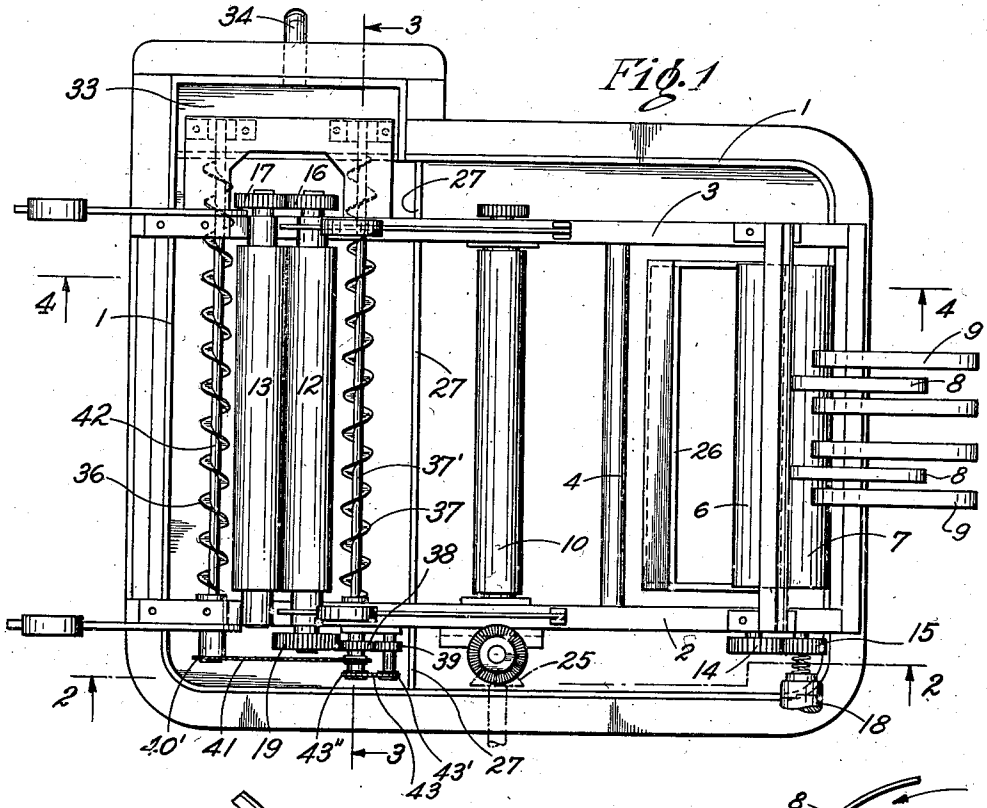
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APPARATUS FOR GALVANIZING

