R. C. STEFFEN.

PROCESS OF GALVANIZING METALS.

APPLICATION FILED JAN. 2, 1919.

1,334,183.

Patented Mar. 16, 1920.

2 SHEETS—SHEET 1.

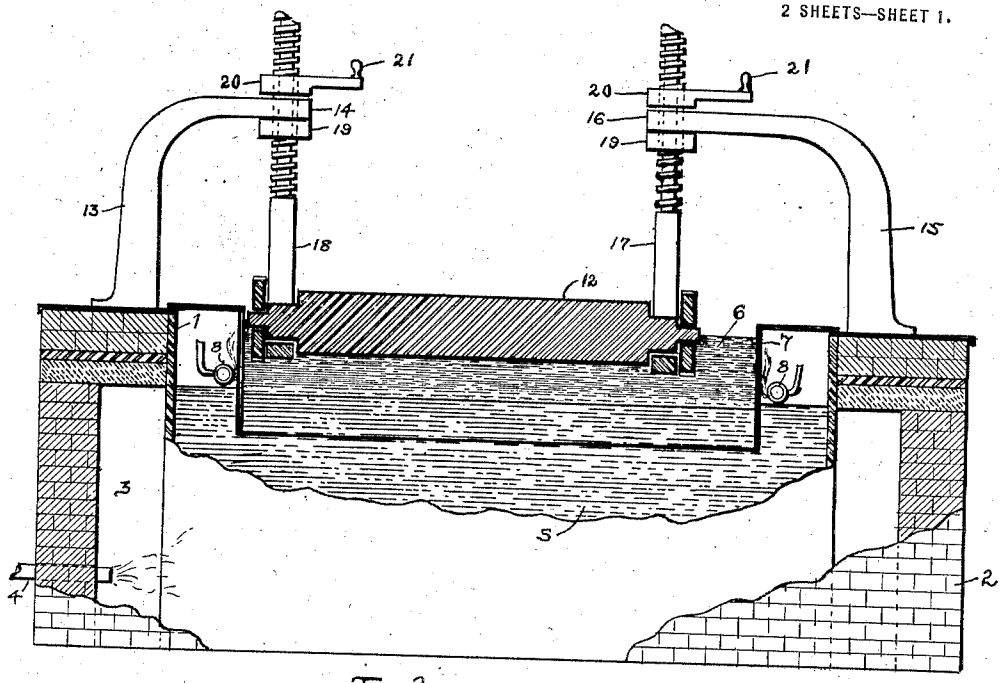

Fig. 2

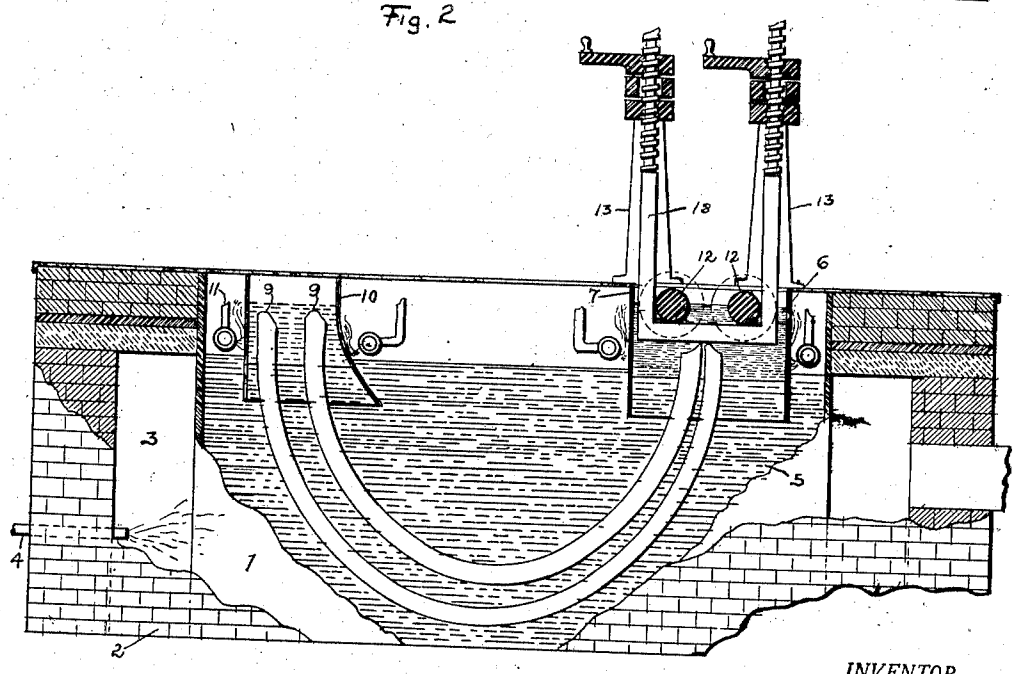

Fig. 1

INVENTOR.

Robert C. Steffen,

BY Howard S. Smith,

His ATTORNEYS.

R. C. STEFFEN.

PROCESS OF GALVANIZING METALS.

APPLICATION FILED JAN. 2, 1919.

1,334,183.

Patented Mar. 16, 1920.

