June 13, 1933. A. H. HANNON 1,913,757

COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 1

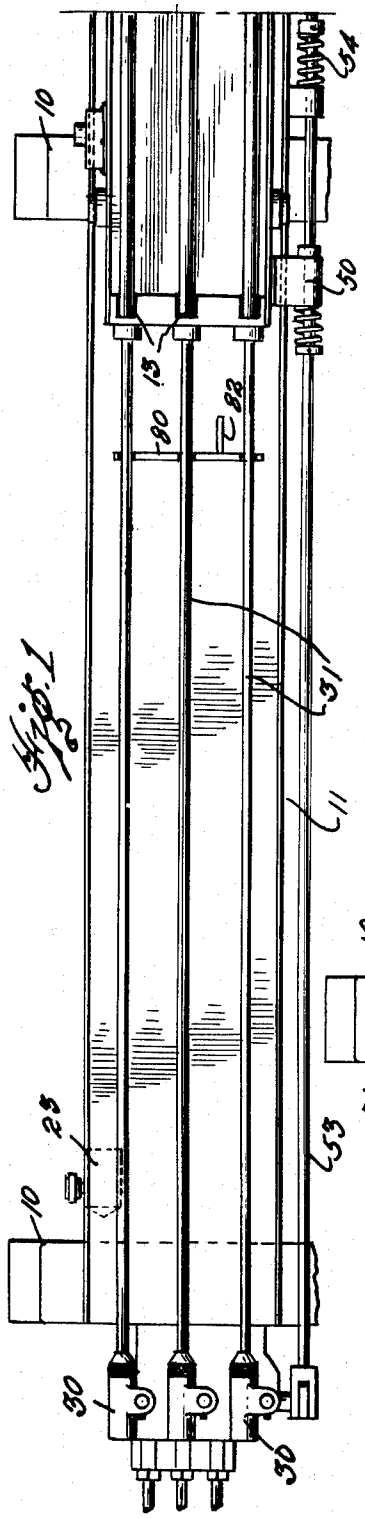


Fig. 1

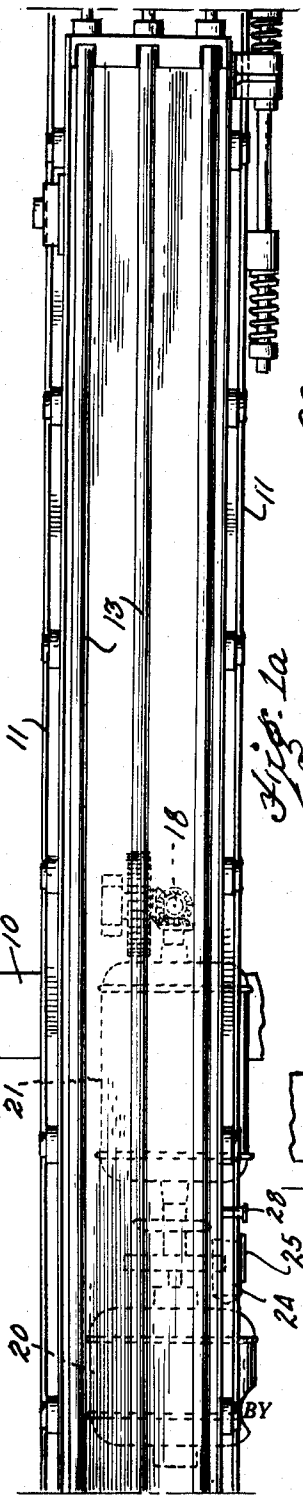


Fig. 1a

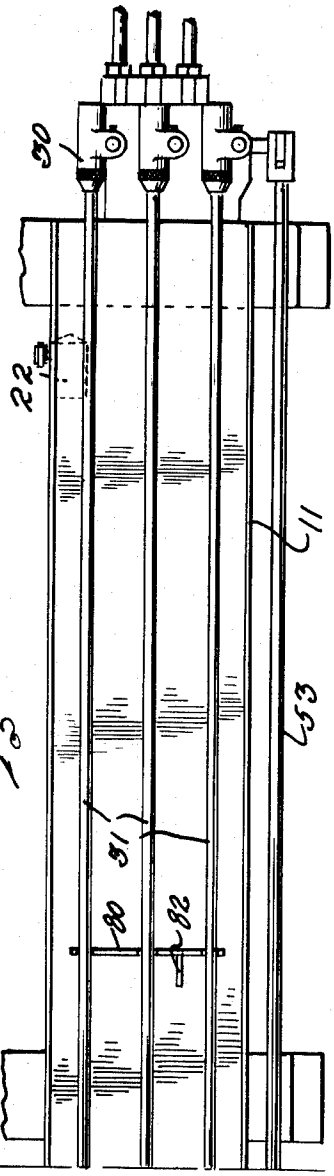


Fig. 1b

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COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 2

