June 5, 1928.

1,672,526

W. J. HAWKINS

METAL COATING MACHINE

Filed March 23, 1926

2 Sheets-Sheet 1

Fig. 1.

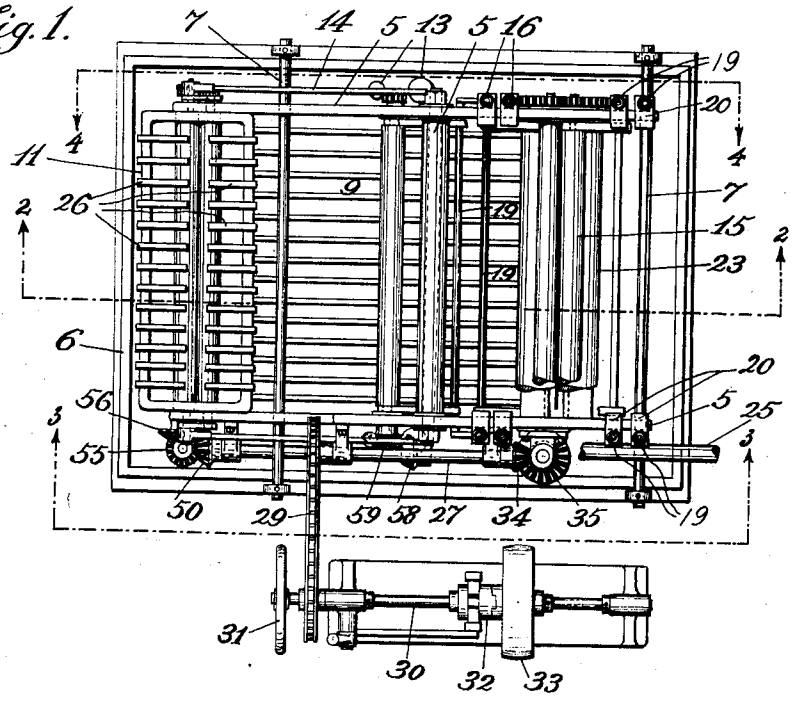
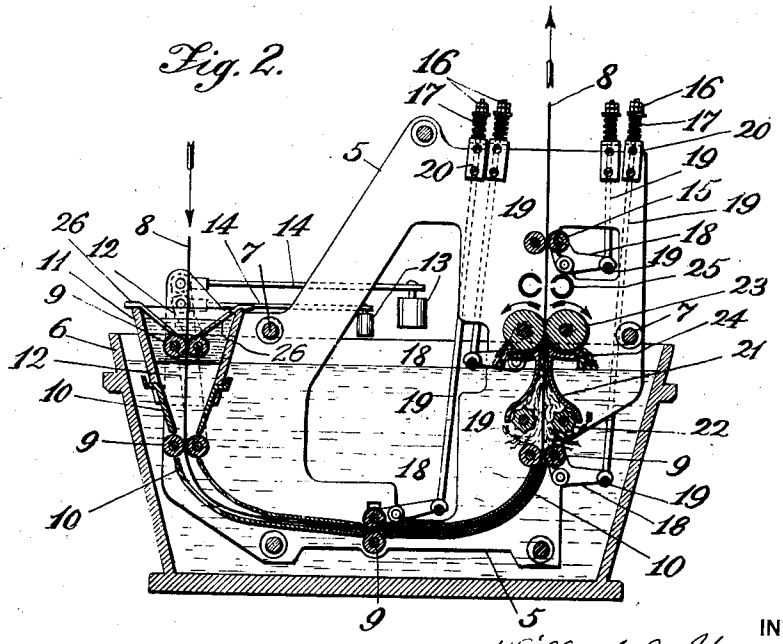


Fig. 2.



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Fig. 3.

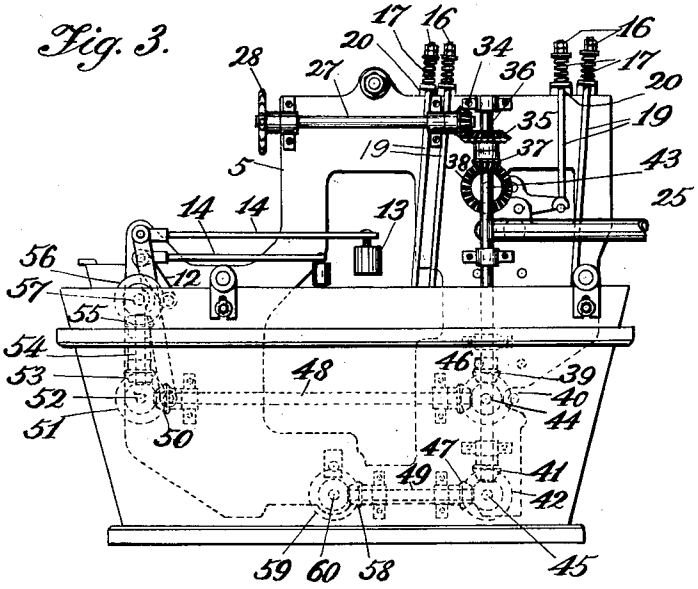
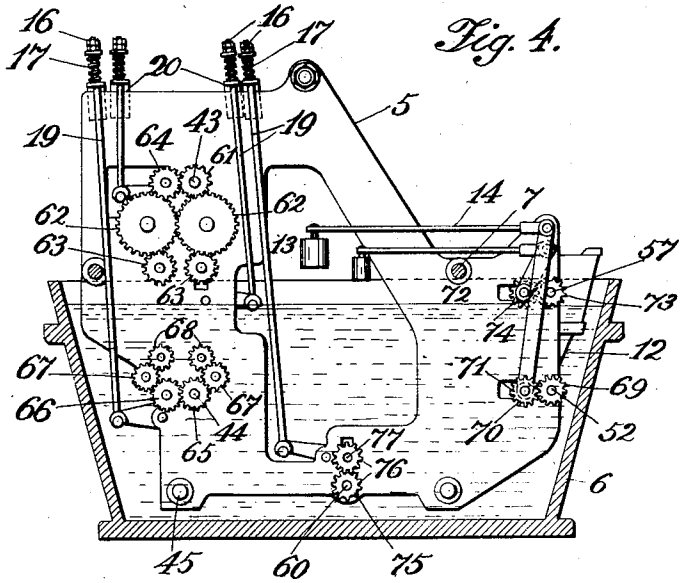


