Aug. 28, 1934. A. G. PERKINS 1,971,535

APPARATUS FOR COATING PIPE

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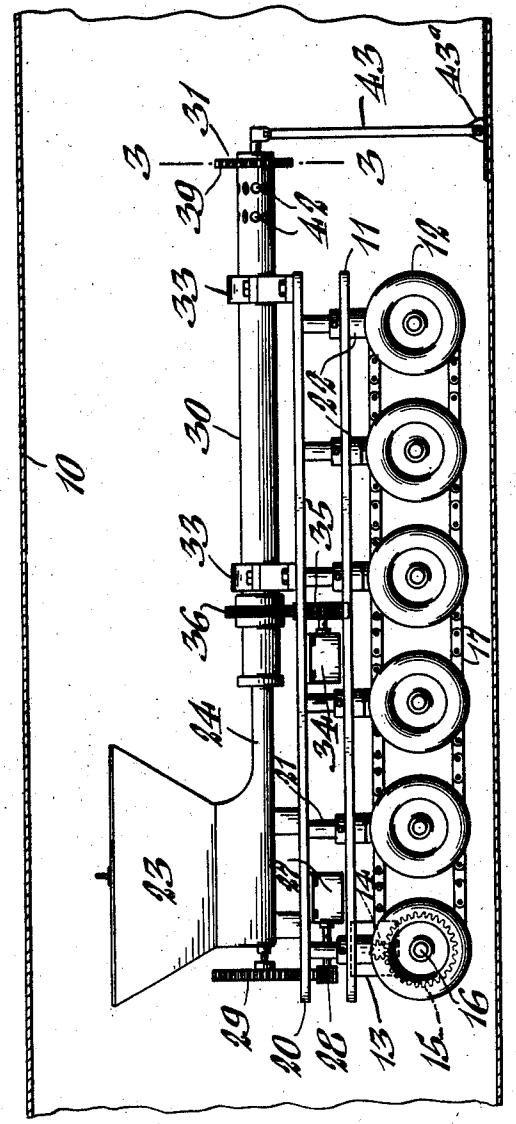


Fig. 1.

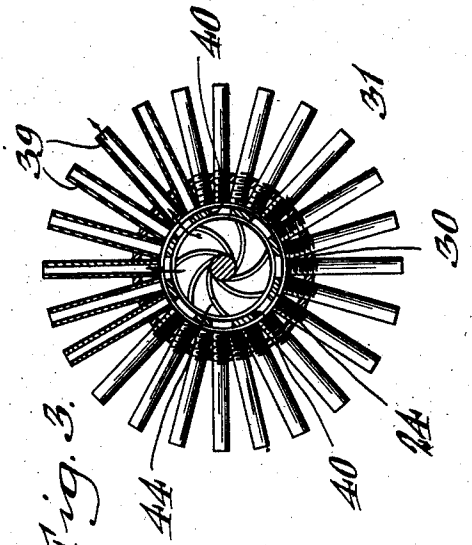


Fig. 3.

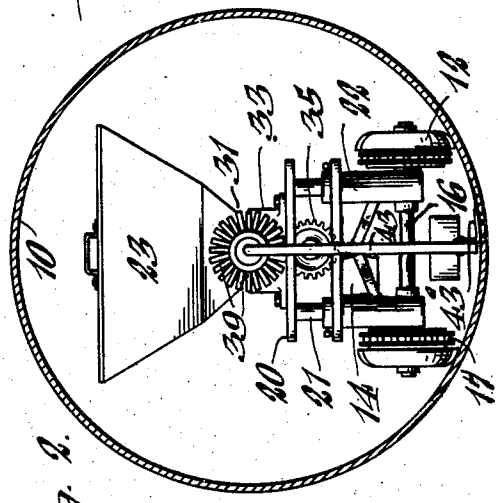


Fig. 2.

