E. C. ALLEMAN.

METHOD OF AND APPARATUS FOR APPLYING LIQUID COATING.

APPLICATION FILED MAR. 24, 1916. RENEWED JAN. 5, 1920.

1,340,645. **Patented May 18, 1920.**

5 SHEETS—SHEET 1.

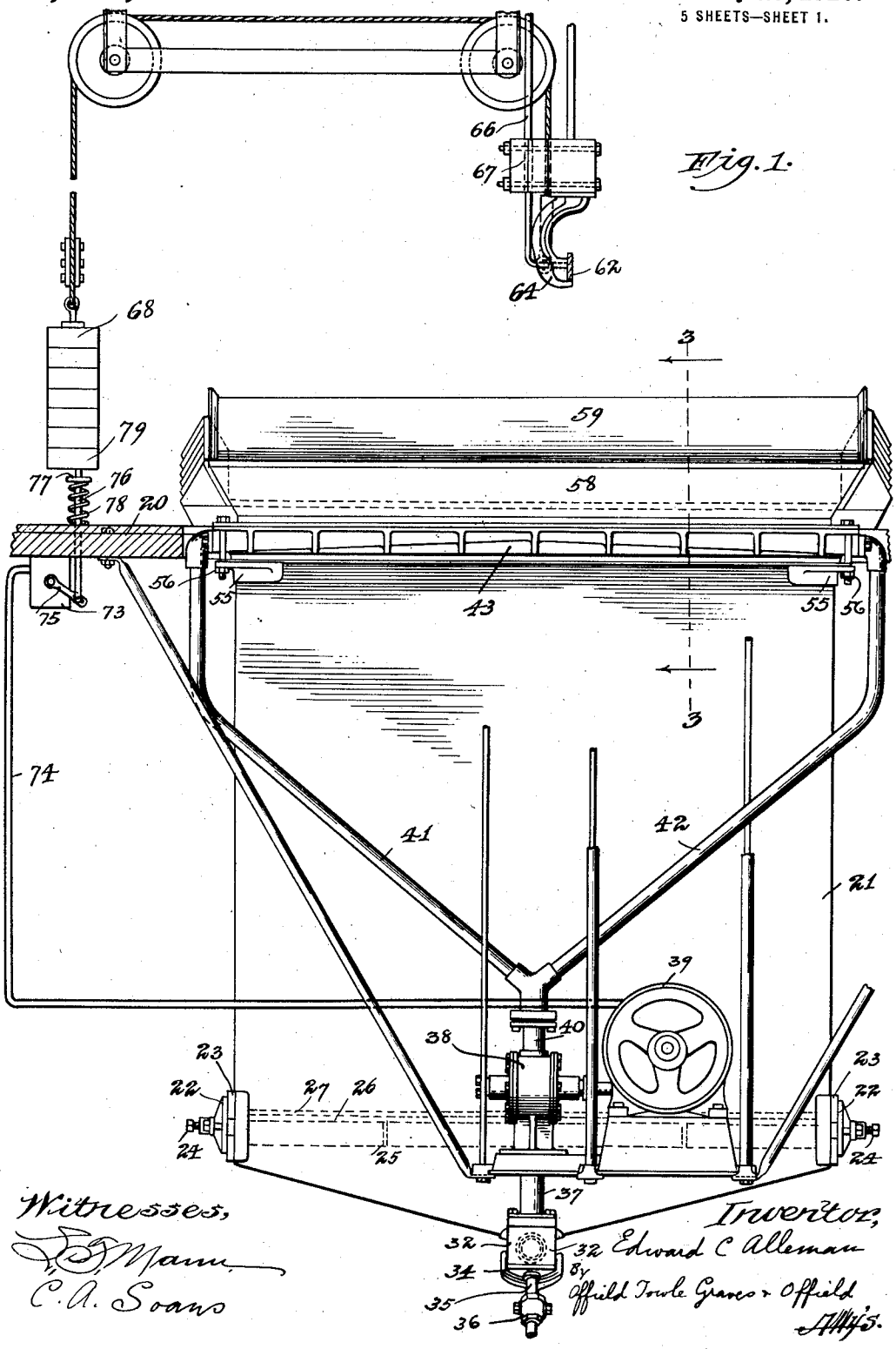


Fig. 1.