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILFORD J. HAWKINS, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO AMERICAN MACHINE AND FOUNDRY COMPANY, A CORPORATION OF NEW JERSEY.

METAL-COATING MACHINE.

Application filed March 23, 1926. Serial No. 96,721.

This invention relates to an improvement in means for coating metal with metal.

In applying a metallic coating to material to be coated, by passing the material through a bath of molten coating metal such as tin or lead, the chief difficulty resides in preventing deposition of foreign matter or impurities, and oxidation at the point where the material emerges from the bath.

It has now been discovered that this difficulty can be overcome by simultaneously compacting the coating metal on the material and dressing excess coating metal off the material before the latter reaches the air where oxidation would otherwise begin, and by keeping the molten coating metal in motion at the point of material emergence to carry away any foreign matter which otherwise might be deposited on the material. The main object of the present invention is the production of means for accomplishing this result. With this and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings, in which like characters of reference indicate the same or like parts, Fig. 1 is a plan view of means constructed in accordance with the invention; Fig. 2 is a sectional side elevation taken on the line 2—2 in Fig. 1; Figs. 3 and 4 are side views taken on the lines 3—3 and 4—4 respectively, showing the mechanism for driving the various rollers for feeding the material through the bath of molten metal and for compacting the coating metal on the material and dressing excess coating metal off the material before the latter reaches the air.

In carrying the invention into effect, there is provided means for supporting a bath of molten coating metal, means whereby material to be coated is caused to pass through and emerge from said bath, and means adjacent the point of emergence whereby excess coating is dressed off the material before it reaches the air and the proper amount of coating is compacted on the material. In the best constructions contemplated, there is also provided a flux chamber through which the material to be coated passes immediately before it enters the bath of coating metal; and a chamber is provided adjacent the point of emergence which has walls projecting above the surface of the bath to keep dross away from the material, a pump being located within this chamber to pump clean metal upwardly from said bath through said chamber to the dressing means to keep the molten metal in motion at the point of emergence. In the best constructions also, there is provided cooling means adjacent the dressing means to harden the coating. These means may be widely varied in construction within the scope of the claims, for the specific structure selected to illustrate the invention is but one of numerous possible concrete embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

Generally speaking, the specific structure selected to illustrate the invention includes a flux chamber adjacent one end of a bath of molten metal, a pumping chamber in and adjacent the other end of said bath and having walls projecting above the surface of the bath, pump rotors working in said pump chamber to keep clean molten metal flowing upwardly to and over the edges of said walls, coating compacting and dressing means above said pump chamber, cooling means above said dressing means, and means for passing material to be coated through said flux chamber, thence through said bath and pumping chamber, thence through said dressing means, and finally through said cooling means.

Referring to the drawings, the working parts of the device are assembled in a frame 5 which is supported by the walls of the kettle 6 supporting a bath of molten coating metal, by means of the cross rods 7. The material to be coated, marked 8, is drawn through the bath by means of groups of feed rollers 9, all of which are positively driven by gearing mounted on the frame 5. One of the rollers of each group is stationarily mounted, while the other is movably mounted and made adjustable in accordance with the thickness of the material to be coated which, as shown, is sheet metal such as steel. The material, on its way through the bath, is guided by the cage 10 which is built into the frame 5 in such manner that the molten metal has free access to all parts of the surface of the material. Before entering the bath, however, the material passes

through the flux chamber 11 which is supported at the entrance of the cage 10 and contains the fluid for pickling the surface of the material.

The feed rollers within the flux chamber also serve to squeeze out any air bubbles which might otherwise impair the coating. The correct adjustment of this group of rollers, and that of the first group in the bath, is secured by hanging the movable roller in the end of a lever 12 fulcrumed in the frame 5 and pressing it against the other roller by means of a weight 13 hung from an arm 14 attached to the fulcrum of the lever 12. The remainder of the feed rollers, including the pull-off rollers 15 above the bath and the discharge end of the cage 10, are adjusted to the material thickness by means of nuts 16 and springs 17, the movable rollers being carried by levers 18 the free ends of which rest on, and can be pulled up by, rods 19 passing through brackets 20 attached to the frame 5.