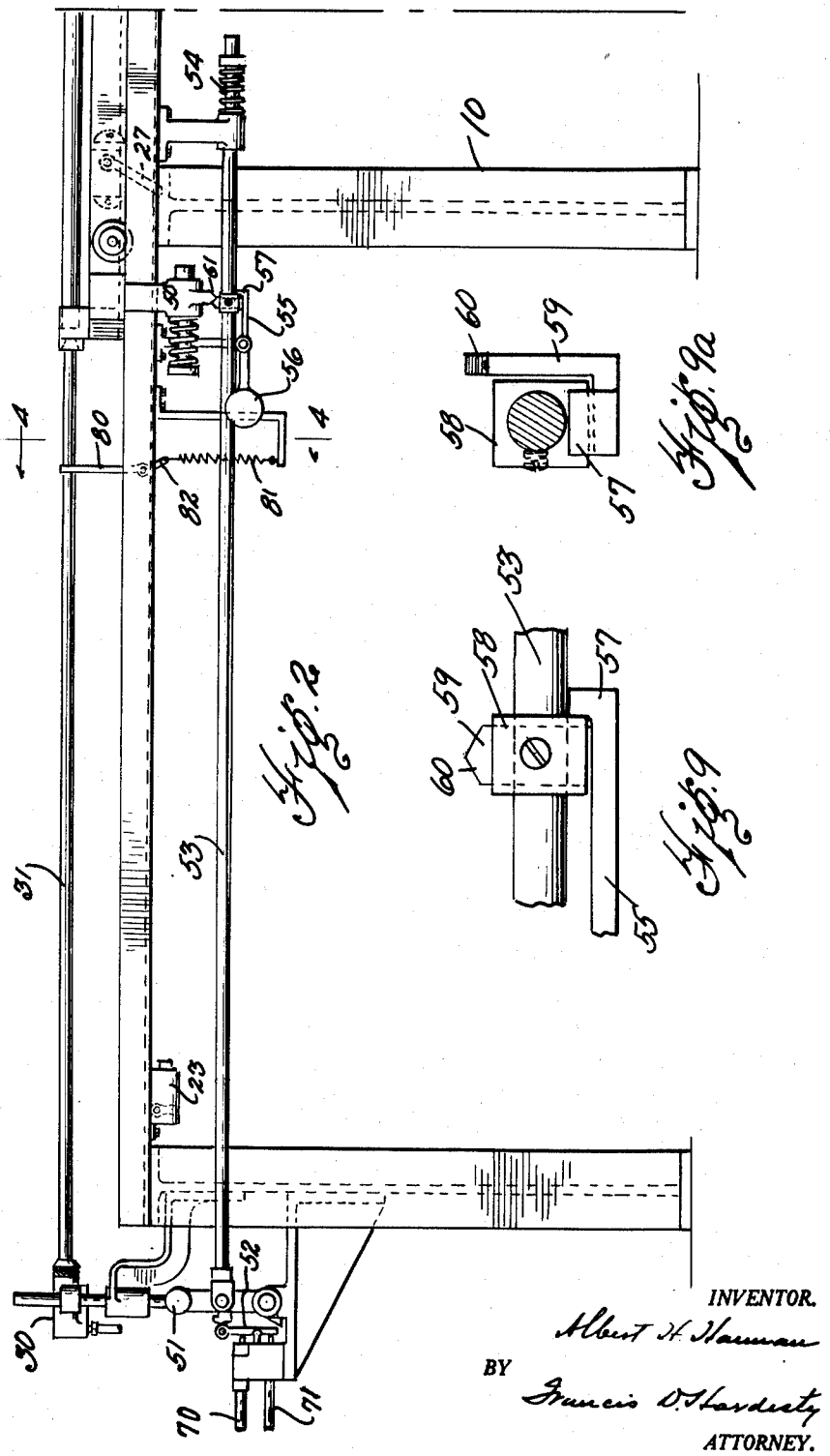


Fig. 2

Fig. 9

Fig. 9a

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June 13, 1933. A. H. HANNON 1,913,757

COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 3

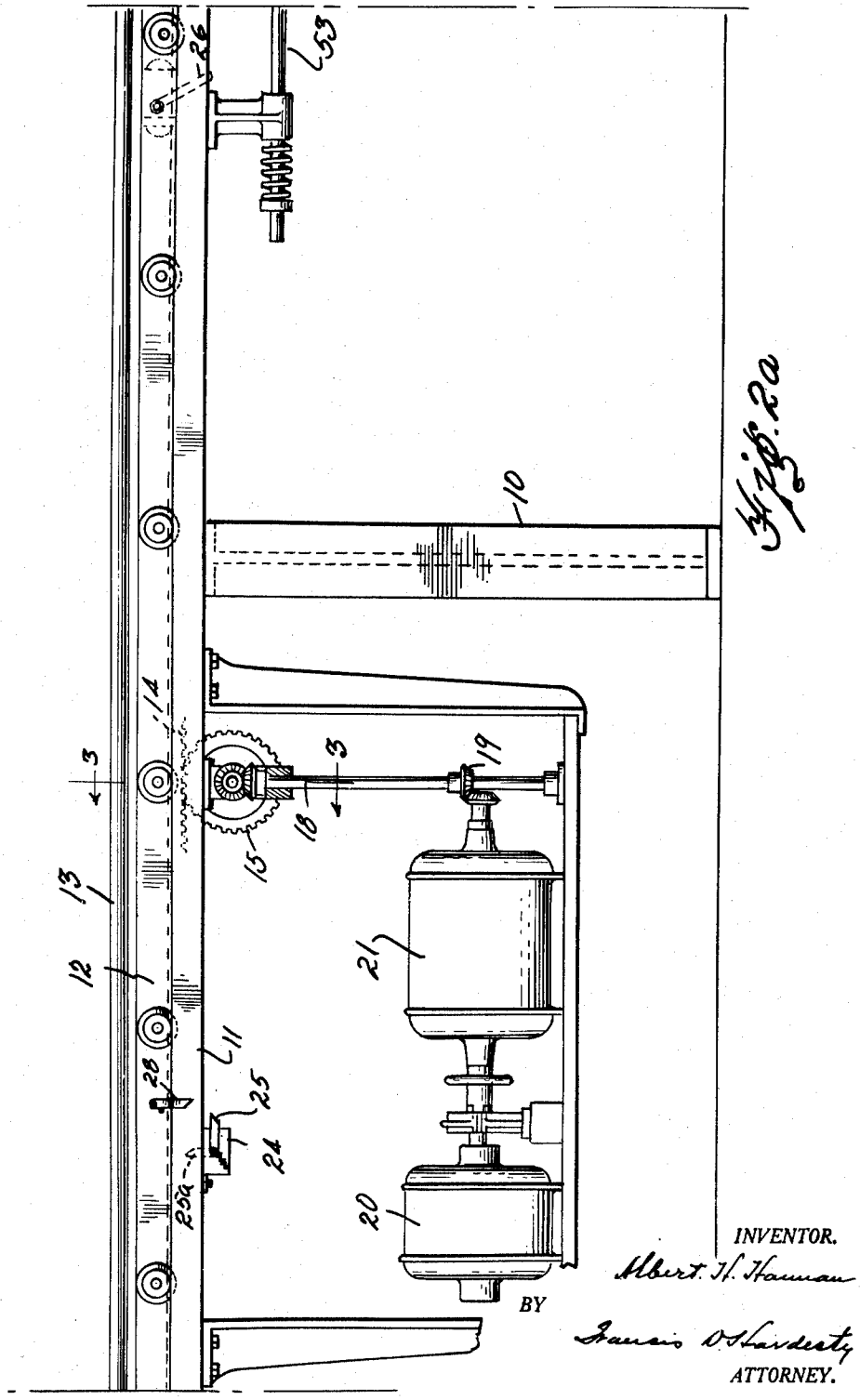


Fig. 2a

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COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 4

