No. 811,854. PATENTED FEB. 6, 1906.

J. LEE.

PROCESS OF TINNING OR COATING METAL SHEETS WITH TIN OR OTHER METALLIC COATINGS.

APPLICATION FILED AUG. 18, 1903.

2 SHEETS—SHEET 1.

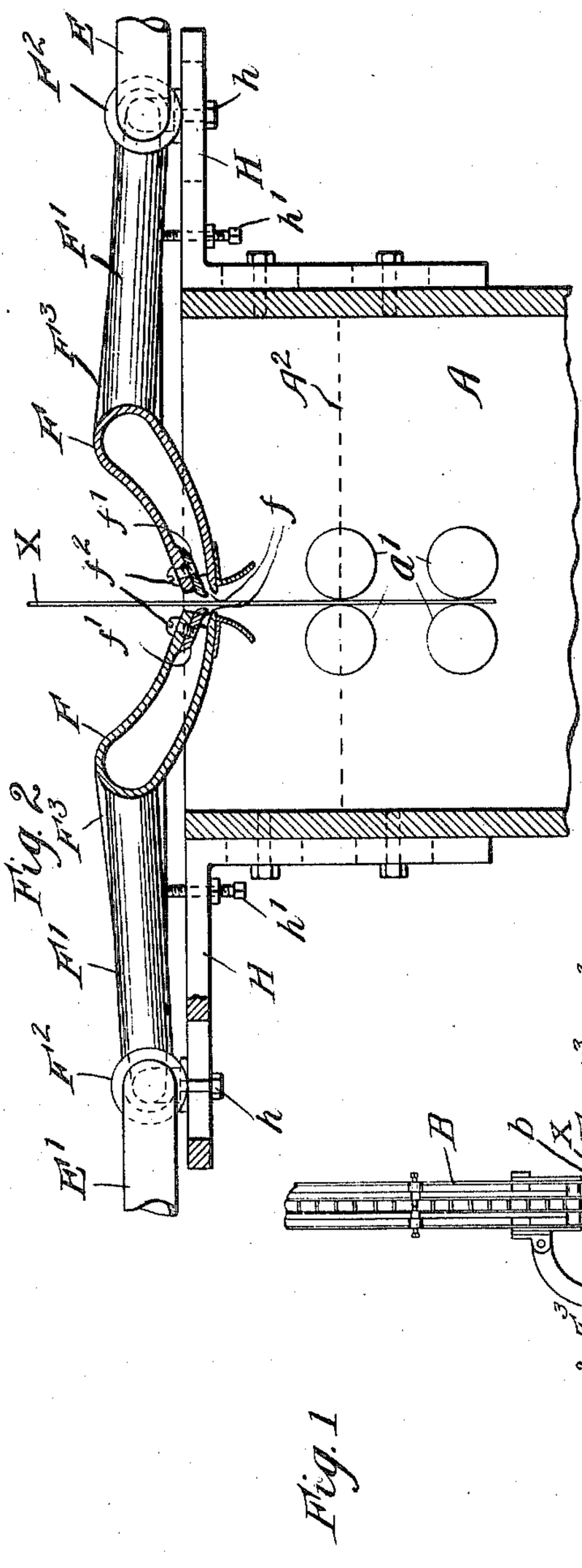

Fig. 2

Fig. 1

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2 SHEETS—SHEET 2.