Filed Nov. 25, 1939 2 Sheets-Sheet 1

Fig. 1



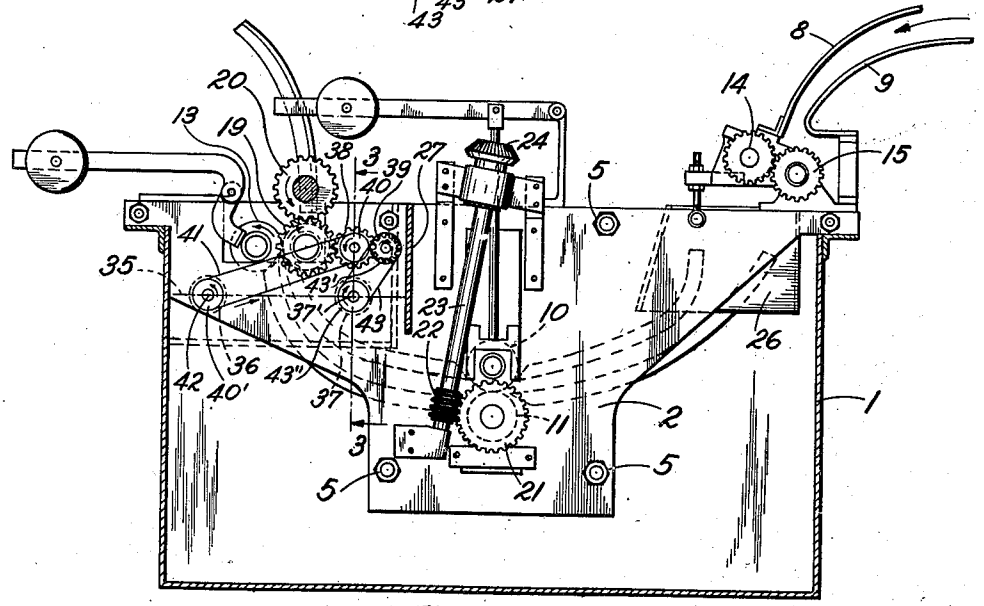


Fig. 2

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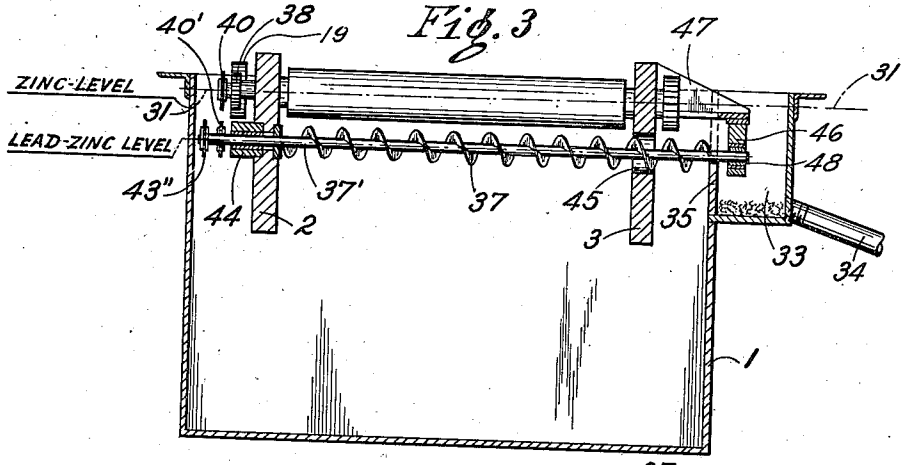
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APPARATUS FOR GALVANIZING

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Fig. 3



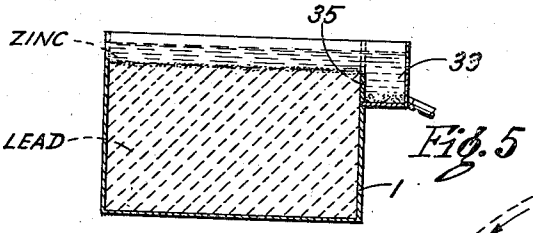


Fig. 5

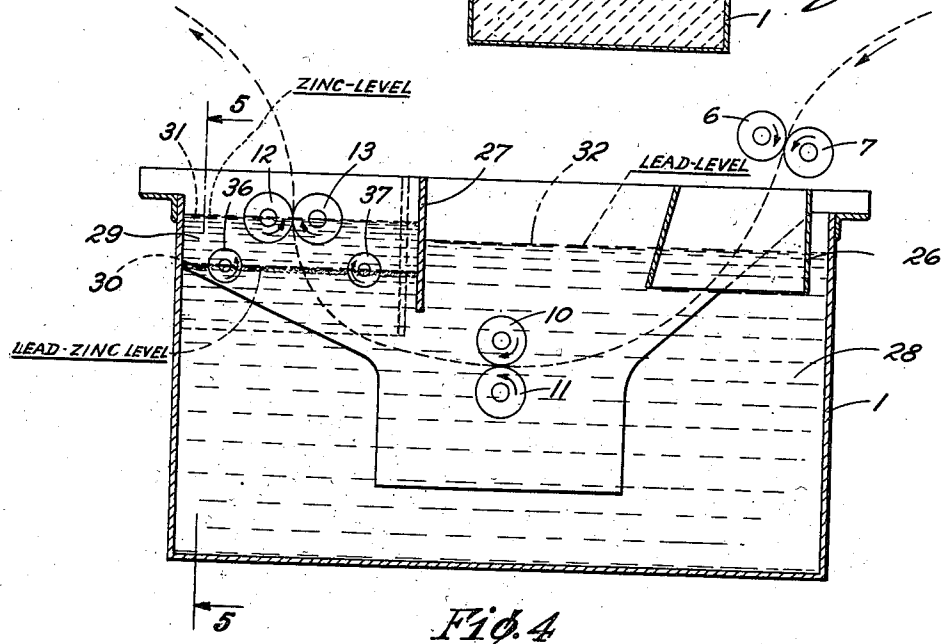


Fig. 4

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Patented Feb. 2, 1943 2,310,162

UNITED STATES PATENT OFFICE

2,310,162

APPARATUS FOR GALVANIZING

Elwin A. Matteson, Youngstown, Ohio, assignor to The Aetna Standard Engineering Company, Youngstown, Ohio, a corporation of Ohio

Application November 25, 1939, Serial No. 306,156

1 Claim. (Cl. 91—12.5)

This invention relates to the art of metal coating and more particularly to certain improvements in apparatus for galvanizing, i. e., coating with zinc, steel sheets or strips.