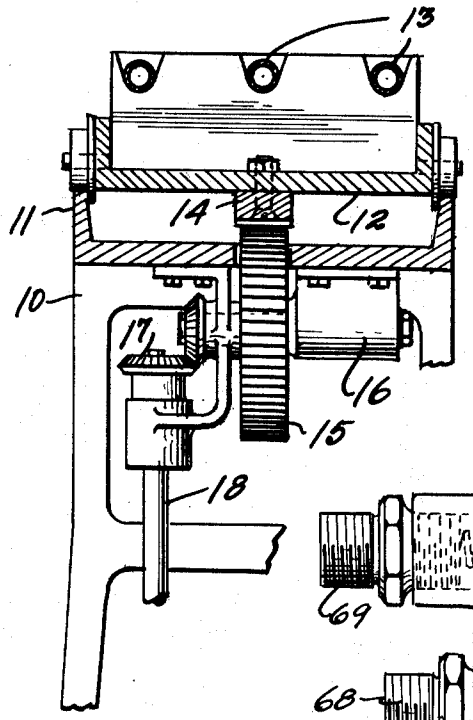


Fig. 3

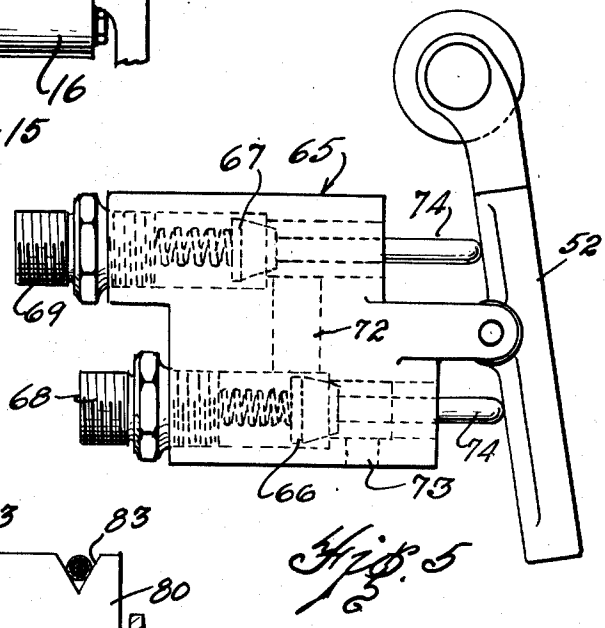


Fig. 5

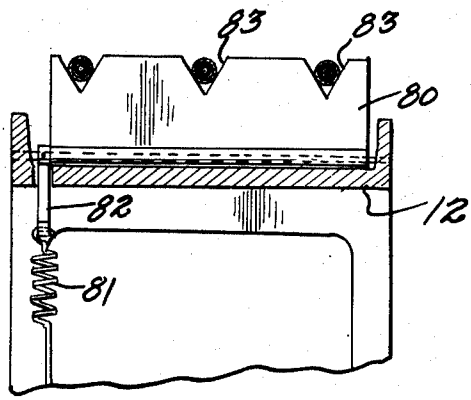


Fig. 4

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COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 5