Fig. 3

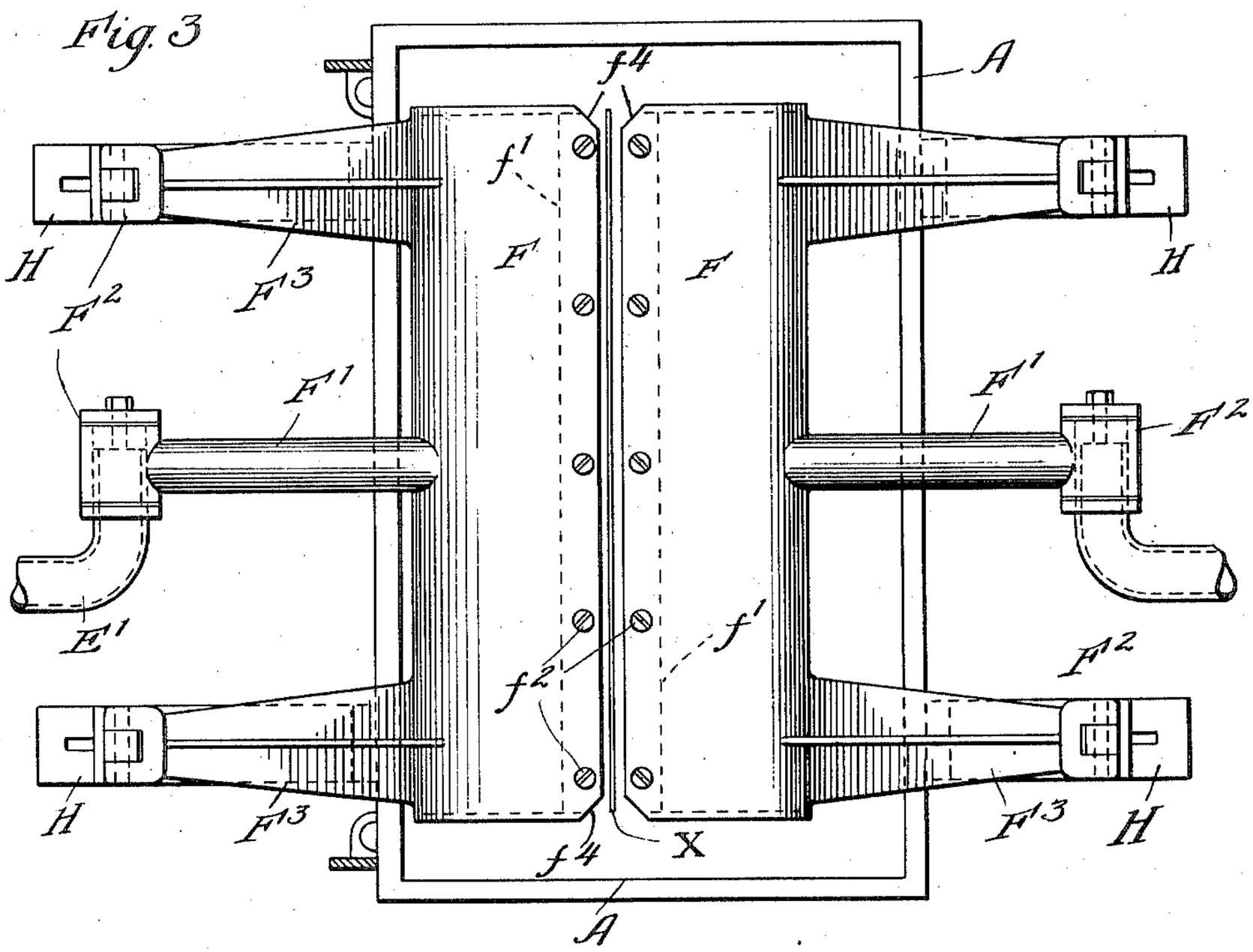


Fig. 4

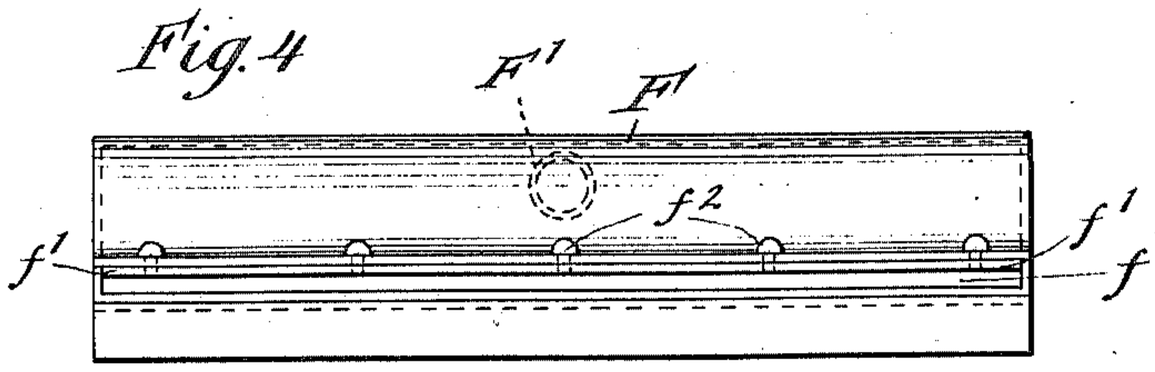
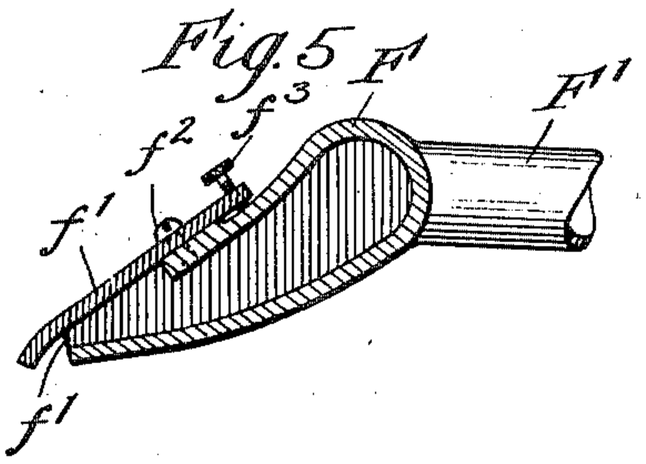