In the galvanizing of steel or iron sheets or other articles it has been a common procedure to pass the sheets into and through a pot or tank of molten zinc to effect the bonding of a layer of pure zinc to all surfaces of the work. A modification of this general procedure is to establish and maintain a pot of molten lead and float upon a portion of the surface of the pot of lead a layer or pool of molten zinc. The sheets are caused to enter and pass through the lead bath which brings them up to the proper temperature and they are then withdrawn through the floating zinc body to apply zinc coating to the preheated articles. The lead does not adhere to the metal and serves merely as a preheating means. This arrangement eliminates the necessity of maintaining a large pot full of molten zinc and also achieves a better zinc coating because the pre-heated sheet is only subjected to contact with the zinc for a relatively short period and thus the alloy layer between the steel and zinc is kept to a minimum thickness. As this alloy layer is relatively brittle it is advantageous, particularly where the sheets are to be bent or formed after galvanizing, to maintain it as thin as possible.

In the galvanizing of ferrous metal articles dross is formed as the work passes through the zinc bath. This dross is composed largely of an alloy of zinc and iron, together with certain other impurities, and is heavier than zinc but lighter than lead. In the operation of a galvanizing pot having a pool of zinc floating on a body of lead, the dross settles down to the junction or common level of the lead and zinc where it floats upon the lead. In order to permit satisfactory continuous operation this dross must be removed. As the operator is unable to see and gauge this lead-zinc level, the removal of this dross presents a rather difficult problem, and it is among the objects of my invention to provide a simple and effective apparatus for continuously removing dross from the lead-zinc level of a galvanizing bath, which apparatus is effective regardless of reasonable variations in the lead-zinc level.

Other objects of my invention include the provision of a galvanizing machine in which a separate dross collecting compartment is provided, together with means for causing a positive flow of dross into this compartment which flow is not seriously interfered with by the presence of a sheet or strip in the bath; the provision of a dross skimming and collecting mechanism which may be applied to the usual galvanizing pot and which is adapted to be driven from the same power source as the exit rolls of the galvanizing machine; the provision of means for skimming dross from a galvanizing bath which is effective regardless of reasonable variations in the dross level in the bath; the provision of means for creating and maintaining a positive flow of dross in a lead-zinc galvanizing bath at all times during the passage of material through the bath; the provision of an effective and rugged apparatus, for improving and rendering more uniform the zinc coating applied by a galvanzing machine.

The above and other objects of my invention will appear from the following description of a preferred embodiment thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a galvanizing pot and machine equipped with my invention.

Figure 2 is a vertical cross-sectional view of the galvanizing equipment shown in Figure 1, taken substantially on line 2—2 of Figure 1.

Figure 3 is a transverse vertical cross-sectional view taken on line 3—3 of Figure 1, showing one of the dross moving screws.

Figure 4 is a simplified illustrative vertical cross-sectional view of my improved galvanizing apparatus taken substantially on line 4—4 of Figure 1, but omitting numerous parts of the structure in order more clearly to show the arrangement of certain features of my invention.

Figure 5 is a diagrammatic cross-sectional view, on a reduced scale, taken on line 5—5 of Figure 4 and showing the disposition of the lead and zinc in the pot.

The tank or pot 1 has an open top and supports the spaced vertically extending frame members 2 and 3 which are connected together by suitable cross members such as the rods 4, the ends of which are secured to the side frame members 2 and 3 by nuts 5 (see Fig. 2). The machine frame structure so formed supports the sheet feeding mechanism and also carries my improved dross skimming apparatus. The entire assembly makes up a galvanizing machine or unit which may be lifted bodily from the pot 1 when so desired.

