

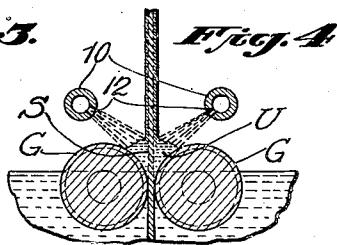
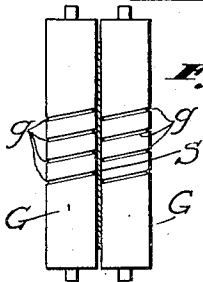
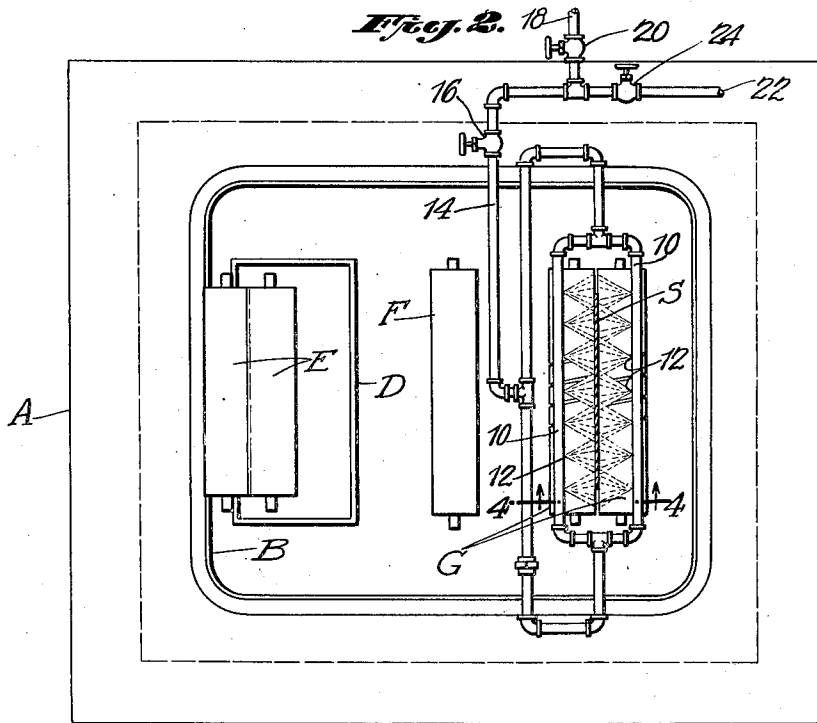
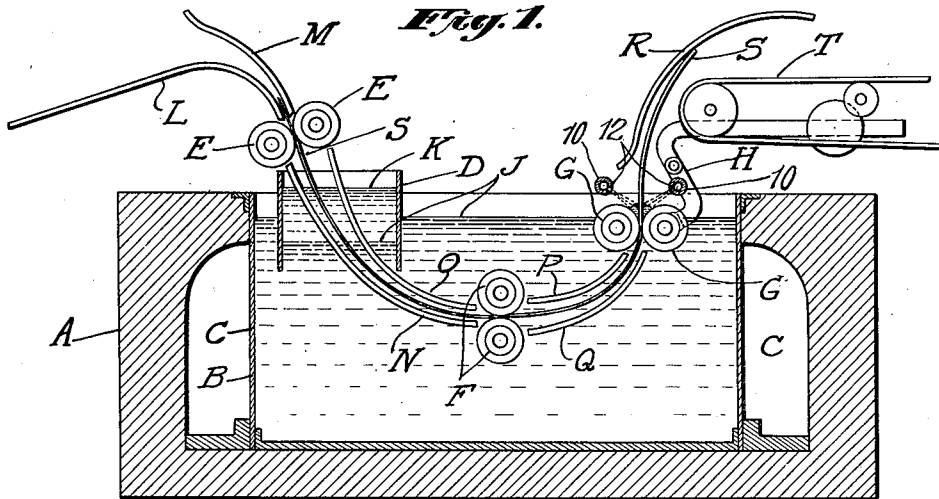
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NONSPANGLED GALVANIZED SHEET

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NONSPANGLED GALVANIZED SHEET

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17 Claims. (Cl. 91—12.7)

This invention aims to provide an improved method and apparatus for the production of non-spangled galvanized sheets.