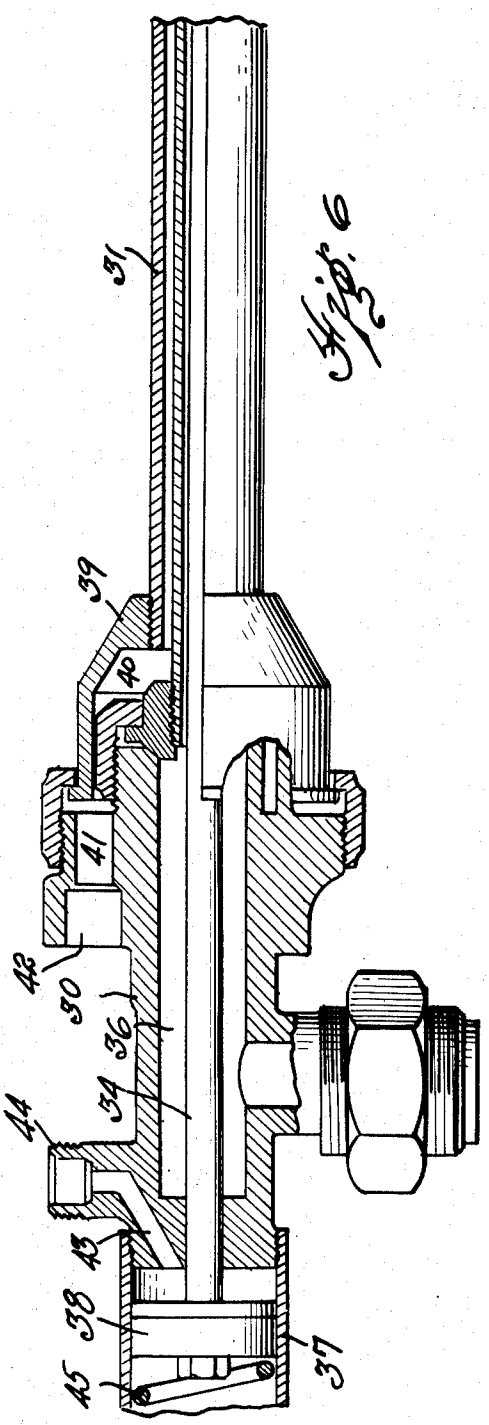


Fig. 6

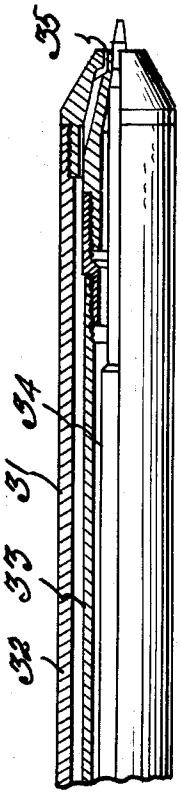


Fig. 7

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COATING MACHINE

Filed July 1, 1929 6 Sheets-Sheet 6

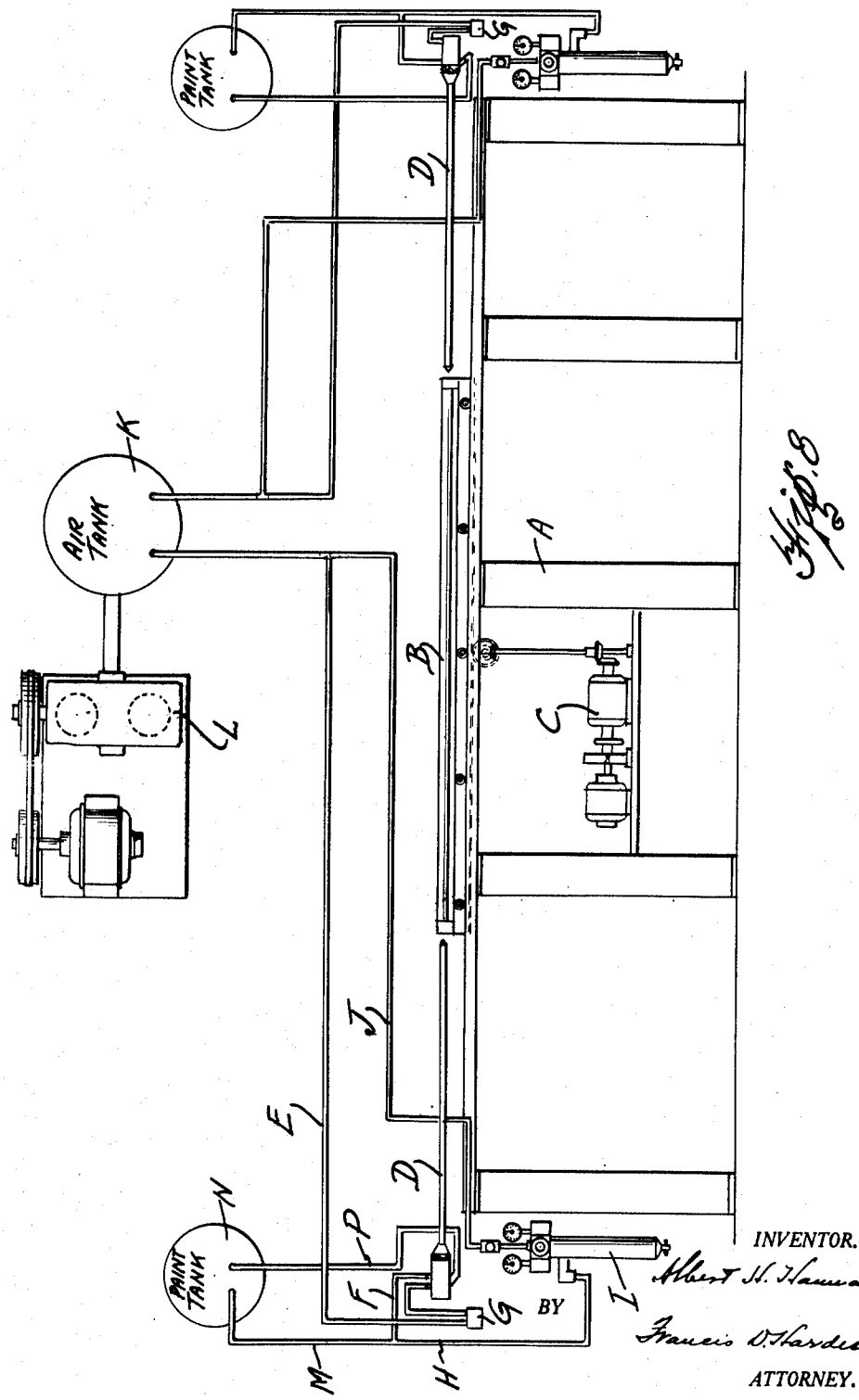


Fig. 8

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UNITED STATES PATENT OFFICE

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COATING MACHINE

Application filed July 1, 1929. Serial No. 375,128.

The present invention relates to coating machines and particularly to machines for spraying coating material on to the surface to be coated.

Among the objects of the invention is to provide a machine especially adapted to apply a liquid coating to the inner surface of pipes or tubes.

Another object is a device of the type indicated which is semi-automatic in its action.

Another object is a device of the type indicated which is comparatively simple in constructon and efficient in operation.

Still other objects will readily occur to those skilled in the art upon reference to the following description and the accompanying drawings in which

Figs. 1, 1*a*, and 1*b*, taken together, show a plan view of the machine.

Figs. 2 and 2*a*, taken together, show a side elevation of that portion of the machine shown in Figs. 1 and 1*a*.

Fig. 3 a section on line 3—3 of Fig. 2*a*.

Fig. 4 is a section on line 4—4 of Fig. 2.

Fig. 5 is an enlarged view in elevation of the air control valve.

Fig. 6 is an elevation, partly in section of the control end of one of the spray devices.

Fig. 7 is a similar view of the nozzle thereof, and

Fig. 8 is a more or less diagrammatic view of the machine and accessory apparatus.

Figs. 9 and 9*a* are respectively a side and end elevation of the means for holding the valve rod.

As indicated in the drawings, the machine comprises a table 10 mounted on suitable supporting legs and carrying tracks 11 extending from one end to the other of the machine and upon which is mounted a suitable conveying truck or car 12. As shown in the drawings, this truck is adapted to carry three pipes or tubes 13, but it is, of course, obvious that a greater or less number may be provided, if desired. The under portion of the car 12 is provided with a rack 14 cooperating with a gear 15 mounted in suitable bearings 16 carried by the table 10 and operated through beveled gears 17 from shaft 18 in turn operated through beveled gears 19 by a motor 20 connected thereto through a suitable reducing gearing 21.