The mechanism for feeding the steel sheet or strip through the metal bath in the pot 1 may be of any suitable form and in the illustrated structure it includes a pair of entering rolls

6 and 7 which are located immediately below the entering guides 8 and 9, a pair of bottom rolls 10 and 11, and a pair of exit rolls 12 and 13. Each of these sets of rolls is driven from a suitable source of power (not shown), the two entering rolls 6 and 7 being geared together by gears 14 and 15 and the exit rolls 12 and 13 by gears 16 and 17. The roll 7 is connected through a coupling 18 to the power source and the shaft of the roll 12 carries a gear 19 meshing with a gear 20 which is also connected to the power source. The bottom roll 11 is provided with a worm gear 21 meshing with a worm 22 on the lower end of the drive shaft 23. The upper end of shaft 23 carries a bevel gear 24 which is driven by a corresponding bevel gear 25 from the power source. Any suitable means may be provided for synchronizing the speeds of the three sets of rolls but, as this forms no part of the present invention, it is not illustrated or described herein. Furthermore, as the details of the roll supports, etc., are not involved in the present invention they need not be specifically described in great detail, but reference is made to the co-pending application of Elwin A. Matteson and Benjamin P. Finkbone, Serial No. 200,486, filed April 6, 1938, now Patent No. 2,183,890, issued December 19, 1939, which fully illustrates and describes a similar arrangement of feed rolls and associated parts.

The usual flux box 26, which may be a walled structure open at the top and bottom, is disposed just below the entering rolls 6 and 7 and the walls extend from above the bath level down into the molten metal. A baffle or mud wall 27 extends entirely across the pot 1 and extends down from the top thereof well below the level of the molten metal. This wall 27, as will more fully appear later, serves to separate the zinc pool from the body of molten lead in the pot and thus reduces the quantity of zinc required to be maintained in the pot.

As is best seen in Figure 4, the pot is substantially filled with molten lead indicated at 28 and a relatively small pool of molten zinc 29 is maintained at the exit end of the pot and prevented from spreading over the entire surface of the molten lead by the wall 27. As zinc is lighter than lead the zinc-lead level or junction 30, which cannot be observed by the operator, may be maintained by properly maintaining the visible zinc level 31 and visible lead level 32 in accordance with predetermined gauge marks or other indicating means. The zinc level 31 is above the lead level 32 and is preferably maintained substantially on the center line of the exit rolls 12 and 13.

At one end of the zinc pool, which is maintained at the exit end of the pot 1, is a dross sump structure best seen at 33 in Figure 3. This sump is a separate compartment from the main pot 1 and, although it is shown on the drawings as being a structure extending beyond the main side wall of the pot 1, it will be understood that it might be incorporated within the walls of the pot if so desired. A dross outlet pipe 34 extends from the bottom of the sump 33 to any suitable place of disposal and is provided with shut-off means such as a valve (not shown) to prevent flow of material from the sump 33 except when it is desired to withdraw dross therefrom. The inner wall 35 of the sump 33 extends up to the normal lead-zinc level 30 and forms a dam preventing the entry of lead into the sump 33. The sump 33 will be filled with molten zinc as indicated in Figures 3 and 5 and the lead-zinc level or dross line 30 will not extend into the sump 33 but will stop at the wall 35.

It will be observed by referring to Figure 4 that, when sheet or strip material is passed through the molten metal in the pot 1 by means of the rolls 6—7, 10—11 and 12—13, it will first be heated to the desired temperature as it passes through the lead bath 28. Then, as it enters the zinc pool 29 through the lead-zinc level 30 and passes out through the exit rolls 12 and 13, it will be given the desired zinc coating. The galvanizing operation causes the formation of dross in the zinc bath 29 and this dross will settle down to the lead-zinc level 30 where it will float upon the surface of the lead. It is important to prevent the accumulation of dross at this level as it seriously interferes with successful coating of the work. In order positively and effectively to prevent the accumulation of dross at the lead-zinc level 30 I provide a pair of conveyor or feed screw members 36 and 37. These are disposed with their axes substantially at the lead-zinc level 30, the screw 36 being on one side of the path of the work through the zinc bath and the screw 37 being on the other side thereof. In the illustrated embodiment of my invention these screws 36 and 37 are of opposite hand and rotate in opposite directions, thus moving the dross toward and into the sump 33.

The driven gear 19 on the exit roll 12 drives a gear 38, suitably supported on the frame 2, which in turn drives another gear 39. The shaft which carries the gear 38 also carries a sprocket 40 and a chain 41 drives the screw 36 through a suitable sprocket 40' mounted on the end of the screw shaft 42. In like manner, a driving connection is established to the shaft of the screw 37 through a chain 43 and suitable sprockets 43' and 43'' connected to the gear 39 and the screw shaft 37' respectively.