2 SHEETS—SHEET 2.

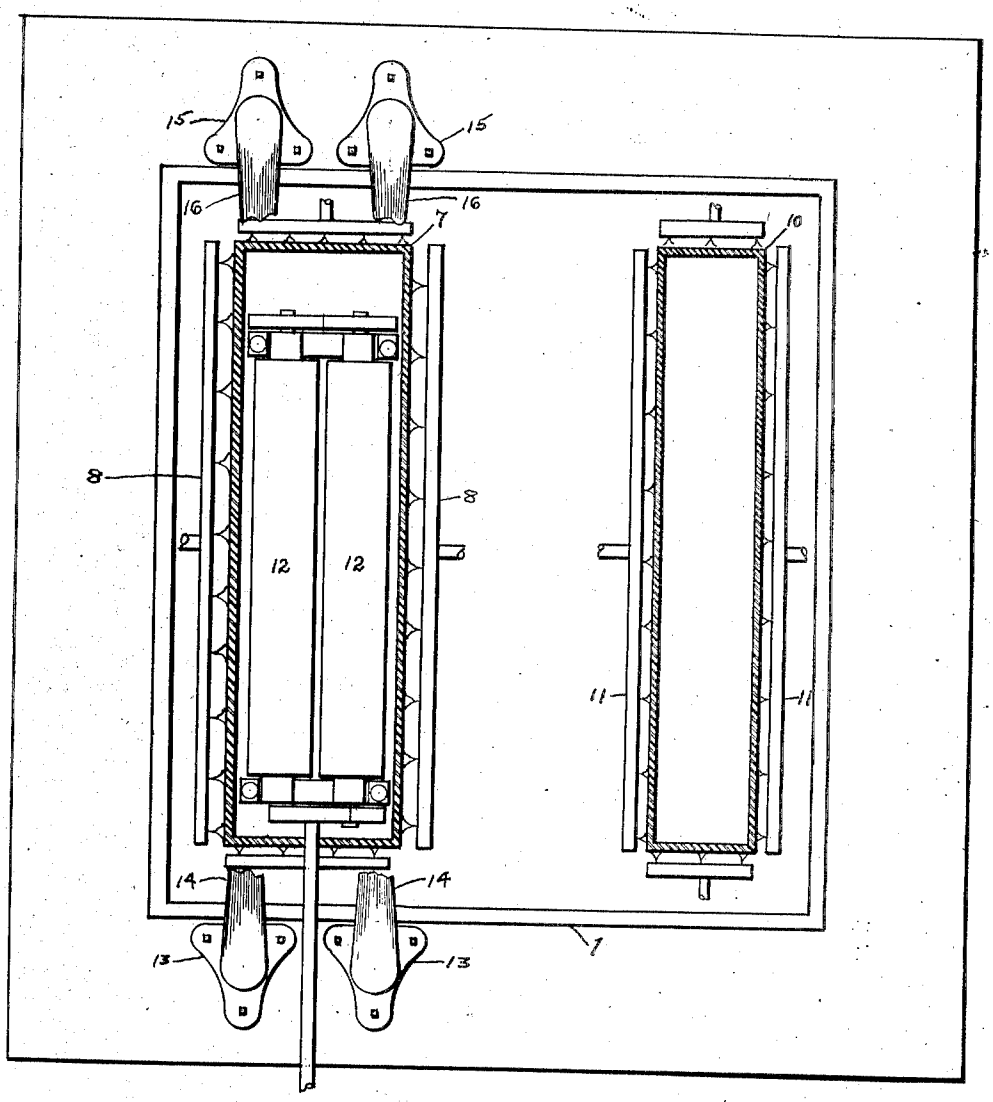

Fig. 3

INVENTOR.
Robert C. Steffen,
BY Horace A. Smith,
His ATTORNEY.

UNITED STATES PATENT OFFICE.

ROBERT C. STEFFEN, OF MIDDLETOWN, OHIO.

PROCESS OF GALVANIZING METALS.

1,334,183. Specification of Letters Patent. Patented Mar. 16, 1920.

Application filed January 2, 1919. Serial No. 269,237.

To all whom it may concern:

Be it known that I, ROBERT C. STEFFEN, a citizen of the United States, residing at Middletown, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in the Processes of Galvanizing Metals, of which the following is a specification.

This invention relates to a process of galvanizing metal which is more expeditious and efficient, and considerably cheaper, than any known processes employed for that purpose.

Under the present practice of galvanization, the spelter is heated from the lead upon which it rests, and as the melting point of spelter is approximately 800° F. and that of lead is approximately 600° F., it is necessary to bring the temperature of the lead 200° above its melting point to melt the spelter which rests upon it. As the temperature of the lead rises, its affinity for the absorption of spelter rapidly increases, with the result that the spelter will mingle through the lead solution, seeking the coldest point, which is at the intake end for the metal sheets and above which it will bubble. More or less spelter will therefore come in contact with the metal sheets during their entire course through the lead agent, and impart to said sheets a thicker coating than they should receive to avoid the following objections. A thick coating of spelter on the sheets, breaks, peels or scales when those sheets are stamped, formed or severely