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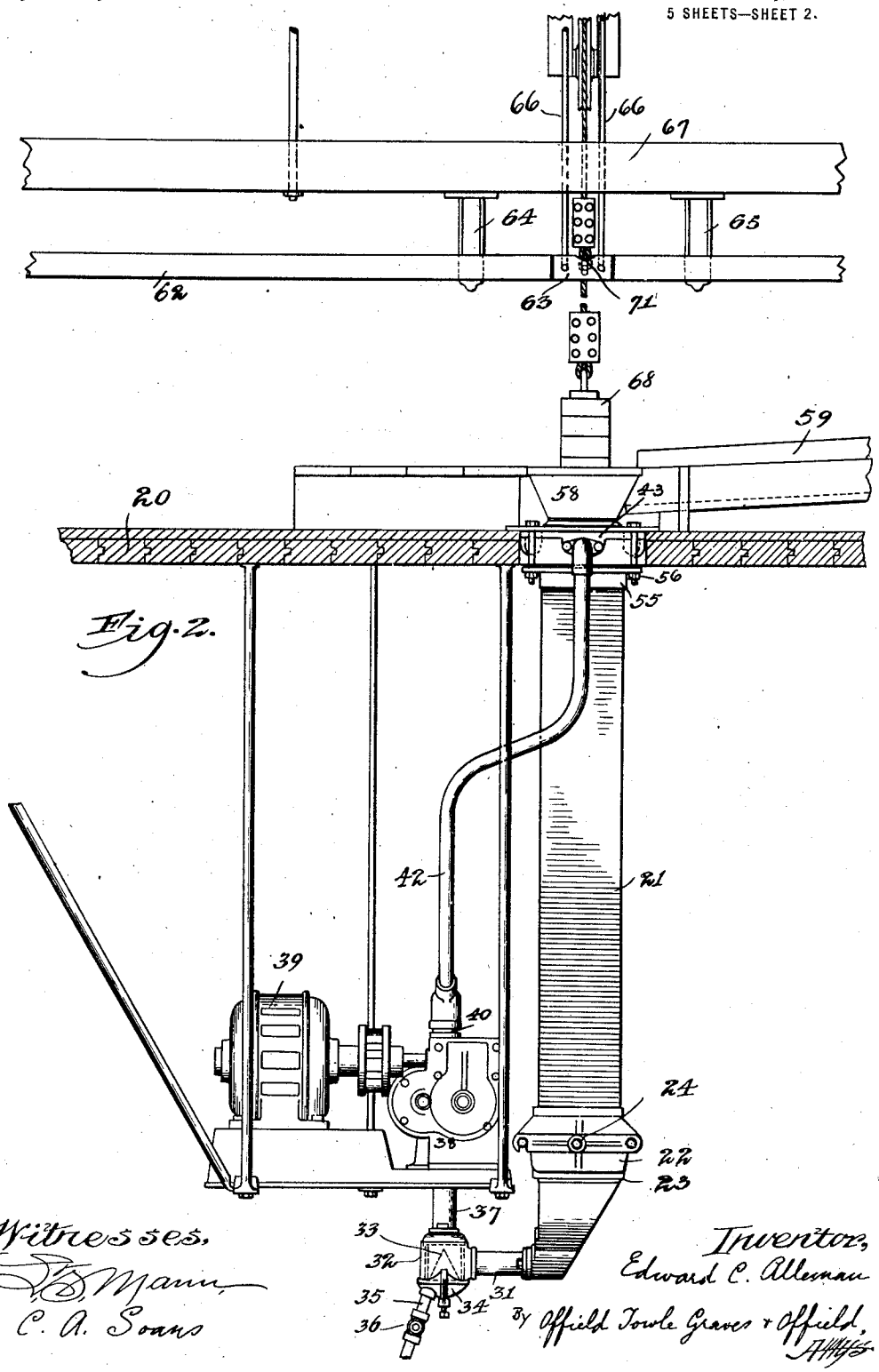


Fig. 2.

