

UNITED STATES PATENT OFFICE

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LINING OF IRON AND STEEL PIPES, TUBES, AND OTHER HOLLOW BODIES

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This invention relates to the lining of iron and steel pipes or tubes with a bituminous substance such as natural or artificial asphalt, or other bituminous substance or composition.

The most satisfactory way of applying such a lining is to distribute the lining substance or composition by centrifugal force, the pipe or tube being spun about its own axis to produce the centrifugal force. Such a process of lining is fully described in the specification of Patent No. 1,605,574 assigned to Stewarts and Lloyds, Limited. In this specification it is mentioned that the pipes are spun individually on a lathe or like machine.

The object of this invention is to provide improvements in the application of bituminous linings by centrifugal force to iron and steel pipes or tubes whereby large numbers of such bodies (hereinafter referred to as "pipes") can be treated in rapid succession, the treatment being carried on continuously.

According to this invention the pipes are lined with a bituminous substance or composition by heating the pipes, charging them, while hot, with the substance in a hot liquid condition, translating the charged pipes bodily and by mechanical action, and, during such translation, spinning them about their own axes to distribute the bituminous substance uniformly over their interior surfaces.

In this way large numbers of pipes can be rapidly put through the different phases of the process, one after another, in a continuous stream.

More specifically, the lining is effected by feeding the pipes on to travelling members moving at differential linear speeds, the pipes being translated bodily by one travelling member or set of members and spun simultaneously by contact with the other travelling member or set of members to distribute over their interior surfaces previously introduced charges of liquid bituminous substance or composition.

The apparatus for carrying out the lining process may comprise travelling members in the form of power driven endless bands located parallel to each other with their upper

stretches in a common, inclined plane, there being a conveyor band or bands for translating the pipes bodily in a transverse position and a rapidly moving spinning band or bands with which the pipes, after having been charged with liquid lining substance or composition, contact, the conveyor band or bands being provided with means for preventing the pipes rolling therealong while being spun.

During or before the translation the pipes may be heated.

In order that the invention may be clearly understood, one embodiment thereof will be described by way of example and with reference to the annexed drawings, whereon,

Fig. 1 is a side elevation of a machine for lining pipes in accordance with the invention.

Fig. 2 is a corresponding plan view.

Referring to the drawings, the numerals 1 denote standards or supports arranged in two parallel rows on strong foundations. A driving shaft 2 is journaled in one row of standards and carries four spaced sprocket wheels 3. Each of the second row of standards 1 supports a sprocket wheel 6 corresponding to a sprocket wheel 3. Over each of the sprocket wheels 3 and its corresponding sprocket wheel 6 a conveyor band 7 is passed, there being thus four parallel bands with their upper stretches in a common plane.

A channel bar 8 is supported under the upper stretch of each band between the corresponding standard 1 at the left hand end of the band and a transverse supporting bar 4 at the other end. The conveyor bands run upon, and are supported by, the said channel bars 8 which thus form skids. Standards 9, between which a cross beam 9^a is placed, give support to the skids 8 between their ends.

The driving shaft 2 is geared at one end through a gear box 10 and a worm shaft 11 to an electric motor 12, the gear ratio being large so that, when the motor is in operation, the driving shaft 2 and the bands 7 are rotated slowly.

Two other rows of standards 13 are placed between the rows of standards 1 in the positions shown. The standards 13 at the right hand end of the machine carry a shaft 14 provided with four spaced sprocket wheels 15

while the other standards 13 carry sprocket wheels 16 corresponding to the wheels 15. Four endless chains 17 are passed over these sprocket wheels 15 and 16, the chains being parallel to the conveyor bands 7 and having their upper stretches co-planar with the upper stretches of the said bands 7. The chains 17 have a band of friction material or belting 17^a secured round their outer faces.

- 10 Channel shaped skids 18 are placed between the standards 13 and under the upper stretch of each of the chain bands 17 (hereinafter referred to as spinning bands) to support the same, the skids being supported between their ends by a transverse beam 19 carried on pedestals 19^a.

One end of the shaft 14 is geared to an electric motor 20 so that the spinning bands can be operated together.

- 20 The conveyor bands 7 are provided with equi-spaced upstanding stoppers 21, the stoppers being spaced apart a distance not less than the diameter of the pipes to be lined. A series of transverse rows of stoppers is thus
25 formed (see Fig. 2).