bent, exposing the scaled surface to the corrosive action of the elements. It is, therefore, one object of my invention to form a much lighter coating on the metal sheets than can be produced by any known processes of galvanization, by first passing those sheets through the preheating agent, and thereafter through an amalgamating agent in contact with only a part of the surface of the latter and heated by an independent unit.

It is a further object of my invention to provide a more economical and efficient process for applying a regular or heavy coating to sheet metal with spelter, by first passing the sheet through spelter, then through lead and thereafter through spelter, keeping the two metals at different operating temperatures by independent heating units, and being able, by varying the depth of the spelter in its independently heated boxes, to definitely control the weight or thickness of the spelter coating formed on the metal sheets.

When lead is heated beyond its melting point—which must be done under the present method of galvanization in order to melt the spelter—it rapidly oxidizes, forming lead oxid which clings to the metal sheet in the form of oxid spots, thereby preventing a uniform coating of spelter upon the sheet. One of these oxid spots, when exposed to the corrosive action of the elements, might be sufficient to ruin a whole sheet of metal. It is, therefore, a further object of my invention to eliminate these oxid spots, by providing a process of galvanization in which the lead is not called upon to heat the spelter whereby it need not be heated beyond its melting point to a degree where lead oxid is formed. Accordingly, the sheets in passing through the lead agent will have no lead oxid spots formed on them.