Near the discharge end of the bath, the material 8 passes through a pump chamber 21 in the lower part of which are located two fluted pump rotors 22 which force clean metal up against the dressing rollers 23 which are mounted just above the walls of the pump chamber 21, and out through the spillway formed between the surfaces of the dressing rollers and the projecting walls 24 of the chamber 21. The circulating metal, filling up the entire space between the pump rotors 22 and the dressing rollers 23, prevents air from coming in contact with the material until after its surface has been dressed and smoothed by the dressing rollers, and carries away any foreign matter which otherwise might adhere to the material and impair its coating.

The dressing rollers 23 are made adjustable by means of one of the levers 18, rods 19, and nuts 16, in a manner similar to that by means of which the feed rollers are adjusted. The dressing rollers also serve to regulate the thickness and evenness of the coating remaining on the material after the excess is dressed off.

After emerging from the dressing rollers, the material is subjected to the action of an air blast issuing from jet openings 25, the air being supplied through a pipe from an air compressor not shown but well known. This air blast cools the coating on the material, and, by varying the air pressure, it can be used to give various finishes to the coating.

For the purpose of guiding the material to and between the feed rollers in the flux chamber, there are provided inclined strips 26 converging toward the bight of the feed rollers within said chamber.

The different rollers described in the foregoing are driven from the drive shaft 27, which is journaled on one side of the frame 5, and is connected by the chain 29 to the shaft 30 carrying the handwheel 31, the clutch 32, and the pulley 33, the latter receiving motion from a motor or other suitable source of motion. The bevel gear 34 on the drive shaft 27 meshes with a gear 35 on the vertical shaft 36 (Fig. 3) which, through bevel gears 37—38 and 39—40 and 41—42, drives the horizontal shafts 43, 44 and 45 respectively. The gears 40 and 42 on the shafts 44 and 45 drive through bevel gears 46 and 47 the horizontal shafts 48 and 49. The shaft 48 has a bevel gear 50 meshing with a bevel gear 51 on the horizontal shaft 52. The bevel gear 51, through the bevel gear 53, also drives a vertical shaft 54 having a bevel gear 55 in mesh with a bevel gear 56 on the horizontal shaft 57. The shaft 49, by means of bevel gears 58 and 59, drives the horizontal shaft 60. The shaft 43 carries the fixed pull-off roller 15, and, by means of the spur gear 61 (Fig. 4), drives the intermediate gears 62 which, in turn, by means of the gears 63, drives the dressing rollers 23, and by means of the gear 64, drive the adjustable pull-off roller 15. The shaft 44, which carries one of the fixed rollers 9, has a spur gear 65 in mesh with the gear 66 on the corresponding adjustable roller, the gears 65 and 66 meshing with the intermediate gears 67 which drive the gears 68 of the pump rotors 22. The shaft 52 is another fixed feed roller shaft, and it has a gear 69 in mesh with a gear 70 of its adjustable mate 71. The shaft 57 similarly drives the shaft 72 by means of the gears 73 and 74. And the shaft 60 of the fixed feed roller near the bottom of the bath, by means of gears 75 and 76, drives the shaft 77 of the adjustable roller of that group. The difference in the thickness of various sheets of material that can be handled by a coating device of this kind is small as compared with the depth of the gear teeth, so that the gears will remain in mesh throughout the range of necessary adjustment.

In view of the foregoing, a more detailed description of the operation of the device is deemed unnecessary to a full understanding of the invention, and it is therefore omitted in the interest of brevity and clearness.

What is claimed is:

1. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, and means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air.

2. The combination with means for sup-

porting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, and means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, said compacting and dressing means including rollers acting on the circulating metal on opposite sides of the material and means for supporting and driving said rollers.

3. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, and means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, said material passing means including a curved material guiding cage and a series of groups of feeding rollers coacting therewith and means for supporting and driving said rollers.

4. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, and a flux chamber associated with said bath at the point where the material enters said bath and through which said material passes before entering said bath.

5. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, and means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, said circulating means including a chamber in said bath having walls projecting above the surface of the bath to keep dross away from the material.

6. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, and means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, said circulating means including a chamber in said bath having walls projecting above the surface of the bath and terminating in lateral extensions forming spillways for the excess metal.

7. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, and means adjacent said compacting and dressing means for cooling the compacted coating on the material.

8. The combination with means for supporting a bath of molten coating metal, of means whereby material to be coated is caused to pass through and emerge from said bath, means for circulating clean molten metal from said bath above its surface adjacent the point of emergence, means acting on the circulating metal to uniformly compact a part of it on and to dress all in excess thereof from the material before it reaches the air, and means adjacent said compacting and dressing means whereby jets of cooling air are directed to opposite sides of the coated material.

In testimony whereof, I have signed my name to this specification.

WILFORD J. HAWKINS.