It is well known to those skilled in the art that so-called galvanizing of sheets involves dipping or passing them through a metal bath so as to apply a thin layer or coating to the sheet. The bath of molten metal heretofore used is of various compositions such as zinc, zinc and tin, or a mixture of zinc, lead and tin.

In the galvanizing methods heretofore used, the surface is covered with so-called spangles formed by a spreading out or crystallizing of the metal on the surface of the sheet. Such spangled products are satisfactory for many purposes. However, there is a demand for dull coated or non-spangled sheets. My invention aims to provide a method and apparatus for producing dull coated or non-spangled sheets.

In the manufacture of ordinary spangled galvanized sheets, the temperature of the bath is in the neighborhood of 800° F. to 850° F. and no attempt is made to treat the sheet after it passes through the usual exit rolls which discharge it from the bath.

Heretofore in the manufacture of non-spangled sheets, it has been customary to bring the bath to a temperature of approximately 1000° F. or higher. In a known method heretofore used to produce dull coated sheets the latter have been preheated to approximately 900° F. prior to being passed through the spelter bath of coating material. Such preheating of the sheet has been accomplished in the known method by passing it through a bath of lead prior to its passage through the molten zinc or spelter used as a coating material.

The prior method involving the use of a bath at a temperature in the neighborhood of 1000° F. involves practical difficulties and tends to the production of an objectionable dross. This dross impairs the character of the coating produced and the high temperatures are destructive to the apparatus and materially contribute to shortening the useful life thereof.

In my improved method, the bath is maintained at a temperature at which there is a minimum production of objectionable dross and the equipment is quite capable of operating satisfactorily at such temperature.

Former methods of producing non-spangled sheets involve a galvanizing or coating treatment which applies an adherent coat or film of metal to the sheet. Such an adherent coating in time will peel off or disintegrate particularly if the

sheets are bent or buckled in use. In contradistinction, my improved method provides a method and means whereby a metal sheet has a protective layer of coating alloyed or homogeneously united therewith. Such an alloyed coating therefore becomes an integral part of the sheet structure and in use will not crack or peel off.

The invention will be fully understood from the following specification when read in connection with the accompanying drawing and the novel features will be defined with particularity in the appended claims.

In the drawing:—

Fig. 1 is a longitudinal section illustrating apparatus embodying the invention;

Fig. 2 is a plan view thereof, with gearing for driving the various feed rolls omitted;

Fig. 3 is a plan view of exit rolls of the apparatus;

Fig. 4 is a fragmentary section on line 4—4 of Fig. 2 showing a sheet in the act of being ejected from the bath through a body of superheated metal and through a zone of hot combustion products.

The apparatus includes a brickwork structure A which surrounds a pot B adapted to hold the molten metal bath of coating material such as zinc or the like. A chamber C surrounds the pot B and is adapted to have hot gases circulated therethrough so as to maintain the bath in a molten condition.

A box-like shell D open at the top and bottom extends a short distance into the bath and is adapted to contain a flux such as sal-ammoniac through which the sheet S is initially passed by the feeding in rolls E—E. Guides L and M direct the incoming sheet toward the rolls E—E. Similar guides N—O guide the sheet through the flux and bath and into engagement with feed rolls F—F. Other guides P and Q direct the sheet toward exit rolls G—G which are adapted to feed the sheet vertically upward through a superheated body of molten metal U which is withdrawn from the bath through grooves *g* formed in the rolls.