Another object of my improved process is to reduce the amount of dross formed when the zinc of the spelter comes in contact with iron from the sides of the pot and the metal sheets passing through the latter. By reducing the area of contact of the spelter with the lead, my invention eliminates approximately 75% of dross formation in the operation of galvanizing. Dross is extremely objectionable, because a small per cent. of it will not only lower the efficiency of the spelter by converting it into a nonusable or injurious composition, but will reduce the life of the iron pot, costing from $500 to $600, to about six or seven months.

A further object of my invention is to effect a saving in the loss of spelter due to oxidation. Under my process, instead of having a large surface of spelter exposed to the air, only a small area is thus exposed, whereupon less zinc is permitted to combine with the oxygen of the air to form zinc oxid.

Another object of my improved process is to expeditiously and economically remove the scale formed by the amalgamated spelter on the exit rolls. Under the present method of changing the rolls, which takes place about once or twice a week, they will frequently buckle, due to the upper half of the roll being exposed to a higher temperature than the lower half during their reinsertion. In other words, they are only half

submerged, exposing them to uneven temperatures which result in buckling. Buckled rolls, because of their uneven contact with the flat sheets, distribute an uneven coating of spelter upon them, forming a thin coating in one place and a thick coating in another. By completely submerging the exit rolls in the lead agent, heated at a higher temperature than the melting point, the scale will not only be readily removed from them, but the rolls themselves will be prevented from buckling due to their uneven temperature when only half submerged in the spelter after reinsertion under the old method. While the rolls are thus being cleaned, the dross in the small quantity of spelter above, may be spooned or dipped out without the necessity of removing the entire guides as is done under the present method. Time and labor are thereby materially saved, and the quantity of spelter required for galvanizing is greatly reduced by reason of the small area it occupies above the lead as compared with the large area it must have under the present process.

Other important and incidental objects will be brought out in the following specification, and particularly set forth in the subjoined claims.

The preferred form of embodiment of my invention, or the means preferably employed for carrying out my improved process, are illustrated in the accompanying drawings, of which Figure 1 is a side elevational view, partly in section, showing the apparatus preferred for carrying out my improved process. Fig. 2 is an end view thereof, partly in section. And Fig. 3 is a top plan view thereof, partly in section.

Throughout the specification and drawings, similar reference characters denote corresponding parts.

My improved process consists first in filling a regular iron pot 1 with lead, said pot being set in a brick heating unit 2 provided with a heating chamber 3 and gas intakes 4 as shown. The lead, which will be designated by the numeral 5, supported at one end, instead of over its entire surface, a small quantity of spelter 6 that is contained in a bottomless box 7 whose sides extend into the lead 5 as shown in Figs. 1 and 2. Gas torches 8, which project their flame into contact with the sides of the box 7 above the level of the lead 5, supply independent heat to the spelter 6 which under my improved process is not melted by the lead for the following reasons.

Lead, as is well known in the art, prepares the metal sheets to receive the spelter, by preheating them. The approximate melting point of lead is 600° F.; that of spelter, 800°. Spelter, being of less specific gravity than the lead, rests upon it; and if, in addition, it derived sufficient heat from the lead to melt it, it would be necessary to heat the latter 200° above its melting point. At that temperature, the lead would have such an affinity for absorbing spelter, that the latter would mingle through it. The metal sheets which enter the lead between semicircular guides 9 9 that extend from one upper end of the pot 1 into the spelter 6 at the other end, would therefore receive a coating of spelter during their entire course through the lead. This coating, added to that which the sheets receive while they travel through the spelter when the latter covers the entire area above the lead, would produce a coating thicker than the trade desires for the following reasons:

When metal sheets thickly coated with spelter, are stamped, formed or severely bent, the galvanized coating will frequently break, peel or scale, exposing the surface of the metal at that point to the corrosive action of the elements. To overcome this objection, my process provides for melting the spelter by the independent torches 8, and not by the lead upon only a small portion of whose surface the spelter rests as compared with the entire upper area thereof which it occupies under the known method. Therefore, the lead need not be heated 200° above its melting point to melt the spelter, for this is taken care of by the independent heating unit, and for this reason it follows that no spelter will be absorbed by the lead to make the spelter coating on the metal sheets unduly thick. The metal sheets will be coated with spelter only as they travel through the small portion thereof confined within the bottomless box 7, and this coating there received will be thin enough to meet the objections heretofore brought out.

