

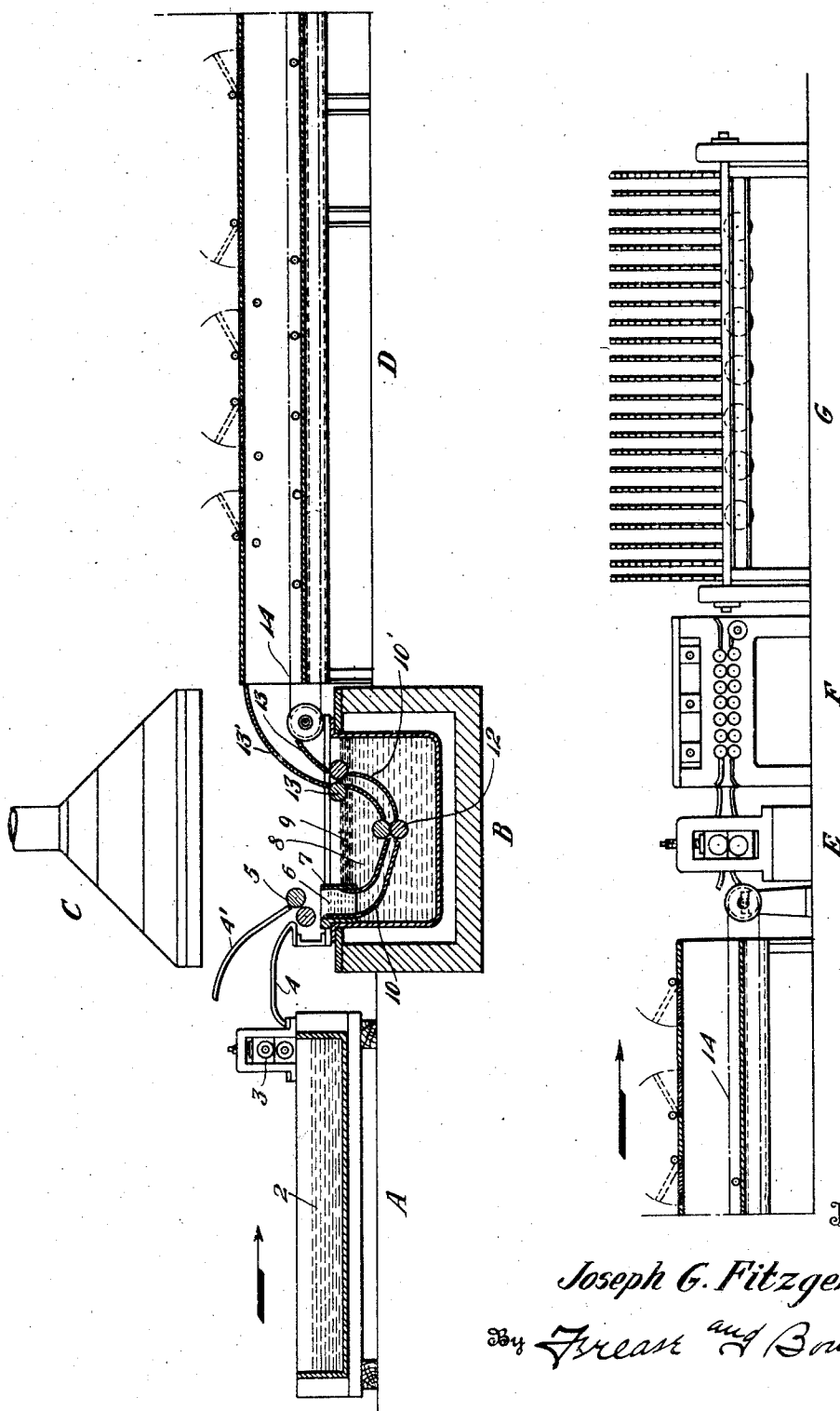
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METHOD OF ZINC COATING FERROUS METAL

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METHOD OF ZINC COATING FERROUS METAL.