Witnesses,
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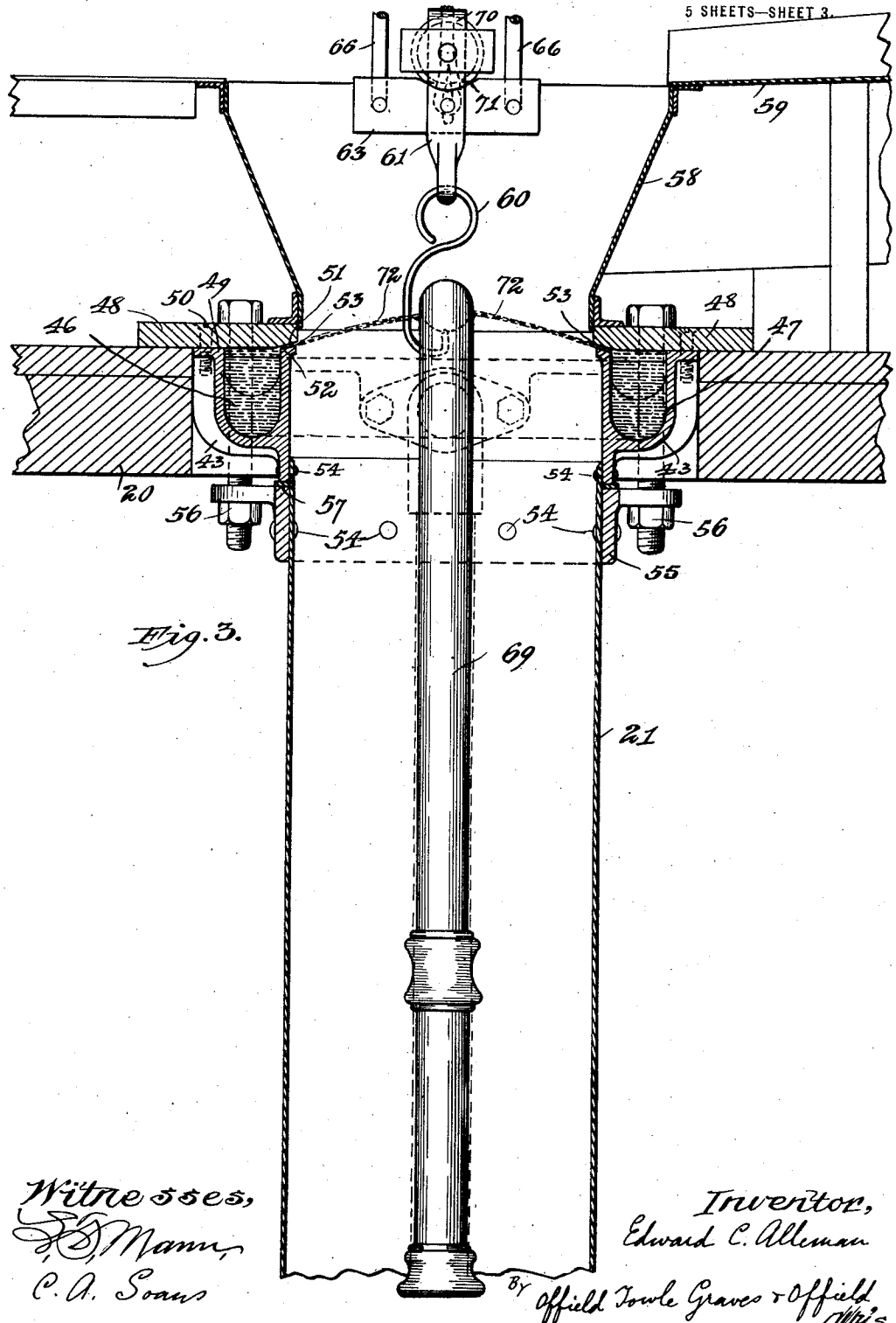


Fig. 3.

Witnesses,
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Fig. 4.

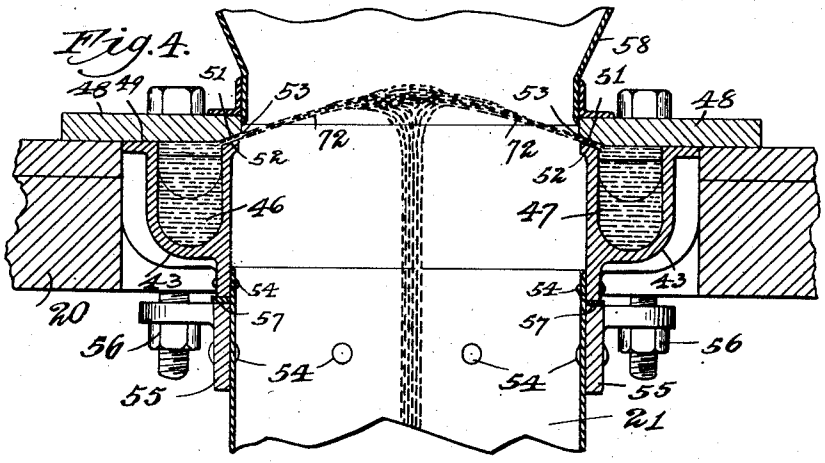


Fig. 5.