However, if a thicker coating of spelter is desired, or it is desired to control the weight of spelter put upon the sheet metal in the operation of galvanizing, my process contemplates the provision at the other end of the iron pot 1, of a second auxiliary bottomless box 10 whose sides extend into the lead 5 on each side of the intake ends of the guides 9 9. This box is independently heated by a gas torch 11, and is adapted to receive spelter in the same manner as the box 7. Accordingly, the metal sheets may thus be made to pass through spelter at the intake and exit ends of the machine, and by regulating the depth of the spelter in both auxiliary boxes 7 and 10, the weight of spelter or coating thereof on the metal sheets can be definitely controlled. The necessity for two separate galvanizing units is thereby obviated by simply introducing spelter into the second auxiliary box 10 above described. A considerable saving in the amount of spelter required under my process of galvanizing is effected, for in either instance the spelter does not cover

the entire area of the upper surface of the lead, but only a relatively small portion thereof.

My improved process not only produces a uniformly distributed and permanently adherent coating of spelter whose weight may be regulated, to a point, if desired, where it is lighter than that formed on metal by any known method, but it effects a vast saving in the time, labor and equipment required for galvanization. In the first place, since the spelter covers such a small surface of the lead, much less spelter is required. In the second place, hot spelter when absorbed by the lead, eats through the iron pot into the heating chamber, with the result that the usefulness of the entire galvanizing unit will be destroyed, requiring quite an outlay for the time, labor and material necessary for its replacement. Under my process the spelter can only eat through the auxiliary boxes 7 and 10, and these may be replaced at small cost.

Furthermore, less spelter will be lost through oxidation under my process of galvanizing, since only a small amount of it is exposed to the air as compared with the large area exposed thereto under the known methods of galvanization.

By reducing the area of contact of the spelter with the lead, my improved process eliminates approximately 75% of the dross formed under the known methods of galvanizing. The zinc of the spelter when it comes in contact with the iron of the metal sheets and that of the sides of the pot 1, forms dross. The latter lowers the efficiency of the spelter, because even a small per cent. of iron is sufficient to convert the zinc of the spelter into a non-usable, injurious composition. Dross, of course, will be formed in the auxiliary spelter boxes, but in a quantity which is small in comparison with that formed where the spelter covers the entire upper surface of the lead; and furthermore, that which does form may readily be removed as will hereinafter be described.

Another objection which my proces of galvanizing eliminates, is the formation of lead oxid spots on the metal sheets as they travel through the lead solution. Under known processes, where the lead is heated beyond its melting point in order to melt the spelter that rests upon it, it rapidly oxidizes, forming lead oxid which produces oxid spots on the metal sheets, thereby preventing a uniform coating of spelter upon them. These oxid spots are objectionable in that they expose the surface of the metal sheets below them to the corrosive action of the elements, which is oftentimes sufficient to ruin an entire sheet of metal. Where the lead is not heated beyond its melting point, as under my process, these oxid spots are eliminated, since the lead is not heated to a temperature where it will oxidize.

My improved process further consists in the method I employ for cleaning the exit rolls 12—12. As is well known in the art, spelter will form on these rolls as an amalgamation which must be removed as often, sometimes, as twice a week. In order to clean these rolls under present methods, it is necessary to entirely remove them, which is an expensive and laborious process. Now when the rolls are reinserted, they will be only half submerged in the spelter, thereby remaining colder on top than at the bottom, which irregular heating causes them to buckle. Because of their uneven contact with the metal sheets, buckled rolls will distribute an uneven coating of spelter upon them, generally forming a thin coating near the edge of those sheets and a thicker coating on their middle portions.

