UNITED STATES PATENT OFFICE.

SAMUEL PEACOCK, OF WHEELING, WEST VIRGINIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WHEELING STEEL & IRON COMPANY, OF WHEELING, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA.

PROCESS OF COATING STEEL SHEETS WITH ALUMINUM.

1,378,052. Specification of Letters Patent. Patented May 17, 1921.

No Drawing. Application filed November 9, 1920. Serial No. 422,812.

To all whom it may concern:

Be it known that I, SAMUEL PEACOCK, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Processes of Coating Steel Sheets with Aluminum; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of coating thin steel sheets with aluminum and has for its object to provide a procedure which will be more efficient in action and less costly to carry out than those which have been heretofore proposed.

With these and other objects in view the invention consists in the novel steps and combinations of steps constituting the process, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

In order that the precise invention may be the more clearly understood, it is said: It is well known that thin sheets of steel after being descaled or cleaned according to well known procedures are now commonly immersed in a bath of molten tin, in order to convert them into the "tin plate" of commerce. The tin of the coating, however, is a large item of cost when it is considered that these sheets are treated by the million, and in addition, said coating entails other well known objections not necessary to mention.

It is therefore the object of this invention more specifically stated, to coat said sheets with aluminum and thus obviate many of the objections that are now met with in the tin coating processes.

But in coating said sheets by dipping them into a molten bath of aluminum, the relatively high temperature of about 700° C. of the latter causes many practical difficulties in obtaining a good coating, which greatly increase the cost of the procedure. That is to say, the differences in temperature between the steel and aluminum are considerable and the coating is not apt to adhere to the steel throughout, unless special precautions are taken. If to remedy this objection, we pass the steel sheets through the molten aluminum slowly enough for the steel sheets to reach the temperature of the bath, and to form an alloy film to hold the coating, the process will be found to be too slow to be commercial.

On the other hand, a rapid passage of the steel sheets through the molten bath will result in a coating consisting of a solidified, or frozen layer, almost devoid of a film of alloy to hold it to the sheet, and possessing a considerable porosity due to a crystalline structure.

In carrying out this invention, I avoid the foregoing objections by employing on top of the molten aluminum a molten layer of an anhydrous double alkali aluminum chlorid such as $AlNaCl_4$, which has a melting point of about 200° C. I further employ the usual apparatus for coating with tin, consisting of a series of submerged guide and traction rolls to carry the steel sheets into and out of the aluminum bath. The double aluminum sodium chlorid layer or bath is preferably maintained at about 300° C. on top of the aluminum by means of cooling coils. The steel sheets after being freed from their oxids, or cleaned, are now heated up in a non-oxidizing atmosphere, or out of contact with the air, to a temperature of say 250° C. or 300° C. or higher, whereupon they are carried through the said double chlorid layer into the aluminum bath. Said double aluminum alkali chlorid is found to readily deposit a firmly adhering film on the steel sheets as they pass into the aluminum, and the molten aluminum readily coats said film with a firmly adhering film of aluminum, as said sheets pass therethrough, with the result that the finished coating is found to be continuous, nonporous, and firmly adhering throughout its surface to the steel sheets.

Another objection heretofore met with in coating steel sheets with aluminum resides in the contamination of the surface of the molten aluminum due to its contact with the air. By floating said double chlorid bath on the molten aluminum, however, all contact with the air is avoided and the coating is therefore greatly improved. Again, as is well known in coating procedures of this kind it is very desirable to pass the coated

sheets through palm oil as they leave the apparatus. It is found that instead of having a single double chlorid bath, two may be provided. The one is positioned on that side of the machine at which the steel plates enter the bath of aluminum, and the other is positioned on the exit side of the machine, so that the aluminum bath joins the two double chlorid baths somewhat like the horizontal portion of a U-shaped container joins the legs thereof.

The two chlorid baths being thus placed similar to the legs of a U-shaped container, the one that occupies the exit position may be readily maintained at a temperature too low to decompose palm oil, and therefore, I have placed a layer of said oil above said last named bath and thus coat the finished plates therewith, as they leave the apparatus.

It is obvious that those skilled in the art may vary the details of the procedure without departing from the spirit of the invention, and therefore it is not desired to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. The process of coating steel sheets with aluminum which consists in first passing said sheets through a molten bath of a double aluminum alkali metal chlorid, and then through a molten bath of aluminum, substantially as described.

2. The process of coating steel sheets with aluminum which consists in first depriving said sheets of any oxid coating they may have, then passing said sheets through a molten bath of a double aluminum alkali metal chlorid maintained at a temperature above 200° C. and then through a molten bath of aluminum, substantially as described.

3. The process of coating steel sheets with aluminum which consists in floating a molten bath of a double aluminum alkali metal chlorid upon a molten bath of aluminum; maintaining the temperature of said first named bath below that of said second named bath; and passing said sheets through said baths in the order named, substantially as described.

4. The process of coating steel sheets with aluminum which consists in floating a molten bath of a double aluminum alkali metal chlorid upon a molten bath of aluminum; maintaining the temperature of said first named bath below that of said second named bath; heating said sheets to the approximate temperature of said first named bath; and passing said sheets through said baths in the order named, substantially as described.

5. The process of coating steel sheets with aluminum which consists in floating a molten bath of a double aluminum alkali metal chlorid upon a molten bath of aluminum; maintaining the temperature of said first named bath below that of said second named bath; passing said sheets through said baths in the order named; and then passing the coated sheets through a bath of palm oil, substantially as described.

In testimony whereof I affix my signature.

SAMUEL PEACOCK.