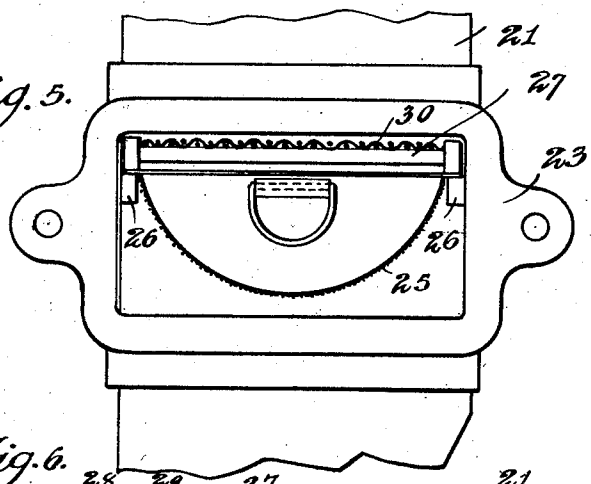
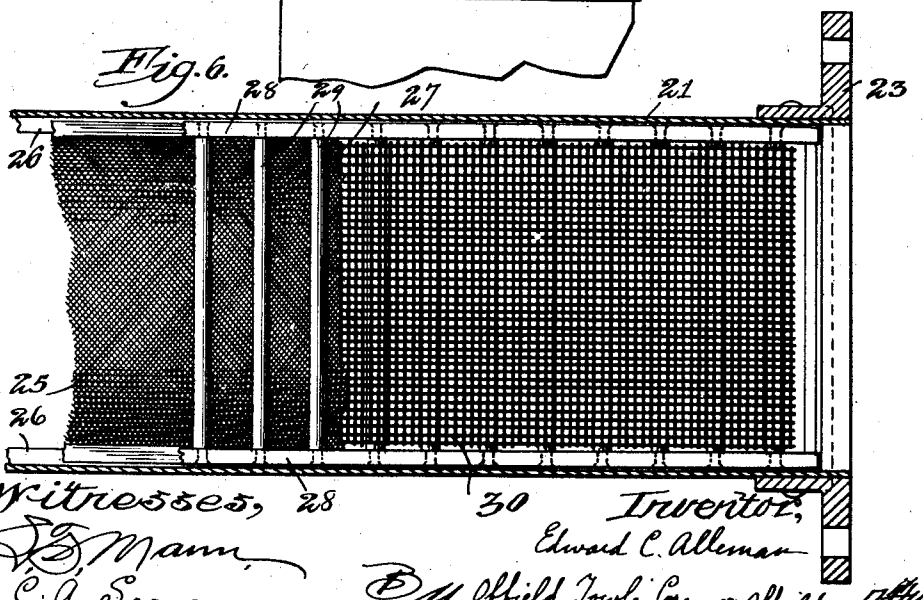


Fig. 6.



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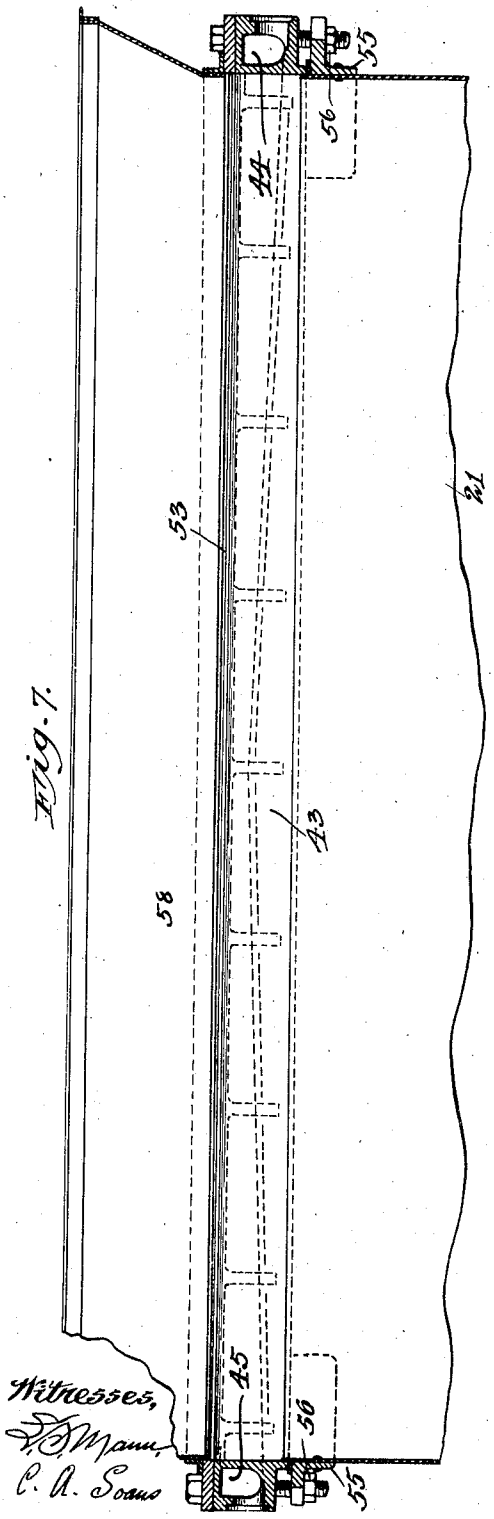


Fig. 7.

