, to the consistency of stiff cement or putty. A charge of the material is then inserted in the manner above described, and it is rubbed onto the wall with the trough, while the pipe is slowly rotated.

This having been done, the temperature of the material is raised in any suitable manner, as for instance, by the use of a gas flame, a blow torch, or some form of electrical appliance, to cause the material to become still more fluent, this being done during the rotation of the pipe. As soon as the material is properly spread, consolidated and bonded, the rotation of the pipe may be stopped, and the material immediately assumes a sufficiently solid and set condition to prevent running.

If desired, the material may be heated to a selected degree of fluency, as for instance to the consistency of paint or cream, prior to inserting such material in the pipe. When so used, it is inserted as above described, and after discharge by the trough, the material is rubbed onto the wall by the trough, while the pipe is slowly rotating.

The speed of rotation is then increased, to 200 R. P. M., which causes the material to become properly spread, consolidated and bonded, and also become sufficiently solid and set to prevent flowing.

In order to thoroughly consolidate the lining, and assist in the intimate union with the casting, a rapid succession of shocks or jars may be imparted to the casting in a direction substantially perpendicular to the axis of rotation. This may be done by any suitable means. As for instance the one or more of the rollers 2 may be corrugated. Or a hard surfaced member may be held in contact with the pipe while it is rotating. The same end may be attained by using hard surfaced rollers.

The centrifugal force exerted on the material spreads it over the entire area of the casting wall, and causes it to press closely against the wall, this action being assisted by the pressure and kneading action of the trough. The rapid succession of small vibrations acts to make the spread of material uniform in depth, to consolidate the same, and to improve the bond between the material and the pipe wall.

It will be understood that in rubbing the material onto the casting wall, the trough may be moved with respect to the casting, so that the relative movement of the two is longitudinal or axial as well as circumferential. This relative movement is attained by a reciprocating movement of the trough. While the trough offers a convenient instrument for restraining the movement of the material with the casting, it is obvious that any other suitable instrument might be used. The trough presents the additional advantage that the material is trapped between it and the casting wall.

I claim:

1. The step in the method of lining pipes or like hollow bodies with water mixed plastic material, which consists in holding a mass of the material in contact with the pipe wall while imparting relative sliding movement to the mass and the wall to effect a conditioning of the wall by moisture and a rigid rubbing pressure or troweling action.

2. The method of lining pipes or like hollow bodies with water mixed plastic material, which consists in working into the pipe wall by a rigid rubbing action a preliminary thin coating of the material to condition said wall and afterwards uniting the body of the lining with the thin coating by direct pressure upon the lining material.

3. The centrifugal method of lining pipes or like hollow bodies with plastic material, which consists in working into the pipe wall a preliminary thin coating of the material to condition said wall while the pipe is rotating at a relatively low speed, and afterwards uniting the body of the lining with the thin

coating by direct pressure while the pipe is rotating at a high speed.

4. The centrifugal method of lining pipes or like hollow bodies with plastic material, which consists in working into the pipe wall while it is rotating at a relatively low speed a preliminary thin coating of the material to condition the said wall, afterwards uniting the body of the lining with the thin coating by direct pressure while the pipe is rotating at a relatively high speed, and imparting to the pipe while it is rotating a rapid succession of shocks or jars.

5. The centrifugal method of lining pipes and like hollow bodies with plastic material, which consists in retaining the material in sliding contact with the pipe wall by restraining member engaging the wall throughout the length of the pipe while the pipe is rotating at a relatively low speed thereby to preliminary condition the wall, afterwards applying direct pressure upon the body of the lining to consolidate it with the thin coating while the pipe is rotating at a relatively high speed, and imparting a rapid succession of shocks or jars to the pipe while it is rotating.

6. The method of conditioning hollow castings such as pipe for the application of plastic linings by the lining material, which consists in slowly rotating the casting while the lining material is held in close contact with the wall thereof and restrained from circumferential movement with the casting.

7. A machine for lining pipes and like hollow bodies with plastic material, comprising means to support and rotate the pipe on a substantially horizontal axis, and means including a trough for introducing a charge of material and distributing it onto the pipe wall, said trough having means at its ends for enabling same to be held or to be moved with respect to the pipe thereby to spread and consolidate the charge.

8. A machine for lining pipes and like hollow bodies with plastic material, comprising means to support and rotate the pipe on a substantially horizontal axis, and means including a trough for introducing a charge of material and distributing it onto the pipe wall, said trough having means at its ends for enabling same to be held or to be moved with respect to the pipe thereby to spread and consolidate the charge, and means in connection with the supporting means to vibrate the pipe.

9. The step in the method of lining pipes or like hollow bodies with water mixed plastic material, which consists in imparting relative movement to a mass of the material in contact with the pipe wall and the wall, while subjecting the wall at the advance edge of the mass to a rigid rubbing action thereby to effect a conditioning of the wall by moisture and pressure.

10. The method of lining pipes or like hollow bodies with plastic material, which consists in imparting relative movement to the pipe wall and to a mass of the material held in contact therewith, while subjecting the wall at the advanced edge of the mass to a rigid rubbing action, thereby to effect a conditioning of the wall by moisture and pressure, and afterwards applying the mass to the conditioned wall. 10

Signed at Birmingham in the county of Jefferson and State of Alabama this 1st day of March A. D. 1926.

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