The above described driving hook-up for the screws 36 and 37 will result in opposite rotation of the screws and therefore the screws are made of opposite hand in order to cause a feeding action or flow of the material in the lead-zinc level 30 in a direction toward the dross sump 33. If desired both screws could, of course, be made the same hand and rotated in the same direction.

As is best seen in Figure 3, the shaft 37' of the screw 37 is supported in one end in a bearing 44 carried by the frame member 2. The frame 3 is provided with a suitable aperture 45 through which the screw 37 extends. The screw shaft 37' just clears the top of the inner wall 35 of the dross sump 33 and this wall is preferably notched adjacent the shaft 37' so that the wall 35 will extend up to about the center line of the shaft 37'. A bearing bracket or hanger 46 is suspended on a projecting arm 47 mounted on the frame 3 and this bracket 46 carries a bearing 48 which supports the other end of the screw shaft 37' within the dross sump 33.

The screw 36 and its shaft 42 are similarly mounted and a suitable aperture is provided in the wall 3 for the screw 36. This aperture may be an elongated slot or a series of holes may be provided so that the dross flow or movement, established by rotation of the screws 36 and 37, in a direction across the bath toward the sump 33 will not be seriously interferred with by the wall 3. It will be understood that rotation of the screws 36 and 37 will set up a flow of dross not only within the radius of the screws themselves but also for

a certain distance on either side thereof. This dross, as it moves across the surface of the lead bath, will pass over the top of the wall 35 into the dross sump 33, which as noted above is filled entirely with zinc. After the dross passes across the wall 35 it will sink through the zinc to the bottom of the sump 33 because the dross is heavier than the zinc. When a sufficient quantity has collected in the bottom of the sump 33 it may be drawn off through the outlet 34. Any zinc which may come off with the dross can be separated therefrom and returned to the bath. The sheet or strip passes upwardly between the two screws 36 and 37 and the flow of dross transversely to the direction of movement of the sheet is not interfered with in any way by the sheet. Moreover, by providing a pair of feed screws 36 and 37, the dross which is formed and collects at the lead-zinc level on both sides of the sheet path is removed.

Even though the lead-zinc level 30 may vary materially in a downward direction from the top of the wall 35 the screws 36 and 37 will still be effective so long as the level does not vary more than the effective radius of these screws. This fact eliminates the necessity for maintaining the lead-zinc level 30, which cannot be seen by the operator, with extreme accuracy as normal variations will not interfere with the effective removal of the dross. If the lead-zinc level 30 drops below the top of the wall 35 the dross will merely build up against the wall 35, due to the action of the screws 37, and, as the screws continue to rotate, will be pushed on over the wall into the sump 33. Care should, of course, be taken to prevent the lead level from rising above the level of the top of the wall 35 so that the lead will not flow into the sump 33, although, in case this should happen, it can be readily corrected by lowering the lead level to the proper position and then drawing off any lead which has accumulated in the sump 33.

From the foregoing description of a preferred form of my invention, it will be seen that I have provided a simple and effective apparatus in which the work is passed through a lead bath and then upwardly through a layer of zinc floating on the lead and in which the dross is moved transversely of the direction of movement of the work and positively removed from the bath. Thus, the galvanizing operation can be carried out rapidly and the quality of the work improved. Although I have described the illustrated apparatus in considerable detail, it will be understood by those skilled in the art that variations and modifications may be made in the same without departing from the spirit of the invention. I do not, therefore, wish to be limited to the particular embodiment of my invention shown and described, but claim as my invention all forms thereof coming within the scope of the appended claim.

Reference is hereby made to my divisional application, Serial No. 456,891, filed September 1, 1942, for Method of galvanizing, and containing claims directed to the method disclosed in this application.

I claim:

In apparatus of the type described, a galvanizing pot, entering rolls for feeding metal sheets or the like into said pot, exit rolls for removing sheets from said pot, a dross sump disposed on one side of said pot adjacent one end of said exit rolls, communicating means between said sump and pot below the top edge of said sump and pot, a baffle extending across said pot between said entering and exit rolls and generally parallel thereto, said baffle having a lower edge above the bottom of said pot, a pair of feed screws extending generally parallel to said exit rolls and disposed at substantially the level of said communicating means below and one on each side of the pass line between said exit rolls, and means for driving said feed screws in proper direction to impart movement to material in said pot toward said dross sump.

ELWIN A. MATTESON.