My improved process for cleaning these rolls provides for completely submerging them in the lead heated to a higher temperature than its melting point, which will thoroughly remove the scale from the rolls without exposing them to uneven temperatures that distort or buckle them. For carrying out this part of my process, I preferably employ the following means:

Referring to the drawings, the numerals 13 13 designate a pair of parallel standards mounted at one side of the galvanizing machine in a position to bring their overhanging ends 14 above the ends of the rolls 12, while similar standards 15 15 are mounted at the other side of the machine to bring their ends 16 above the opposite ends of said rolls. At one end the rolls 12 are pivotally supported by a U-shaped member 17, while the opposite ends of said rolls are likewise supported by a similar U shaped member 18. The upper ends of the U-shaped member 17, which are threaded, loosely pass through openings provided in the overhanging ends 16 of the standards, while the upper ends of the U-shaped member 18, which also are threaded, loosely pass through openings provided in the overhanging ends 14 of the standards 13. A lock nut 19 is threaded on each threaded end of the U-shaped members, below its respective overhanging standard end, while a nut 20 to which a handle 21 is secured, is threaded on each threaded end of the U-shaped members above its respective overhanging standard end. When the handles 21 are turned clockwise, they will raise the U-shaped members 17 and 18, and with them the rolls 12; while when said handles and the lock nuts 19 are turned in the opposite direction, they will permit gravity to lower said rolls.

When it is desired to clean said rolls 12,

the handles 21 and lock nuts 19 are turned a sufficient distance to permit the rolls to sink in the lead 5 until they are completely submerged in it. The lead, which has previously been heated, or is then heated, beyond its melting point, will thoroughly remove the accumulated scale from the peripheries of these rolls without exposing them to the uneven temperatures that cause them to buckle when they are only half submerged.

While the rolls 12 are thus submerged in the lead, the dross which has formed in the spelter above, may be readily spooned out. Under present methods, the entire guides have to be removed to take out the large quantity of dross that has formed in comparison to the small quantity which exists under my process. The saving in time and labor which my process effects, can thus be realized when it is seen that the exit rolls can be cleaned at the same time the dross is being dipped out. Instead of approximately six men working to accomplish these two operations in a greater length of time, under my improved process the rolls can be cleaned and the dross dipped out by one man in approximately one half hour.

Having described my invention, I claim:

1. The process of galvanizing metal, which comprises passing it through a preparing agent and a galvanizing agent above a part of the surface of the latter and heated by independent means.

2. The process of galvanizing metal, which comprises, first passing it through a preheating agent and thereafter through a galvanizing agent resting upon a portion of the surface of the latter but maintained at its approximate melting point by independent heating means.

3. The process of galvanizing metal, which comprises first passing it through molten lead, and thereafter through spelter resting upon a part of the surface of the latter but maintained at its approximate melting point by independent heating means.

4. The process of producing a coating of desired thickness on metal, which comprises passing the latter through spelter in measured quantity, then through lead, and thereafter through spelter, causing the spelter to occupy but a small portion of the surface of the lead and maintaining said spelter at its approximate melting point by independent heating means.

5. The process of galvanizing metal which comprises using lead in conjunction with spelter, and disposing the latter upon only a portion of the surface of the lead, whose temperature is maintained at a point that will not permit it to absorb spelter.

6. The process of galvanizing metal, which comprises passing it through lead and then between exit rolls immersed in spelter, and maintaining said rolls in a clean state by periodically submerging them in the lead heated to a sufficient temperature to remove the scale from said rolls without exposing them to any uneven temperatures that would cause them to buckle.

In testimony whereof I have hereunto set my hand this 31st day of December, 1918.

ROBERT C. STEFFEN.

Witness:

HOWARD S. SMITH.