Pipes 10—10 are mounted in juxtaposition to the exit rolls G—G and are provided with burner openings 12—12 preferably drilled on an angle so as to direct a flame downwardly toward the exit rolls G and against the opposite sides of the sheet S being coated. These burner pipes are connected by piping as shown in Fig. 4 with supply pipe 14 having a control valve 16 therein which is adapted to regulate the intensity of flame im-

pinged on the sheet, the exit rolls and the superheated bath U.

Suitable gaseous fuel is supplied from a pipe 18 having a valve 20 therein and air to support combustion supplied from a pipe 22 having a control valve 24. By manipulating the valves 20 and 24 the character of the flame can be varied so that as the sheet emerges from the exit rolls it may be passed through either an oxidizing or non-oxidizing flame. This flame creates a zone of hot products of combustion through which the outgoing sheet is compelled to travel as it is ejected from the bath.

The flame or zone of hot products of combustion from the supply pipes superheats the isolated body of metal U which is drawn through the grooves *g* as the rolls *G* revolve. The flame raises the temperature of the sheet and superheats the liquid metal in the immediate zone of the hot products of combustion to a temperature somewhat above that of the bath in the pot B and in this way the coating metal is alloyed with or homogeneously united to the metal of the sheet.

The flames or the zone of hot products of combustion from the pipes 10—10 also serve to thin out or melt off some of excess coating metal which is not alloyed with the sheet. This excess metal of course flows downwardly into the isolated body U or some of it may be carried over by the rolls due to their rotary movement.

Notwithstanding the thinning down or melting off of a part of the coating by a wiping action of the flames, the increased adhesion of the coating to the plate produced by the flames results in a heavier coating than was obtained by the old method, in which the flames were lacking. Such heavier coating is indicated on the upper part of the sheet in Fig. 4.

After the sheet has had a protective body or film of metal alloyed therewith, it is fed vertically upward by the feed out rolls and strikes the guide R which directs it to a suitable conveyor T on which the sheet is allowed to cool at normal atmospheric or room temperature. Because of the alloying treatment and the passage of the sheet through the superheated body of metal and through the zone of controlled combustion products, it is unnecessary to subject the sheet to any special controlled cooling as required in methods heretofore used. The finish of the sheet produced is dull or non-spangled and the zinc or other protecting metal used is alloyed with the ferrous foundation sheet in such a way that there will be no cracking, peeling or separation of the protective metal due to bending or buckling of the sheets in use.

The grooves *g* formed in the feed rolls are preferably helically disposed. By varying their pitch the amount of molten spelter drawn from the bath to the superheated zone U can be varied. Variation in the pitch of the grooves aids materially in controlling the amount of metal applied per square foot of finished sheet. Usually one of the rolls *G* will be carried by a pivotally supported arm H having a counter-weight thereon such as shown in Fig. 1. This weight of course serving to yieldingly press one of the exit rolls toward the other. J indicates the surface of the molten bath of metal and K indicates the top surface of the sal-ammoniac flux.

In practice, I find that the composition and intensity of application of the gaseous products of combustion largely control the quality of the finished product secured. The composition of the gaseous products of combustion applied to

the sheet is controlled by manipulation of the valves 20 and 24 and the intensity of the flame is controlled by a manipulation of the valve 16. The heat applied impinges on the exit rolls as well as on the sheet itself. In this way, difficulties due to cooling or chilling of metal on the exit rolls is avoided. Also any spelter not alloyed with the sheet, but merely clinging thereto as a coating will be thinned down or melted off. Therefore no unalloyed molten metal will remain on the sheet hence there can be no spangling thereof.

While I have described the improved method and apparatus quite specifically it is not to be construed that I am limited thereto since variations may be made by those skilled in the art without departure from the invention as defined in the appended claims.

What I claim is:—

1. The method of producing non-spangled galvanized metal sheets which comprises passing each sheet through a molten metal bath, feeding each sheet vertically out of the bath and impinging a flame downwardly at an angle against the thus coated sheet immediately as it leaves the bath whereby the excess metal is removed downwardly and the remainder is alloyed with the sheet.