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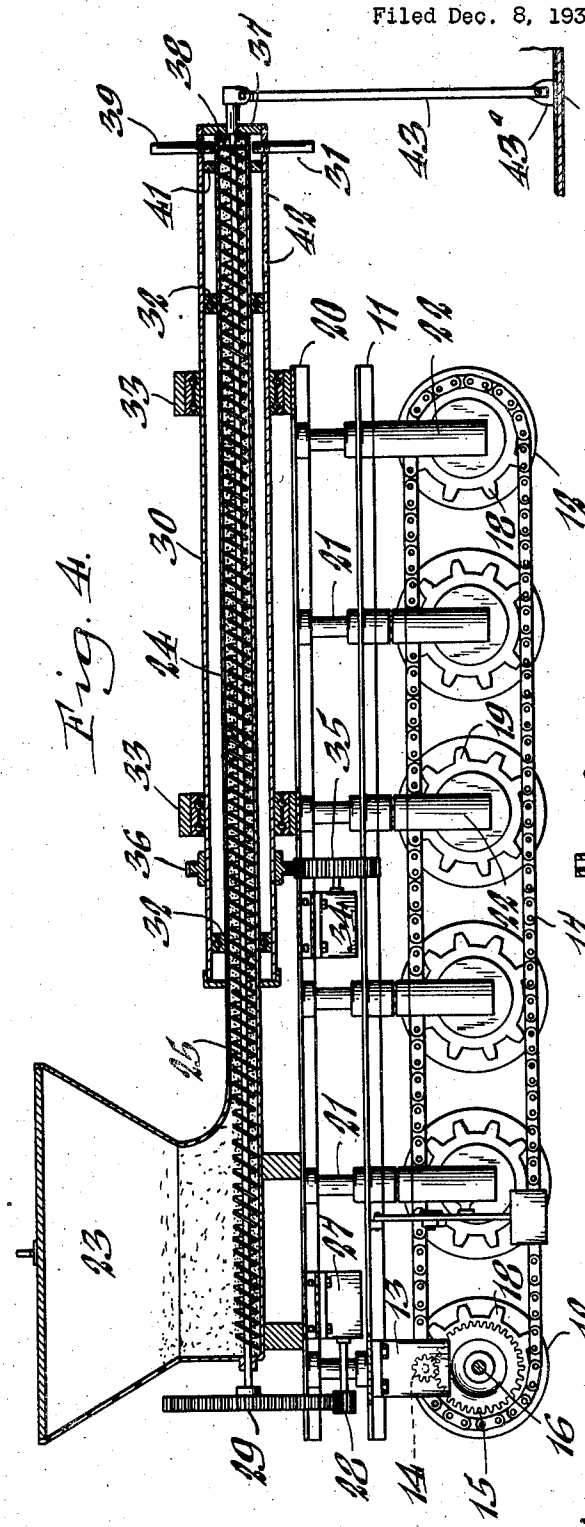


Fig. 4.

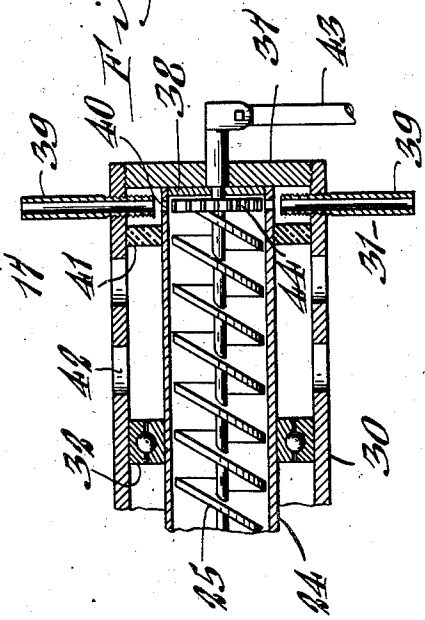


Fig. 5.