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The invention relates to the process of coating ferrous metal with a film of zinc, which is commonly called galvanizing when applied to the zinc coating of steel or iron sheets. One object of the improvement is to cause such a coating to adhere so tightly to the ferrous metal that it will not become detached or scale therefrom during bending, breaking or deep drawing operations; and another object of the improvement is to so control the crystallization of the zinc coating as to present a uniform velvety gray frosted appearance to the surface of the sheet.

Ordinary galvanized sheets present a bright surface of large granular spangles variegated in appearance and of different sizes and shapes, which may have so little adhesion to the ferrous metal of the sheet as to separate and scale therefrom during forming operations or when subjected to high temperature; and such a coating is not uniform enough in texture to be serviceable for certain uses, as for instance, for oven linings and the like.

I have found that by superheating a steel or iron sheet to a higher temperature than is ordinarily used in a galvanizing process, before it is passed through molten spelter, the pores of the ferrous metal will open up to such an extent that when it is bathed in the molten spelter, the same will find its way into the pores and amalgamate more intimately with the ferrous base; and the same superheating of the sheet, and the resulting superheating of the spelter, results in a thinner coating of the same being applied to the sheet.

I have also discovered that the adhesion of such a coating is increased by a slow and gradual cooling of the same, extended through a considerable period of time; and that this treatment also reduces the size, the appearance, and the character of the spangles, which may be reduced to such a minute size as to present a uniform velvety gray frosty appearance, instead of the bright flaky appearance of the ordinary galvanized sheet.

By thus superheating the sheet in lead and spelter baths successively, and then controlling the degree and the rate of the cooling conditions, I have found that a galvanized sheet can be produced with a coating so tight as to adhere, without scaling, during forming operations, or when subjected to high

temperatures; and also with a uniform velvety gray surface which is desirable for special uses.

Without intending to limit the scope of the invention thereto, certain apparatus is illustrated in the accompanying drawings, forming part hereof, showing a longitudinal elevation section, somewhat diagrammatic, of apparatus which may be used for carrying out the improved process.

Such apparatus may include a cleaning tank A, a galvanizing pot B with a hood C therefor, a heat maintaining and cooling tunnel D, finishing rolls E, leveling rolls F and a porcupine cooling table G.

Steel or iron sheets may be cleaned for galvanizing by a weak solution of hydrochloric or muriatic acid in the tank A, and then carried by rolls 3 between guides 4 and 4' to feed-in rolls 5, which direct them downward through a salammuniac flux 6 in a trough 7 directly into a bath of molten lead 8, all in accordance with common and well known practice.

The molten lead bath may have a depth of some thirty or thirty-six inches on top of which floats a layer of molten spelter 9, which may be molten zinc, together with such additions of tin, antimony, and the like, as may be desired, according to the particular character of the coating desired. It will be understood that the flux trough 7 extends downward into the molten lead, so that the sheets pass through the flux into the lead without coming into contact with the spelter.

For the purpose of the present invention, the molten lead is maintained at a temperature of from 850° to 950° F. preferably about 900° F., which is from 50° to 100° higher than common galvanizing practice; the purpose of which is not only to superheat the body of the sheets before passing the same through the spelter, but to open or enlarge the pores of the ferrous metal so that the spelter and iron will amalgamate more completely.

Furthermore, the superheating of the lead serves to superheat the spelter floating thereon to a higher temperature than in ordinary practice, and melts the same to a thinner liquid, which not only amalgamates more readily with the ferrous metal, but produce a thinner coating thereon.

The sheets are directed and conveyed

through the molten lead and upward through the molten spelter floating thereon by guides 10 and 10', submerged rolls 12, and feed-out rolls 13; whence the hot coated sheets are directed by guides 13 and 13' on an endless conveyor 14, which details of the apparatus may all be in accordance with common practice.