The motor 20 which is preferably a reversing electric motor, is controlled by means of several switches 22, 23, and 24; switches 22 and 23 being reversing switches, while switch 24 is a stop switch. Referring to Fig. 2*a*, it will be noted that the switch 24 includes an arm 25 which in the dotted line position 25*a* permits current to flow through the motor and upon starting the latter, the car 12 is moved to the right hand end as indicated by Figs. 1 and 2. As the car approaches the end of the device, an arm 26 cooperates with switch 22 to reverse the flow of current through motor 20 and thereby reverse its direction of rotation, thus causing the car 12 to move back along the track until the arm 27 carried upon the car cooperates with the switch 23 to again reverse the current, and thereby the motor, so as to reverse the movement of the car. The latter then moves again toward the right until the arm 28 strikes the lever 25 and moves it to full line position whereupon the circuit through the motor is broken and the car stops. The rest position of the car thus determined, is the loading and unloading position.

At each end of the table 12 is mounted a plurality of spray guns indicated as a whole by numeral 30, each of which is provided with a long nozzle portion 31 adapted to project into the pipes or tubes 13 as the car moves toward the end and spray the inside thereof at the proper time. These spray guns are shown more in detail in Figs. 6 and 7, and each consist of a head 30 with its nozzle extension 31 and the latter comprises two concentric tubes or pipes 32 and 33 together with a valve member 34 enclosed in the latter tube. The outer tube or pipe has an opening 35 at its forward end which remains open during the operation of the machine and the inner tube or pipe has an opening at its outer end adapted to be opened and closed by the valve member 34 and which opens just within the extreme end of tube 32.

The body portion of the spray gun comprises a casting having a chamber 36 therein open to the inner tube 33 and through

which passes the valve member 34. This latter extends through the rear of the casing of the body portion 30 and into a cylinder 37, being provided with a piston 38 fitting within said cylinder. The outer tube 32 is fixed in a cap member 39 enclosing a chamber 40 connecting with the passageway 41 provided with a suitable threaded opening 42 by means of which the passageway 41 may be connected with a suitable source of air under pressure.

The cylinder 37 is also open to a passage 43 and threaded portion 44 so that air may be supplied to the cylinder behind the piston 38 in order to open the valve 34 at the end of pipe 33. The piston being returned upon release of the air pressure by means of a spring 45.

In addition to the elements already described in connection with the car 12, the latter carries at each end a buffer member 50 which is adapted to coact with a lever 51 at each end of the table when the car end reaches said end. This buffer member 50 strikes the end of the lever 51 just as the car reaches the end of the table (referring to Fig. 2) and moves the latter thereby rocking the lever 52 which is the air valve control lever and at the same time carrying along with it the rod 53 and compressing the spring 54 on the rear end of the latter.

When the rod 53 has been moved by means of the buffer member 50 and the spring 54, it is held in its new position holding open the air valve by means of the retaining catch indicated at 55. This catch comprises a lever having at one end a weight 56 and at the other end a hook portion 57 adapted to hook behind a block 58 fixed in adjusted position on the rod 53. The lever also carries at one side an upwardly projecting portion 59 having its upper end pointed or cam shaped as indicated at 60. This portion 60 cooperates with a projection 61 carried by the buffer 50 so that when the rod 53 as shown in Fig. 2 has been moved to the left, the lever 55 will retain it in that position until the buffer 50 has returned to rest position with the car and has passed over the portion 60, pushing it down and releasing the hook 57 from behind the block.

The valve mechanism is shown best in Fig. 5 and consists of a valve block 65 containing two valves 66 and 67 located opposite the two threaded nipples 68 and 69 respectively, by means of which suitable pipe connections 70 and 71 are attached. The nipple 69 and its pipe lead from a suitable source of air under pressure while the nipple 68 and its pipe lead to the connection 44 on the spray gun. Within the block the two valve chambers are connected by a passage 72 and the chamber for valve 66 is provided with an exhaust passage 73. These two valves control the operation of the coating liquid supply to the spray gun and operate alternately and oppositely, valve 66 operating to open and close the air supply pipe 68 and valve 67 operating to open and close the exhaust 73. When valve 66 is open and valve 67 closed, by means of the stems 74 being actuated by lever 52, air enters 68, passes through passage 72 and out of 69 to the cylinder 37 to operate the piston therein. When the lever 52 moves back, the valve 67 opens and the valve 66 closes and the air in cylinders 37 exhausts, allowing the piston 38 to move back and close the valve 34.

When the loaded car 12 moves from its loading position toward either end of the track, the sprays at that end are idle until the buffer member 50 strikes the lever 51 thus turning on the spray material to the gun. At the same time the reversing switch 23 has been operated and the car starts back. The spray continues until the lever 55 has been operated to release the rod 53. This operation takes place just as the end of the spray nozzle leaves the pipe. The same sequence of operations takes place at the other end of the track, so that the sprays are in operation as the pipe is leaving them and each coats half of the interior.