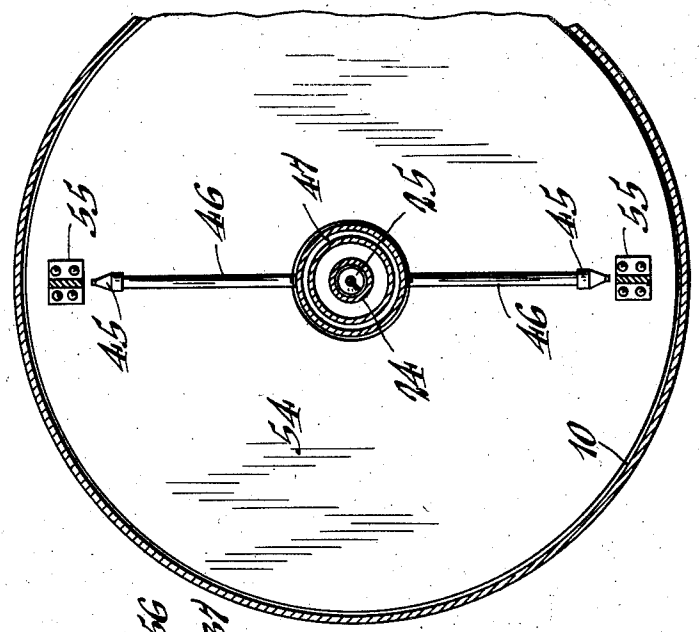
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Aug. 28, 1934. A. G. PERKINS 1,971,535

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Fig. 7.



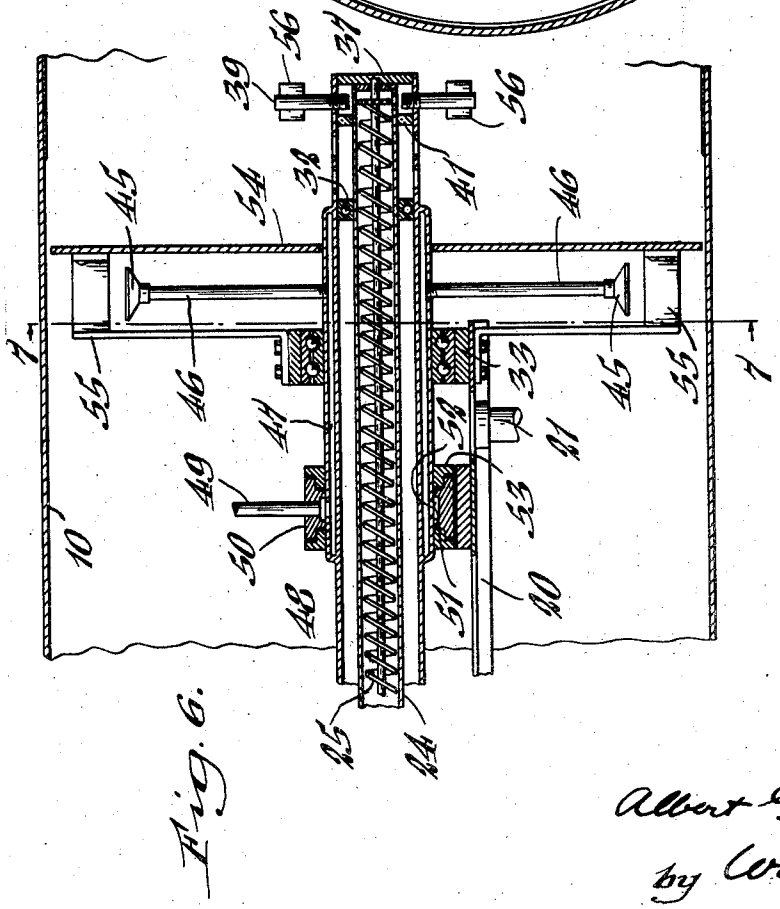


Fig. 6.

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UNITED STATES PATENT OFFICE

1,971,535

APPARATUS FOR COATING PIPE

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Application December 8, 1931, Serial No. 579,729

13 Claims. (Cl. 91—44)

This invention relates to an apparatus which has been designed for applying a protective coating or lining to the inner walls of pipe lines to prevent the formation of barnacles thereon.

Its primary object is the provision of an efficient apparatus of this character having simple and effective means for delivering or discharging the coating material evenly and rapidly over the pipe wall.

Another object of the invention is to provide a coating or spraying apparatus having novel means for distributing the coating material centrifugally in relatively small, steady streams over the pipe wall, and which is provided with means for agitating the coating material to maintain it at the proper consistency as it is delivered from the discharge end of the apparatus.

A further object is to provide a coating apparatus having means for delivering a solid or powdered coating material to the pipe wall in conjunction with a fluid spray.