2. The method of producing non-spangled galvanized metal sheets which comprises first passing each sheet through a molten metal bath and then immediately as it leaves the bath passing the sheet upwardly between and in contact with two downwardly directed flames.

3. The method of producing non-spangled galvanized metal sheets which comprises first passing each sheet through a molten metal bath, providing a superheated zone, holding part of the bath in said superheated zone and passing the sheet therethrough.

4. The method of producing non-spangled galvanized metal sheets which comprises first passing each sheet through a molten metal bath, holding part of the bath in a restricted zone maintaining hot products of combustion in contact with the molten metal in said zone, and passing the sheet through the molten metal and the hot products of combustion in said restricted zone.

5. The method of treating metal sheets which comprises passing each sheet upward between exit rolls partly immersed in a molten bath and directing a flame downwardly at an angle toward the rolls and against each face of the sheet immediately as it emerges from the bite of said rolls.

6. The method of treating metal sheets passing vertically upward between a pair of grooved exit rolls partly immersed in a bath of molten metal and adapted to hold an isolated body of metal in their bite which comprises directing flames downwardly at an angle against opposite sides of the sheet toward said isolated body of metal.

7. The method of treating metal sheets which comprises feeding each sheet upward from a molten bath while impinging a downwardly flowing jet of hot products of combustion directly against the sheet immediately as it emerges from the bath so that the excess metal is removed and the remainder is alloyed with the sheet.

8. The method of treating ferrous sheets which comprises first passing each sheet vertically from a bath of molten zinc, and then through a zone of hot products of combustion directed downwardly at an angle to impinge against the sheet immediately as it emerges from the bath.

9. An apparatus for treating metal sheets comprising means for holding molten metal, exit rolls partly immersed in the molten metal adapted to feed sheets therefrom and means for directing
5 hot products of combustion toward the bite of said exit rolls.

10. An apparatus for treating metal sheets comprising means for holding molten metal, exit rolls for feeding sheets therefrom, means for dis-
10 charging hot products of combustion downwardly at an angle against opposite sides of that part of the sheet immediately adjacent said exit rolls.

11. An apparatus for treating metal sheets comprising means for holding molten metal, exit
15 rolls adapted to feed sheets out of the molten metal and means for directing a flame downwardly at an angle against the sheet immediately as it emerges from said rolls.

12. An apparatus for treating metal sheets comprising means for holding molten metal, exit
20 rolls adapted to feed sheets out of the molten metal and means for directing flames downwardly at an angle against opposite sides of the sheet immediately as it emerges from said rolls.

13. Apparatus for treating metal sheets comprising means for holding molten metal, exit rolls adapted to feed sheets out of the molten metal and means for impinging a flame downwardly at
25 an angle other than a right angle directly against the sheet as it emerges from said rolls and means
30 for varying the intensity of said flame.

14. An apparatus for treating metal sheets comprising means for holding a bath of molten metal, grooved exit rolls partly immersed in said metal, burner pipes for directing flames against
5 said rolls and opposite sides of said sheets and means for supplying fuel and air to said pipes.

15. An apparatus for treating metal sheets comprising means for holding a bath of molten metal, grooved exit rolls having portions im-
10 mersed in the molten metal and arranged upon rotation to hold a body of molten metal in their bite and means for superheating said body of molten metal.

16. An apparatus for treating metal sheets comprising means for holding molten metal, exit
15 rolls adapted to feed sheets upwardly out of the molten metal and means for directing a flame downwardly at an angle other than a right angle against the sheet as it emerges from said rolls and means for varying the composition of said
20 flame.

17. An apparatus for treating metal sheets comprising means for holding a bath of molten metal, grooved exit rolls partly immersed in said metal, burner means for directing flames against
25 said rolls and opposite sides of said sheets and means for supplying regulated quantities of fuel and air to said burner means.

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