At the left hand or feed end of the apparatus is a feed rack composed of a number of parallel bars 22 level with or slightly inclined downwards towards the ends of the
30 conveyor bands 7 on which they abut. At the right hand or discharge end of the apparatus is a finished-pipe rack composed of bars 23 and connected to the apparatus by a series of downwardly inclined channel bars 24.

- 35 Between the feed end of the conveyor bands 7 and the spinning bands 17 a series of longitudinal ramps 25, each consisting of an incline, a substantially horizontal part and a decline, are located, one alongside each
40 of the conveyor bands. A transverse spindle 26 is passed through bearings on the ramps and carries four arms 27. The spindle may be operated manually by a crank handle (not shown) or mechanically.

- 45 31, 31 are two swinging jibs each carrying an oil gas burner or burners 32 of known type for heating pipes. Each burner is carried by a trolley 33 movable along the jib so that a wide range of adjustment of the burners is
50 possible. 34 and 35 represent hose for conveying the oil and air respectively to the burners. The burners 32 are adapted to project long flames into the interior of the pipes on the feed rack or, if desired, on the con-
55 veyor bands 7.

Water spraying apparatus 28 is located above the spinning bands 17 and conveys water under pressure to transverse spray
60 pipes 30.

- 60 The operation of lining pipes with a molten bituminous substance or composition is as follows:—

The electric motors 12 and 20 are started and these drive the conveyor bands 7 and the
65 spinning bands 17, respectively, in the same

direction, but the latter at a very much greater linear speed than the former which move very slowly.

The pipes to be lined, marked 5 throughout, are lifted on to the feed rack 22 on which they lie transversely. Each end of each pipe is plugged by a ring and a number of removable rings or collars 29 are clamped around it to act as guides while the pipe is on the machine.

The pipes are rolled in succession along the feed rack until they are caught one by one by the stoppers of the conveyor bands. Hereafter, for the sake of clearness, the treatment of one pipe will be described, but it is to be understood, that, in practice, the pipes follow one another along the machine in quick succession.

The conveyor bands carry the pipe along and it is heated between the feed end of the said bands and the ramps 25, by for instance, the application of an oil or gas flame or flames while still moving.

Continuing its course, the pipe is carried up the ramps 25 until it comes over the arms 27 on the spindle 26 which are rotated, either manually or mechanically, to carry the pipe on to the horizontal part of the ramps where it is charged with liquid bituminous substance or composition from either or both ends. A period of rest for each pipe at this stage may be arranged for, but if the arms are moving slowly this is not necessary. In order to expedite the charging, the substance or composition may be supplied in a heated and liquid state from a reservoir or tank by means of one or more counterweighted ladles, each ladle being dipped in the tank, raised and tipped into the pipe, so delivering a measured quantity of the substance or composition.

After charging, the pipe passes down the declines into engagement with the stoppers of the conveyor bands by which it is carried forward on to the rapidly moving spinning bands. The friction between these bands and the pipe is sufficient to cause the latter to spin rapidly about its axis, the pipe being prevented from rolling along the conveyor bands by the fact that it is confined between stoppers. The spinning of the pipe causes the lining substance or composition to be distributed uniformly over the walls of the pipe in known manner.

Passing on, the pipe comes under the water spraying apparatus 28 and is sprayed with water while still spinning, to hasten the setting of the lining, spinning in all cases being continued until the lining is hard enough to support itself.

Coming to the end of the conveyor bands, the pipe rolls off on to the bars 24 to the finished pipe rack whence it is removed.

By adopting this method and apparatus large numbers of pipes can be quickly lined,

the process being continuous as long as a supply of pipes is available. There is the advantage that no handling of the pipes is required during the process.

For thoroughly good results I prefer to use the composition described in specification No. 1,605,574 consisting of asphalt and a loading material such as slaked lime or kieselguhr and the pipes are heated before charging to a temperature of about 300° F. so as to prevent chilling of the molten composition when introduced, which militates against good adhesion, and also to maintain the composition in a liquid state long enough to permit of its being properly distributed.

It will be appreciated that numerous variations may be made in the apparatus for lining the pipes. For example, when treating pipes of differing diameters means is provided for shifting the positions of the stoppers on the conveyor bands, the stoppers being, for example, clamped thereto. Alternatively, where there are more than two conveyor bands this may be effected by giving, say, each alternate band a lead over its neighbour so that the stoppers are not in transverse rows but are staggered with the result that the effective space between adjacent rows is altered. For this purpose the conveyor bands may be shifted on their sprocket wheels or the sprocket wheels may be mounted on their driving shaft so that they can be turned thereon and then made fast.