Other features of the invention reside in the novel construction and arrangement of parts hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings:—

Figure 1 is a side elevation of my improved coating apparatus shown as traveling through a pipe line for treating its interior walls. Figure 2 is a front view of the apparatus arranged within the pipe. Figure 3 is an enlarged transverse section taken in the plane of line 3—3, Figure 1. Figure 4 is an enlarged central longitudinal section of the apparatus. Figure 5 is an enlarged fragmentary vertical section of the nozzle end of the apparatus. Figure 6 is a fragmentary longitudinal section of a slightly modified form of the inventon. Figure 7 is a fragmentary cross section taken on line 7—7, Figure 6.

Similar characters of reference indicate corresponding parts throughout the several views.

While my apparatus may be employed for coating different kinds of work, it has been primarily designed for treating the inner walls of pipe lines with a protective coating, such, for example, as a wet or plastic-like material as concrete, or a dry material, such as powdered cement, in conjunction with a suitable fluid for enabling the powdered material to adhere to the pipe wall. To this end the apparatus consists generally of a carriage adapted to be propelled through the pipe line and dispensing means for applying the protective coating to the pipe wall as the carriage travels lengthwise through the pipe.

Referring now to the drawings, particularly Figures 1–4, inclusive, 10 indicates a section of steel pipe through which my apparatus is designed to travel for treating or coating the inner wall of the pipe with a covering of concrete or like moist or plastic material. The carriage of the apparatus may be of any appropriate construction, that shown in the drawings by way of example, consisting of a frame 11 including traction wheels 12 driven by an electric or air motor 13 connected by gearing 14, 15 with the driving shaft or axle 16 of the several traction wheels. Motion is transmitted from this driving shaft or axle to the various traction wheels by a sprocket chain 17 which passes around the sprocket wheels 18 applied to the endmost traction wheels, while its upper and lower stretches engage sprocket wheels 19 applied to the intermediate sets of traction wheels.

Surmounting the frame 11 is a platform 20 carrying depending posts 21 which telescopically engage corresponding tubular members 22 applied to the frame, thereby permitting adjustment of the platform diametrically of the pipe. Mounted on this platform are the operative parts for controlling the application of the coating material to the pipe wall as the carriage travels lengthwise through the pipe. In the preferred construction of such parts, the same comprise a feed hopper or receptacle 23 for receiving the material, such as concrete, employed for coating the pipe walls, this hopper being disposed near the front end of the apparatus and having a longitudinally disposed feed conduit 24 projecting rearwardly from its bottom end and containing a screw conveyor 25 or like element for propelling the coating material such as concrete from the hopper to the rear or discharge end of the apparatus which is provided with a dispensing device or applicator for delivering the concrete in layer-like fashion onto the pipe wall. The feed screw 25, which is disposed in the bottom of the hopper and extends practically the full length of the conduit 24, is journaled at its ends in appropriate bearings and is driven at a comparatively slow speed by an air or electric motor 27 connected by a pinion 28 with a gear wheel 29 fixed on the front end of the feed screw.

The dispensing device for centrifugally discharging the coating material onto the pipe walls preferably consists of a rotatable member or tube 30 surrounding the feed conduit 24 and revolvable about the axis of said conduit at a high speed relative thereto and provided at its free or rear end with a spray device or nozzle, indicated generally by the numeral 31, designed to discharge the ma-

terial in small steady streams onto the pipe wall to produce a relatively thin, uniform protective coating thereon. The tubular member 30 is preferably somewhat larger in diameter than the feed conduit and interposed in the resulting annular space between these parts are suitable bearings 32 which permit a free revolving movement of the tubular member relative to the conduit. Outside bearings 33 applied to the platform 20 and in which the front and rear ends of the tubular member 30 are journaled also serve in conjunction with the internal bearings 32 to support and maintain the feed conduit and tubular member in proper axial alinement. This tubular member may be driven in any suitable manner, as by an electric or air motor 34 through suitable gearings 35 and 36 so that the tubular member is driven at a speed of approximately 1000–1200 R. P. M.