The tunnel D may be of an open or a muffle type, and may be heated by direct or indirect means, as for instance electric coils, or some form of fuel, and as shown may be heated by gas flames flowing from suitable apertures or slots in transverse tubes, so that the flames may impinge the sheet if desired.

The heating means are arranged so as to maintain the temperature in the end portion of the tunnel adjacent to the galvanizing pot, and so that the temperature in the tunnel will gradually decrease toward the other end thereof; the purpose of the tunnel being to control the cooling of the hot coated sheets so that the same will be gradual and will extend through a considerable period of time.

The preheating of the sheet and the spelter by the superheated lead bath, not only more completely amalgamates the spelter coating with the ferrous body of the sheet, but with the slow and gradual cooling thereof so modifies the granular structure of the coating as to not only change the appearance thereof as described, but also increases the adhesion thereof to the body of the sheet, so that the same can be bent sharply or drawn deeply or subject to high temperature without detaching or scaling the coating from the body of the sheet.

The finishing rolls E may be ordinary cold rolls for compressing the coating on and into the ferrous metal and producing a smooth finish thereon, or wire scratching rolls for making a satin finish, or brush burnishing rolls for making a bright finish, in accordance with the common use of these and other kinds of finishing rolls.

The ordinary flattening rolls F may be used for straightening a bent or buckled sheet and a porcupine cooling table G may be used for finally cooling the sheets for manually handling the same for delivering them at the end of the continuous processes described herein.

I claim:

1. The method of zinc coating ferrous metal, which consists in heating the metal to be coated to from 850° to 950° F. and then coating it in a molten spelter bath to produce a tight coat.

2. The method of zinc coating ferrous metal, which consists in heating the metal to be coated in a molten lead bath to from 850° to 950° F. and then coating it in a molten spelter bath to produce a tight coat.

3. The method of zinc coating ferrous

metal, which consists in heating the metal, then coating it in a molten spelter bath, and then controlling the cooling of the hot coated sheet, to produce a tight coat of the desired character and appearance.

4. The method of zinc coating ferrous metal, which consists in heating the metal to be coated to from 850° to 950° F., then coating it in a molten spelter bath and then controlling the cooling of the hot coated sheet, to produce a tight coat of the desired character and appearance.

5. The method of zinc coating ferrous metal, which consists in heating the metal in a molten lead bath, then coating it in a molten spelter bath, and then controlling the cooling of the hot coated sheet, to produce a tight coat of the desired character and appearance.

6. The method of zinc coating ferrous metal, which consists in heating the metal to be coated in a molten lead bath to from 850° to 950° F., then coating it in a molten spelter bath, and then controlling the cooling of the hot coated sheet, to produce a tight coat of the desired character and appearance.

7. the method of zinc coating ferrous metal, which consists in coating the metal in a molten spelter bath, and then controlling the cooling of the hot coated metal by predetermined gradations of temperature to produce the desired character and appearance of the coating.

8. The method of zinc coating a ferrous metal, which consists in coating the metal in a molten spelter bath, and then controlling the temperature of the cooling of the hot coated metal to produce the desired character and appearance of the coating.

9. The method of zinc coating ferrous metal, which consists in coating the metal in a molten spelter bath, and then controlling the time and the temperature of the cooling of the hot coated metal to produce the desired character and appearance of the coating.

10. The method of zinc coating ferrous metal, which consists in coating the metal in a molten spelter bath, then controlling the cooling of the hot coated metal by predetermined gradations of temperature to produce the desired character and appearance of the coating, and then finishing and flattening the sheet, all by a continuous process.

11. The method of treating galvanized sheets immediately following the exit of the latter from the galvanizing bath, which consists in passing the sheets through a zone of applied heat in which they are permitted to cool gradually by predetermined gradations of temperature.

In testimony that I claim the above I have hereunto subscribed my name.

JOSEPH G. FITZ GERALD.