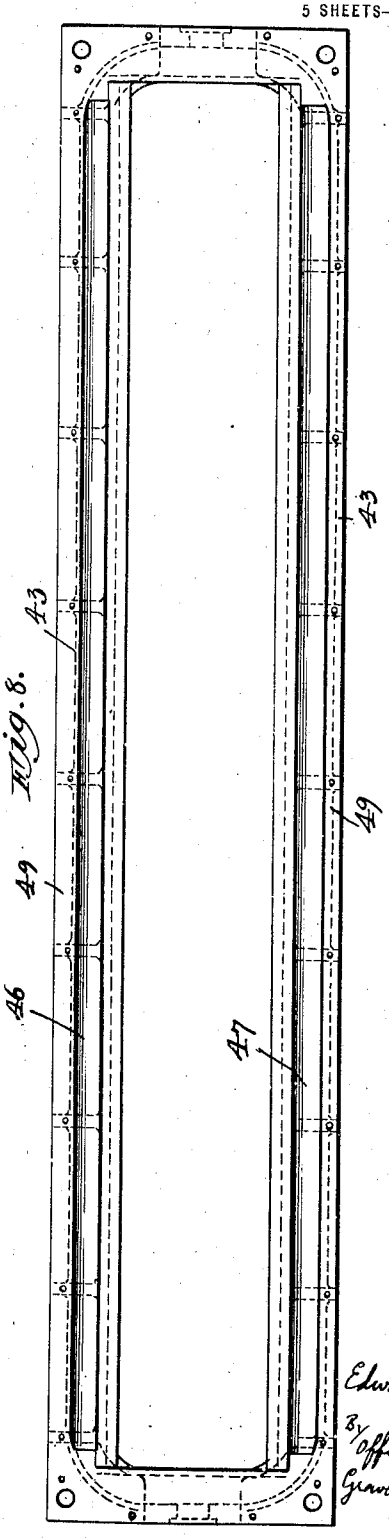


Fig. 8.

Witnesses,
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UNITED STATES PATENT OFFICE.

EDWARD C. ALLEMAN, OF KENOSHA, WISCONSIN, ASSIGNOR TO SIMMONS COMPANY, A CORPORATION OF DELAWARE.

METHOD OF AND APPARATUS FOR APPLYING LIQUID COATING.

1,340,645. Specification of Letters Patent. Patented May 18, 1920.

Application filed March 24, 1916, Serial No. 86,337. Renewed January 5, 1920. Serial No. 349,638.

To all whom it may concern:

Be it known that I, EDWARD C. ALLEMAN, a citizen of the United States, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Methods of and Apparatus for Applying Liquid Coating, of which the following is a specification.

My invention relates to an improved method of and apparatus for applying liquid coatings, such as paint, varnish, or other material, to the exterior surfaces of objects to be coated. Although the invention has many applications, it will be found to be particularly serviceable and efficient in applying coatings to comparatively large objects, for instance, the end frames of metal bedsteads.

The salient objects of the invention are, to provide a method and apparatus of the class described which shall result in marked economy in time, labor, and consumption of coating material; to provide a process and apparatus suitable for coating bulky objects and which requires the use of a comparatively small quantity of coating material at any one time; to provide a process and apparatus of the class described in which the initial investment for applying a large number of different classes or colors of coatings is insignificant, and by which the apparatus may be washed out and arranged for a different coating in a comparatively short time; to provide an improved and more uniform surface finish for the coated articles; to prevent deterioration of the coating material; to prevent waste of solvent by evaporation; to provide an arrangement by which pigments or other ingredients in the coating material are at all times equally distributed through the entire bulk of coating material; to prevent the coating material from entering crevices in hollow articles; to prevent fouling of the coating material by particles of foreign matter; to provide an arrangement which readily permits of frequent cleansing of the apparatus and storage of the coating material in sealed receptacles when not in use; to provide a process and apparatus in which the fire hazard is reduced to a minimum; and, in general, to provide an improved process and apparatus of the character referred to.