Instead of using a number of ramps for charging, only one at one end of the pipes may be used, the stoppers being arranged to carry the pipe up this ramp so that it is tilted to facilitate charging. Instead of using a ramp or ramps, the pipes may be raised at one end by an hydraulic ram or rams.

The skids supporting the bands may be replaced by moving or stationary chains or the spinning bands may simply comprise bands of belting fabric running on stationary skids or supports and kept lubricated.

If so desired, the pipes may be heated in a furnace and, while hot, be passed to the feed rack.

After the application of the cooling water from the sprays, the pipes may be subjected to the action of rotary or other brushes, in order to clean and dry their exterior surfaces.

Preferably the conveyor bands and spinning bands are arranged at a slight incline, the feed end being higher than the discharge end.

I claim:—

1. Lining iron and steel pipes with a bituminous substance by charging the pipes with the substance in liquid condition, translating the charged pipes bodily and by mechanical action, and, during such translation and following their charging, spinning them about their own axes at a speed materially in excess of their speed of translation

to distribute the bituminous substance by centrifugal force uniformly over their interior surfaces.

2. Apparatus for lining iron and steel pipes with a bituminous substance comprising, in combination, conveying means on to which the pipes are fed, and travelling spinning means located intermediate the conveying means and moving at a different speed from said conveying means, said conveying means translating the pipes bodily, and the spinning means, while the pipes are being so translated, contacting with the underside of the pipes and, by frictional engagement, spinning them about their own axes to distribute previously introduced charges of liquid bituminous substance.

3. Apparatus for lining iron and steel pipes with a bituminous substance comprising a plurality of parallel endless conveyor members driven in unison on to which the pipes are fed and which translate said pipes bodily, a plurality of parallel endless travelling members driven in unison adjacent to said conveyor members, into contact with which travelling members the pipes are carried after having been charged with liquid bituminous substance and by frictional engagement with which the pipes are spun while being translated in order to distribute over their interior surfaces the charges of bituminous substance, and means for preventing rolling of the pipes along the conveyor members while being spun.

4. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side and driven in unison, means for feeding pipes in a transverse position on to said bands for translation bodily, a plurality of parallel endless travelling bands located side by side, driven in unison and into contact with which the pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute over their interior surfaces charges of liquid bituminous substance introduced before spinning, means for preventing rolling of the pipes along the conveyor bands while being spun, and means for discharging the lined pipes from the apparatus.

5. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, driven in unison and on to which the pipes are fed and by which they are translated bodily, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with the bituminous substance in a liquid condition, a plurality of parallel endless travelling bands located side by side, driven in unison and into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute the charges of bituminous substance

therein, and means for preventing rolling of the pipes along said conveyor bands while being spun.

6. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side, driven in unison and on to which the pipes are fed and which translate said pipes bodily, a plurality of parallel endless travelling members adjacent to said conveyor members, located side by side, driven in unison and into contact with which traveling members the pipes are carried after charging with bituminous substance in liquid condition and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces the charges of bituminous substance, means for cooling the pipes after lining and while still being spun, and means for preventing rolling of the pipes along the conveyor member while being spun, the endless members being of such length that translation and spinning continue until the lining is set.

7. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side on to which the pipes are fed in succession and by which they are translated bodily, means for driving the conveyor bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with the bituminous substance in a liquid condition, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated in order to distribute the charges of bituminous substance therein, means for rapidly driving the travelling bands in unison, means for preventing the pipes rolling along the conveyor bands while being spun, and means for cooling the pipes.

8. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side, on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, and a series of spaced, upstanding stoppers on the conveyor members between which the pipes lie to prevent their rolling along said bands, the endless members being of such length that trans-

lation and spinning continue until the lining is set.

9. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, means for driving the conveyor bands in unison, means for feeding pipes in a transverse position on to said bands for translation bodily, a plurality of parallel endless travelling bands located side by side with their upper stretches co-planar with those of the conveyor bands and on to which the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling bands in unison, a series of spaced upstanding stoppers on the conveying bands between which the pipes lie to prevent their rolling along said bands, and means for discharging the lined pipes from the apparatus.

10. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with the bituminous substance in liquid condition, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute the charges of bituminous substance therein, means for rapidly driving said latter bands in unison, and a series of spaced, upstanding stoppers on the conveying bands between which the pipes lie to prevent their rolling therealong.

11. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side, on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side, with their upper stretches co-planar with those of the conveyor members and adjacent to said conveyor members, on to which traveling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for cooling the pipes after lining and while still being spun, and a series of spaced, upstanding stoppers on the conveyor members between which the pipes lie to prevent their rolling therealong, the end-

less members being of such length that translation and spinning continue until the lining is set.

12. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with liquid bituminous substance, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute the charges of bituminous substance therein, means for rapidly driving said latter bands in unison, a series of spaced, upstanding stoppers on the conveyor bands between which the pipes lie to prevent their rolling therealong, and means for cooling the pipes after lining and while still being spun.

13. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side, on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for spraying water on to the pipes after lining and while still spinning, and means for preventing rolling of the pipes along the conveyor members while being spun.

14. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for preventing rolling of the pipes along the conveyor members while being spun, and a straight skid located under the upper stretch of each member over which skid the member runs and by which the member is supported.

15. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, means for feeding pipes in a transverse position on to said bands for translation bodily, means for driving said bands in unison, a plurality of parallel endless travelling bands located side by side into contact with which the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, means for preventing rolling of the pipes along the conveyor bands while being spun, and means for discharging the lined pipes from the apparatus.

16. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with liquid bituminous substance, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional contact with which they are spun while being translated in order to distribute said charges of bituminous substance therein, means for rapidly driving said travelling bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, and means for preventing rolling of the pipes along the conveyor bands while being spun.

17. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun, while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for cooling the pipes after lining and while still being spun, means for preventing rolling of the pipes along the conveyor members while being spun, and a straight skid located under the upper stretch of each member over which skid the member runs and by which the member is supported.

18. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes thereon, means for temporarily raising the pipes off said bands for charging with liquid bituminous substance, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute the charges of bituminous substance therein, means for rapidly driving said latter bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, means for preventing rolling of the pipes along the conveyor bands while being spun, and means for cooling the pipes after lining and while still being spun.

19. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, a series of spaced, upstanding stoppers on the conveyor members between which the pipes lie to prevent their rolling therealong, and a straight skid located under the upper stretch of each member over which skid the member runs and by which the member is supported.

20. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, means for feeding pipes in a transverse position on to said bands for translation bodily, means for driving said bands in unison, a plurality of parallel endless travelling bands located side by side into contact with which the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, a series of spaced, upstanding stoppers on the conveyor bands between which the pipes lie to prevent their rolling

therealong, and means for discharging the lined pipes from the apparatus.

21. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side, on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with liquid bituminous substance, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute the charges of bituminous substance therein, means for rapidly driving the latter bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, and a series of spaced, upstanding stoppers on the conveyor bands between which the pipes lie to prevent their rolling therealong.

22. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor members located side by side on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members located side by side, with their upper stretches co-planar with those of the conveyor members and adjacent to said conveyor members, on to which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated, in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for cooling the pipes after lining and while still being spun, a series of spaced, upstanding stoppers on the conveyor members between which the pipes lie to prevent their rolling therealong, and a straight skid located under the upper stretch of each member over which skid the member runs and by which the member is supported.

23. Apparatus for lining iron and steel pipes with a bituminous substance comprising endless conveyor bands located side by side on to which the pipes are fed and by which they are translated bodily, means for driving said bands in unison, means for heating the pipes, means for temporarily raising the pipes off said bands in order to be charged with liquid bituminous substance, a plurality of parallel endless travelling bands located side by side into contact with which the charged pipes are carried and by frictional engagement with which they are spun while being translated, in order to distribute said charges of bituminous substance therein,

means for rapidly driving the latter bands in unison, a straight skid located under the upper stretch of each band over which skid the band runs and by which the band is supported, a series of spaced, upstanding stoppers on the conveyor bands between which the pipes lie to prevent their rolling therealong, and means for cooling the pipes after lining and while still being spun.

24. Apparatus for lining iron and steel pipes with a bituminous substance comprising a plurality of parallel endless conveyor members located side by side on to which the pipes are fed and which translate said pipes bodily, means for driving said members in unison, a plurality of parallel endless travelling members adjacent to said conveyor members, into contact with which travelling members the pipes are carried and by frictional engagement with which the pipes are spun while being translated in order to distribute over their interior surfaces previously introduced charges of liquid bituminous substance, means for rapidly driving said travelling members in unison, means for spraying water on to the pipes after lining and while still spinning, means for preventing rolling of the pipes along the conveyor members while being spun, and a straight skid located under the upper stretch of each member over which skid the member runs and by which the member is supported, the endless members being of such a length that translation and spinning continue until the lining is set.

In testimony whereof I affix my signature.
NORMAN STRAFFORD DEWEY.