At its rear or free end, which projects a slight distance beyond the corresponding end of the feed conduit 24, the tubular member 30 is provided with a suitable closure 37, and the conduit is provided with a similar closure 38. Forwardly of its closure and immediately surrounding the rear or discharge end of the feed conduit, the tubular member 30 is provided with a plurality of discharge nozzles, jets or pipes 39 which are disposed radially and in contiguous relation about the tubular member to revolve therewith. At its rear end the feed conduit 24 has an annular row of discharge ports 40 which are disposed substantially radially in line with the jet pipes and through which the coating material is discharged into the opposing inlet ends of such pipes, the latter being disposed at their inner ends in proximity to the outer surface of the feed conduit. As shown in Figure 5, a suitable packing 41 is interposed between the outer wall of the feed conduit and the inner wall of the tubular member at a point forwardly of the discharge ports 40 to prevent the coating material from working into the space between said parts. In the event that the coating material should gain access to the annular space between the feed conduit and the tubular member, I provide openings 42 for the discharge by centrifugal force of such surplus material before it gains access to the bearings 32.

As shown in Figure 4, the feed screw 26 projects through the plugs or closures 37, 38 and preferably mounted thereon is a radial arm or support 43 having a troweling element 43*a* thereon which is adapted to smooth over the film or layer of concrete after being applied to the pipe wall by the dispensing device. In order to keep the concrete at its proper consistency, it is kept in motion by a suitable agitator or bladed wheel 44 mounted on the feed screw and disposed within the feed conduit 24 in the vicinity of its discharge ports 40.

In the modified form of the invention shown in Figures 6 and 7, the apparatus is designed to effect the application of a dry material, such as powdered cement, to the pipe wall, such material requiring an application of a suitable fluid to the pipe wall to enable the material to stick or adhere thereto. In this embodiment of the invention, the arrangement of the feed screw 25 and the dispensing device for discharging the material by centrifugal force onto the pipe wall is identical with that of the previously described structure. The means for applying the fluid or cement adhering solution to the pipe wall, previously to applying the powdered cement thereto, consists of one or more spray nozzles 45 applied to radial pipes 46 connected to a jacketed portion 47 which may be formed on the revolving tube 48. Fluid is supplied to the jacket 47 through a pipe 49 which is connected to a stationary distributing head or collar 50 surrounding the water jacket and having an internal groove 51 communicating with ports 52 opening into the jacket, as seen in Figure 6. To prevent leakage of the fluid between the distributing collar and the contiguous wall of the revolving tube 48, packing glands 53 are screwed into the opposite ends of said collar. The fluid for causing the powdered cement to adhere to the pipe wall may be water, turpentine or like material.

The spraying nozzles 45 are disposed forwardly of the cement-discharging nozzles 39 so that the pipe 10 is coated with the fluid prior to receiving the protective charge of cement. To prevent the dust issued from the cement, as the same is discharged from its nozzle, working its way forwardly of the machine and being deposited onto the pipe wall prior to its receiving the fluid coating, I provide a dust shield 54 which is of a diameter approximately equal to that of the internal diameter of the pipe and which is disposed between the cement distributing nozzles 39 and the spray heads 45. This shield is stationary and may be supported on suitable brackets 55 attached to the adjoining portions of the machine frame. As a further means of keeping the dust from being deposited onto the pipe wall, I preferably provide the nozzle or jet pipes 39 with fins or vanes 56 which, during the operation of the machine, tend to create a vacuum and thereby prevent the dust from being deposited on the pipe wall.

This machine may also be advantageously employed for reconditioning water pipe lines and the like by utilizing a sand blast, the sand being directed against the pipe wall in the same manner as the coating material.

I claim as my invention:—

1. An apparatus for lining pipe walls, comprising a carriage movable lengthwise through the pipe, feed means adapted for communication with a source of substantially plastic coating material and having a radial discharge, and a revolving member surrounding the discharge end of said feed means to form a chamber therewith for receiving the material from said radial discharge and including jets revolvable therewith for conducting and directing the material by centrifugal force against the pipe-walls.

2. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of substantially plastic coating material and having discharge ports therein, means extending substantially the full length of said conduit for continuously feeding the material through said conduit toward its discharge ports, and a revolving nozzle applied to the discharge end of said feed conduit about its discharge ports to form a receiving chamber for the coating material and including jets radiating therefrom and communicating at their inner ends with the nozzle chamber surrounding said feed conduit, whereby the coating material is delivered centrifugally in successive small streams onto the pipe wall.

3. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of substantially plastic coating material and having radial ports at its discharge end, means for positively feeding the material toward the discharge end of said conduit and having a member at its discharge end for directing the material through said ports, a tubu-

lar member revolvably mounted on said feed conduit in concentric spaced relation about its discharge ports, and jets radiating from said member and having their inlet ends in communication with the space between the feed conduit and the tubular member and in proximity to the discharge ports of the latter.

4. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of substantially plastic coating material and having radial ports at its discharge end, means for continuously feeding the material through the conduit, a tubular member revolvably mounted on said feed conduit in concentric spaced relation about its discharge ports, and nozzles radiating from said member and having their inlet ends extending into the space between the feed conduit and the tubular member and in proximity to the discharge ports of the latter, the outlet ends of said nozzles being spaced from the pipe wall whereby the coating material is delivered centrifugally in sucessive small streams on to the same.

5. An apparatus for lining pipe walls, comprising a carriage movable lengthwise through the pipe, a hopper for a substantially plastic coating material mounted thereon and having a feed conduit extending therefrom, said conduit having discharge ports therein, means for continuously feeding the material toward the discharge end of the conduit, and a revolvable member disposed in spaced relation over the ported portion of said conduit to form a receiving chamber for receiving the material from the conduit ports, said member having jets radiating therefrom disposed with their inlet ends in contiguous communicating relation with said discharge ports, the outlet ends of said jets being spaced from the pipe wall, whereby the coating material is directed by centrifugal force and in successive small streams onto the pipe wall.

6. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of coating material and having discharge ports therein, means for forcing the coating material through said conduit and its discharge ports, a revolving nozzle in communication with said discharge ports, and means arranged in the feed conduit and forwardly of said forcing means for agitating the coating material in the vicinity of said discharge ports.

7. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of substantially plastic coating material and having discharge ports thereon, a feed screw for forcing the coating material through said conduit and its discharge ports, a revolving nozzle in communication with said discharge ports, and an agitating element arranged in the feed conduit adjacent to the discharge ports thereof.

8. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of coating material and having discharge ports therein, a feed screw for forcing the coating material through said conduit and its discharge ports, a revolving nozzle in communication with said discharge ports, an agitating element arranged in the feed conduit adjacent to the discharge ports thereof, and means for troweling the material after it has been deposited on the pipe wall.

9. An apparatus for lining pipe walls, comprising a revolving nozzle adapted for communication with a source of coating material, means disposed at one side of said nozzle for delivering adhesive material on the pipe wall in advance of said coating material, and a baffle disposed between said nozzle and said adhesive-delivery means.

10. An apparatus for lining pipe walls, comprising a carriage movable lengthwise through the pipe, a feed conduit mounted thereon in communication with a source of coating material, a chamber for receiving a fluid adhesive material, longitudinally-spaced revolvable nozzles in separate communication with said feed conduit and said chamber for applying said materials to the pipe wall in different planes and in succession one over the other, and a circular baffle plate mounted on said carriage in a plane between said nozzles, respectively.

11. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of coating material and having discharge ports therein, means for forcing the coating material through said conduit and its discharge ports, and a revolving tubular member disposed in spaced concentric relation about the feed tube and having nozzles radiating therefrom, the inlet ends of said nozzles being in communication with the feed conduit discharge ports, said tubular member having outlets therein for the centrifugal discharge of any surplus coating material.

12. An apparatus for lining pipe walls, comprising a feed conduit adapted for communication with a source of coating material and having discharge ports therein, a revolving nozzle applied to the discharge end of said feed conduit and including jet pipes radiating therefrom, the inner ends of said jet pipes being disposed in communicating relation with the discharge ports of said feed conduit, and vanes applied to the outer portions of said jet pipes.

13. An apparatus for lining pipe walls, comprising a feed conduit for a substantially plastic coating material having a discharge, means for feeding the material through said conduit toward its discharge end, and a revolving member encircling the discharge end of said conduit to form a chamber therewith for receiving the coating material therefrom and having communicating means radiating therefrom and revolvable therewith for confining and directing the material in a radial path by centrifugal force onto the pipe wall.

ALBERT G. PERKINS.