In the drawings, which illustrate a preferred type of apparatus for carrying out my improved method or process—

Figure 1 is a side elevation of the apparatus;

Fig. 2 is an end elevation of Fig. 1;

Fig. 3 is an enlarged section taken on the line 3—3 of Fig. 1 and showing an object being coated;

Fig. 4 is a fragmentary view of a portion of Fig. 3 showing the object removed;

Fig. 5 is an enlarged end elevation of the lower portion of the collecting tank;

Fig. 6 is a fragmentary sectional plan of the sump and screen covering the same;

Fig. 7 is a longitudinal section taken through the conduit casting; and

Fig. 8 is a plan view of the same with the side plates removed.

I have selected as showing the application of my invention an apparatus which is capable of being employed in the coating of such objects as metal bed frames. The apparatus, as shown in the drawing, is located at or below the level of the floor 20 upon which stand the operators when handling the bed frames or manipulating the apparatus. The apparatus includes a sheet metal inclosure 21, the dimensions of which are such as to accommodate the largest bed frame or other object which is to be operated upon. The lower portion of this inclosure or tank 21 is equipped at its ends with opposite hand-hole covers 22 covering apertures in the flanged members 23 in the ends of the tank 21. Said hand-hole covers 22 are furnished with clamping screws 24, the arrangement being such as to permit rapid removal or replacement of the hand-hole covers for cleaning purposes. Accessible through the hand-holes when the covers are removed is a semi-circular screen 25 of fine mesh extending the entire length of the tank or inclosure 21. Said screen rests upon a pair of longitudinal internal supports 26 and can be readily slid out of the hand-hole whenever it is desired to remove the accumulation of foreign matter. In order to protect the comparatively weak mesh of the screen 25, I prefer to arrange above the screen a rack 27 having side members 28 and a series of rather closely spaced cross-rods 29. Immediately above and supported by the cross-rods 29 is located a compara-

tively stout, heavy wire screen 30 which effectually arrests falling objects and prevents injury to the screen proper 25.

Below the screen 25, the sump portion of the tank is arranged to drain toward a sump pipe 31 communicating with a sump chamber 32. Said sump chamber is preferably equipped with a screen 33 and removable cover 34. The coating material may be drawn off through a pipe 35 controlled by a valve 36. Rising from the top of the sump chamber 32 is a vertical suction pipe 37 which enters the suction side of a geared rotary pump 38. Said pump 38 is driven through a set of worm gears by an electric motor 39, the controlling means for which will be described hereinafter.

The delivery pipe 40 is forked, having two branches 41 and 42, as shown in Fig. 1, each of said branch pipes leading to one end of the conduit casting 43 (see also Fig. 7). The ends of said pipes 41 and 42 lead directly into the end conduits 44 and 45, the ends of which communicate with similar side conduits 46 and 47, the shape of the latter being shown in Figs. 3 and 4. The side edges of said conduits 46 and 47 are equally planed off and are covered by a pair of cover plates 48. Said cover plates are secured to the outer flanges 49 by flat-head screws 50, the inner edges of the cover plates being beveled, as shown at 51, so as to form with the beveled inner edges 52 of the side conduits a pair of longitudinal slits 53. Said slits 53 preferably extend continuously from end to end of the cover plates and constitute openings through which the coating material is discharged in the form of sheets.

The tank 21 is connected at its upper end to the conduit casting 43 by means of a series of rivets or bolts 54 and is also secured in a similar manner to a pair of three-sided end castings 55 which are hung from the floor by bolts 56. Packing is inserted, as shown at 57, in order to prevent the coating material from running down the outside of the tank. Above the conduit casting extends a flaring sheet iron bottomless trough 58 for preventing splashing of coating material, and draining into one side of said splash trough 58 is an inclined drain-board 59 (see Figs. 1, 2, and 3) which receive the drip from the coated articles before the latter are finally moved away from the vicinity of the coating apparatus.

In practice, when my apparatus is used for coating bed frame ends, each frame is supported by a wire hook 60 depending from a hanger-trolley 61 which rolls upon an overhead track 62. The track extends in a direction at rightangles to the major horizontal dimension of the tank 21, a section of the rail 63 immediately above the tank being severed from the track, the track ends at either side of the break being rigidly supported by hangers 64 and 65. Said rail section 63 is suspended by a pair of rods 66 vertically slidable in the member 67, the weight of the track section and associated parts, together with the bed frame to be operated upon, being balanced by a counterweight 68.