Fig. 8 shows more or less diagrammatically the entire installation and in this figure, the table carrying the track is indicated at A, with the car and pipe at B operated by the motor and gearing C.

The spray guns D are shown as connected by the two pipes E and F to the air supply directly through pipe E and valve G, and indirectly through pipe F which is one branch of a pipe H leading from a drier I for the air which comes in contact with the coating liquid. This drier I is connected through pipe J to the air supply tank K, kept at a suitable pressure by pump L. The other branch M of pipe H leads to the coating liquid supply tank N so as to keep a suitable pressure therein.

From the tank N a pipe P conveys the coating material to the spray guns. As the spray gun extensions are necessarily quite long and constantly filled with liquid coating material, they are rather heavy and therefore require support near their ends in order that they may enter the pipes properly. Provision for such support is made by means of the hinged and notched plate or frame 80 shown in Figs. 1, 1*a*, 2 and 4. This element is resiliently held upright by means of a suitable spring 81 anchored at one end to the table 10 and attached at its other end to an arm 82 carried by the element 80. When the pipes are entirely free from the gun extensions, the latter rest in the notches 83 as shown in Fig. 4. When, however, the nozzles enter the pipes, the latter moving over the former merely push the element 80 down, swinging it on its hinges, and then support the nozzles themselves.

Now, having described the invention and the preferred forms of embodiment thereof, it is to be understood that the said invention is to be limited, not to the specific details herein set forth and illustrated, but only by the scope of the claims which follow:—

I claim:—

1. In a machine for internally coating pipes or tubes a supporting table or frame having a track thereon, a tube carrying car on said track, a spray device mounted on said table at one end of said track and adapted to enter a tube when said car is moved toward that end, means adapted to be actuated by said car to cause operation of said spray device when said car reaches the end of its movement, means to cause return movement of said car and means to stop said spray as the latter leaves said tube.

2. In a machine for internally coating tubes and pipes, a frame having mounted at each end thereof a spray device for spraying liquid coating material and of substantially one half the length of a tube to be coated, a tube carrier mounted on said frame and movable toward the ends thereof whereby to cause the spray devices to enter and be withdrawn from first one end of a tube and then the other, and means to cause the operation of the spray devices as they are being withdrawn from said tubes.

3. In a machine for internally coating tubes and pipes, a frame having mounted at each end thereof a spray device for spraying liquid coating material and of substantially one half the length of a tube to be coated, a tube carrier mounted on said frame and movable toward the ends thereof whereby to cause the spray devices to enter and be withdrawn from first one end of a tube and then the other, and means operable by said carrier to cause operation of the spray devices as they are being withdrawn from said tubes.

4. In a machine for internally coating tubes and pipes, a frame having mounted at each end thereof a spray device for spraying liquid coating material and of substantially one half the length of a tube to be coated, a tube carrier mounted on said frame and movable toward the ends thereof whereby to cause the spray devices to enter and be withdrawn from first one end of a tube and then the other, and means to cause operation of the spray devices as they are being withdrawn from said tubes, and means to shut off said spray devices as they leave the tube.

5. In a machine for internally coating tubes, a tube support, a spray device at each end thereof and in alignment therewith and adapted to enter a tube on said support upon relative movement thereof, means to produce such relative movement to cause said tube to cover first one spray and then the other and to be withdrawn therefrom, and means to cause operation of said sprays only during the withdrawal movement.

6. In a machine for internally coating tubes, a tube carrier, a frame upon which said tube carrier is adapted to travel, and move the tube thereon lengthwise, a spray device fixed at each end of said frame in alignment with said tube and sufficiently small to enter the latter, said spray device being substantially one half the length of a tube and said frame being substantially twice the length of a tube, reversing motor mechanism for moving the carrier from an intermediate rest position between the ends of the spray devices, to one end of the frame, then back to the other end, and then to said intermediate rest position, means on said carrier to cause actuation of said mechanism to produce said movements, and means for actuating a spray device during movement of the carrier and tube away from that end on which it is mounted.

7. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising an elongated spray device also of small diameter, means to support said device in horizontal position, means to support the tube to be coated in a horizontal position, mechanism for causing relative horizontal movement of the supports to cause said device to enter said tube a considerable distance and then to be withdrawn therefrom and means automatically controlled by a moving part of the machine and operating for the first time upon the beginning of the withdrawal of said device from said tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat the tube interior continuously and only during said withdrawal.

8. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising an elongated spray device also of small diameter, means to support said device in horizontal position, means to support the tube to be coated in a horizontal position, mechanism for causing relative horizontal movement of the supports to cause said device to enter said tube a considerable distance and then to be withdrawn therefrom and means automatically controlled by a moving part of the machine and operating for the first time upon the beginning of the withdrawal of said device from said tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat the tube interior continuously and only during said withdrawal, the tubes serving to support said spray device when they are relatively telescoped.

9. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising a pair of axially aligned spaced elongated spray devices, also of small diameter, means to support said devices in a horizontal position and in axial alignment,

means to support the tube to be coated in a horizontal position, between and in axial alignment with the spray devices, mechanism for causing relative horizontal movement of the tube support and of the spray device supports, to cause each of said devices to enter said tube a considerable distance and then to be withdrawn therefrom, and means operatively connected to each of the devices and automatically controlled by a moving part of the machine and operating for the first time upon the beginning of the withdrawal of the device to which it is connected from the tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat a portion of the tube interior continuously and only during said withdrawal.

10. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising a pair of spaced elongated spray devices, also of small diameter, means to support said devices in a horizontal position, means to support the tube to be coated in a horizontal position, between the spray devices, mechanism for causing relative horizontal movement of the tube support and of the spray device supports to cause each of said devices to enter said tube a considerable distance and then to be withdrawn therefrom, and means operatively connected to each of the devices and automatically controlled by a moving part of the machine and operating for the first time upon the beginning of the withdrawal of the device to which it is connected from the tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat a portion of the tube interior continuously and only during said withdrawal.

11. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising an elongated spray device also of small diameter, means to support said device in horizontal position, means to support the tube to be coated in a horizontal position, mechanism for causing relative horizontal movement of the supports to cause said device to enter said tube a considerable distance and then to be withdrawn therefrom and means automatically controlled by a moving part of the machine and operating for the first time upon the beginning of the withdrawal of said device from said tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat the tube interior continuously and only during said withdrawal, and means, automatically controlled by a moving part of the machine and operating at the end of the withdrawal stroke to cause cessation of the spray as the spray device arrives at the end of its withdrawal stroke.

12. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising an elongated spray device also of small diameter, means to support said device in horizontal position, means to support the tube to be coated in a horizontal position, mechanism for causing relative horizontal movement of the supports to cause said device to enter said tube a considerable distance and then to be withdrawn therefrom and means operating for the first time upon the beginning of the withdrawal of said device from said tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat the tube interior continuously and only during said withdrawal.

13. A machine for internally coating elongated pipes or tubes of relatively small diameter comprising an elongated spray device also of small diameter, means to support the tube to be coated in a horizontal position, mechanism for causing relative horizontal movement of the supports to cause said device to enter said tube a considerable distance and then to be withdrawn therefrom and automatically controlled means operating for the first time upon the beginning of the withdrawal of said device from said tube, and then continuously thereafter during said withdrawal only to cause said device to spray coat the tube interior continuously and only during said withdrawal.

14. The process of coating the inside surface of an elongated tube which includes the steps of (*a*) supporting the tube substantially horizontally, (*b*) inserting an elongated spray coating device in said pipe, (*c*) commencing the spraying operation only after the device has been inserted, (*d*) withdrawing said device from said tube, and (*e*) continuing the spraying operation on the withdrawal stroke of the spray device, and automatically stopping the operation of the spraying device as the end of the spraying device leaves the tube.

15. The process of coating the inside surface of an elongated tube which includes the steps of (*a*) supporting the tube substantially horizontally, (*b*) inserting an elongated spray coating device in said pipe, (*c*) automatically commencing the spraying operation only after the device has been inserted, (*d*) withdrawing said device from said tube, and (*e*) continuing the spraying operation on the withdrawal stroke of the spray device, and automatically stopping the operation of the spraying device as the end of the spraying device leaves the tube.

16. In apparatus for treating pipes, the combination with a nozzle, of means for relatively moving the pipe and the nozzle, movable means for supporting said nozzle, and means for automatically actuating said movable supporting means to leave the nozzle free of its support during a predetermined portion of the relative movement between the nozzle and the pipe.

17. In apparatus for internally treating elongated pipes of relatively small diameter, the combination with a spray nozzle also of small diameter of means for relatively moving the pipe and the nozzle to telescope the former over the latter, fixed supporting means for said nozzle at one end thereof, movable supporting means intermediate the length of said nozzle and means for automatically moving said movable supporting means to leave the nozzle free thereof during a predetermined portion of the relative movement between said nozzle and the pipe.

18. In a method of treating the interior surface of tubes, inserting the tube spraying apparatus within a tube until the spray end of the tube spraying mechanism is adjacent the interior end of the tube, withdrawing the pipe spraying apparatus from the tube by relative motion of the two, and automatically controlling for the first time upon the beginning of the withdrawing movement and then continuously thereafter during said withdrawal only the application of a single coat of spraying material from the inner end outwardly toward the outer end, and the stopping at the end of the withdrawal movement.

19. In a method of treating the interior surface of tubes, inserting a tube spraying apparatus within a tube until the spray end of the tube spraying mechanism is adjacent the interior end of the tube, withdrawing the tube spraying apparatus from the tube by relative motion of the two, controlling automatically both the application of a single coat of spraying material from the inner end outwardly toward the outer end by the withdrawal movement of the spray device, and the stopping at the end of the withdrawal movement.

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