Describing the operation of the apparatus, the bedstead end 69, carried by its own individual trolley-hanger 70, is rolled onto the removable track section 63. It will be noted that the latter is provided with a slight depression 71 which prevents the trolley from running off the end of the rail section while the latter is in lowered position. The motor having been started, as will be described later, the paint or other coating material in the lowered portion of the tank will be forced through the pipes 41 and 42 into the end conduits of the conduit casting and thence into the side conduits 46 and 47 and out through the longitudinally extending slits 53 in the form of two upwardly directed unbroken sheet-like jets 72 of fluid. The bedstead end is lowered vertically down into the tank which, as previously stated, is of sufficient depth to accommodate the largest size of bed frame. While the bedstead end is being lowered into the tank and subsequently raised therefrom, the two sheet-like jets 72 will engage opposite sides of the object and the coating fluid will be flowed or evenly spread over the entire surface of the bedstead end. The direction of the jet 72 is slightly upward so as to insure the coating of the under sides of any horizontal members which may form a part of the bedstead frame or other object to be coated.

It should be noted that the quantity of coating liquid contained in the apparatus is extremely small, usually from five to ten gallons for an apparatus capable of coating bedstead ends of ordinary dimensions. Under these conditions the surface of the coating fluid in the tank is below the object being coated and there is no tendency to force liquid through crevices or into hollow parts of the article being operated upon. In this respect my invention possesses great advantages over dipping processes.

Owing to the fact that the coating liquid is strained in two places before it reaches the pump, the coating is free from imperfections caused by foreign matter falling into the coating inclosure. In addition, the efficient straining of the coating fluid prevents clogging of the discharge slits 53, which are of comparatively small width. (I have found that good results are obtained with an opening one-thirtysecond, $\frac{1}{32}$, of an inch across). If on rare occasions it is found that the slits tend to clog and do not deliver an unbroken sheet-like flow of liquid, it is a simple matter to run a cleaning tool, such as a thin metal blade, along the entire

length of the slit and thus immediately clear the openings without stopping the operation of the apparatus.

With my improved process and apparatus there is no tendency for the pigments or other ingredients of the coating fluid to settle or become concentrated in certain portions of the liquid, for the reason that the pump continually stirs up and mixes the liquid. This is of great importance with certain coating fluids in which the solvent tends to separate out and rise to the surface. When using the apparatus a proper quantity of coating fluid is obtained by adding fresh pure material as the liquid is used up; thus, the liquid always remains fresh and pure, insuring a uniform and perfect finish, all of the parts receiving precisely the same color and thickness of coating. Since the surface area of liquid to which the air has access is extremely limited, undue evaporation of solvent is largely prevented, thus effecting a considerable saving.

With my improved arrangement it is unnecessary to leave the coating fluid in the tank during the night or such other times when the apparatus is not in use. In such cases I draw off the entire contents of the apparatus through the pipe 35 and store the liquid in air-proof sealed receptacles which protect it from contamination, oxidation, evaporation, or other exterior agencies which might affect its quality. After drawing off the liquid, the apparatus is cleaned out by adding a small quantity of benzin or other solvent and running the motor for a short time to thoroughly wash all parts of the machine. The benzin is then drawn off, leaving the apparatus in absolutely clean condition. The ability to clean out the apparatus as above described in a very few minutes enables me to make a change in the color or kind of coating to be applied by one and the same machine, without undue loss of time, and I am not compelled to maintain a different apparatus for every color or coating which I may wish to apply to the articles to be finished. Also, since only a few gallons of each color are required, it is unnecessary to keep up large stocks of different colors or kinds of coating fluids, which would be necessary with ordinary dipping tanks.

If desired, the arrangement may be such that the pump motor is automatically started and stopped at the beginning and end of each coating operation. To this end I utilize an automatic switch 73 through which passes the power circuit 74 before the current reaches the motor. Said switch 73 may be of any ordinary type, such as a Sundh switch, and having an operating lever 75 which is actuated by a vertical plunger rod 76. Said rod has at its upper end a fixed collar 77 between which and the floor 20 is inserted a coil compression spring 78 which tends to raise the plunger and close the switch. Such tendency, however, is prevented by the weight of the counterpoise 68, the lower plate 79 of which rests upon the upper end of the plunger, forcing down the arm 75 and holding the switch open so that the motor does not rotate. It will be obvious that when the object is dropped into the coating field by lowering the track section 63, the counterpoise 68 will rise and allow the switch to close and start the motor.

It will of course be understood that the use of my process and apparatus is not confined to any particular kind of articles or class of coating fluids to be applied thereto, the arrangement being obviously capable of modification to suit individual needs. Hence, by describing a specific embodiment, I do not wish to limit my invention, the scope of which must be determined by reference to the appended claims.

I claim—

1. The improvement in the art of applying a liquid coating to the surface of an object, which consists in establishing a thin, generally horizontal, sheet-like stream of coating fluid and passing the object vertically through said stream.

2. The improvement in the art of applying a liquid coating to the surface of an object of comparatively large dimensions, which consists in forcing through a longitudinal slit a supply of coating fluid, thereby producing a substantially horizontal, thin, sheet-like jet of coating fluid of length comparable with the length of the object, and simultaneously moving the object vertically within range of said jet for a distance comparable with the height of said object.

3. The improvement in the art of applying a liquid coating to the surface of an object, which consists in directing toward opposite sides of the object a pair of opposed, low pressure, approximately horizontal sheet-like streams of liquid coating material and propelling the object vertically in a direction transverse to the direction of flow of liquid.

4. In apparatus of the class described, the combination of a circulating pump, a pair of parallel conduits situated in the same horizontal plane and connected with said pump, said conduits having along their parallel adjacent sides longitudinal slits of comparatively limited width for delivering opposed sheet-like jets of coating fluid, and a receptacle for collecting the surplus coating fluid and communicating with said pump.

5. In apparatus of the class described, the combination of a circulating pump, a pair of parallel conduits situated in the

same horizontal plane and connected with said pump, said conduits having along their parallel adjacent sides longitudinal slits of comparatively limited width for delivering opposed sheet-like jets of coating fluid, a receptacle for collecting the surplus coating fluid and communicating with said pump, a screen in the pump circuit, and means for passing an object through the coating zone intermediate said apertures.

6. In apparatus of the class described, the combination of a circulating pump, a vertical open-topped tank-like inclosure communicating at its lower end with the suction end of said pump, said inclosure being of sufficient depth and cross-section to completely accommodate an object lowered into said inclosure, and a conduit connected to the delivery end of said pump and having on one of its sides a generally horizontal longitudinal slit for delivering an approximately horizontal sheet-like jet of coating fluid.

7. In apparatus of the class described, the combination of a circulating pump, a vertical open-topped tank-like inclosure communicating at its lower end with the suction end of said pump, said inclosure being of sufficient depth and cross-section to completely accommodate an object lowered into said inclosure, and a pair of parallel conduits situated on either side of the upper end of said inclosure, said conduits being connected to the delivery end of said pump and having perforations along their adjacent sides for delivering opposed approximately horizontal streams of coating fluid.

8. In apparatus of the class described, the combination of a circulating pump, a vertical open-topped tank-like inclosure communicating at its lower end with the suction end of said pump, said inclosure being of sufficient depth and cross-section to completely accommodate an object lowered into said inclosure, and a pair of parallel conduits situated on either side of the upper end of said inclosure, said conduits being connected with the delivery end of said pump and having opposed parallel longitudinal slits along their adjacent sides for delivering opposed approximately horizontal sheet-like streams of coating fluid.

9. In apparatus of the class described, the combination of a circulating pump, a vertical open-topped tank-like inclosure communicating at its lower end with the suction end of said pump, said inclosure being of sufficient depth and cross-section to completely accommodate an object lowered into said inclosure, a pair of parallel conduits situated on either side of the upper end of said inclosure, said conduits being connected with the delivery end of said pump and having perforations along their adjacent sides for delivering opposed streams of coating fluid, a screen intermediate said pump and tank, means for lowering an object through said streams into the tank, and means for actuating said pump controlled by said lowering means.

10. In apparatus of the class described, the combination of a circulating pump, a vertical open-topped tank-like inclosure communicating at its lower end with the suction end of said pump, said inclosure being of sufficient depth and cross-section to completely accommodate an object lowered into said inclosure, a pair of parallel conduits situated on either side of the upper end of said inclosure, said conduits being connected with the delivery end of said pump and having opposed parallel longitudinal slits along their adjacent sides for delivering opposed approximately horizontal sheet-like streams of coating fluid, a screen intermediate said pump and tank, means for lowering an object through said streams into the tank, and means for actuating said pump controlled by said lowering means.

11. The improvement in the art of applying a liquid coating to the surface of an article, which consists in projecting an unbroken sheet of coating fluid freely through space and progressively passing the article through said sheet.

12. The improvement in the art of applying a liquid coating to the surface of an article, which consists in projecting freely through space a pair of opposed unbroken sheets of coating liquid and progressively passing the article simultaneously through both of said sheets.

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