Fig. 5



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UNITED STATES PATENT OFFICE.

JOHN LEE, OF PHILADELPHIA, PENNSYLVANIA.

PROCESS OF TINNING OR COATING METAL SHEETS WITH TIN OR OTHER METALLIC COATINGS.

No. 811,854. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed August 18, 1903. Serial No. 169,930.

To all whom it may concern:

Be it known that I, JOHN LEE, a citizen of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Processes of Tinning or Coating Metal Sheets with Tin or other Metallic Coatings, of which the following is a specification.

My invention relates to improvements in the process of tinning or coating iron, steel, or other metal sheets with tin or other metallic coatings.

Heretofore in manufacturing tin-plate or coating sheets with metallic coatings it has been customary to immerse in or convey the sheets to be coated through a tinning pot or vessel containing molten tin or other coating metal furnished with tinning-rolls, between which the sheets pass and the extent or thickness of the metallic coating is ordinarily regulated or governed by the speed at which the sheets are passed through the tinning-pot, and in the method or process heretofore in use the sheets are produced with a selvage edge, owing to the tin or other metallic coating collecting at the extreme lower edge of the sheet as it passes out of the tinning-pot, which is not only detrimental in the cutting up of the tin-plate, but results in a considerable loss due to the excess of coating material unnecessarily used. In the process or method heretofore in use also the capacity of the tinning-machine is comparatively limited, owing to the time required for the molten tin to properly flow off of the freshly-coated sheet as it passes out of the molten tin between the finishing-rolls, and heretofore also the surface of the sheets are left smeared to a greater or less extent with palm-oil or other flux used in the tinning operation and require to be cleaned with bran or other cleaning material at considerable expense.

The object of my invention is to provide an improved process or method of tinning or coating metal sheets with tin or other metallic coating by means of which the extent or thickness of the coating may be regulated accurately and controlled independent of the speed of the sheets passing through the tinning-pot, by which the production of the selvage edges on the sheets or coatings of extra thickness at the edges may be prevented or avoided, and by means of which the sheets may be tinned or coated much more rapidly and cheaply than by the process or method heretofore in use, and by means of which also the freshly-tinned sheets may be produced as they come from the tinning-pot substantially free or clean from oil or flux upon their surfaces.

My invention consists in the means or method I employ to practically accomplish this important object or result—that is to say, it consists in subjecting the freshly tinned or coated sheets as they issue from the molten tin in the tinning-pot and while the coating of tin on their surfaces is yet fluid to the action of compressed superheated air or other fluid applied in wide blasts approximately the width of the sheet directly to the coated surfaces of the sheets as they pass upward from the tinning-pot. By this means the surplus tin while it is yet molten may be removed from the surface of the sheet as it issues from the tinning-pot, the extent or thickness of the coating accurately regulated and made uniform throughout the entire surface of the sheet at the extreme edges thereof as well as elsewhere, and this independent of the speed at which the sheets to be tinned pass through and out of the tinning-pot. By varying the pressure of the hot air or other fluid projected against the surface of the freshly-tinned sheet as it passes upward out of the tinning-pot the coating of tin or of other coating metal may be made of any thickness desired whatever may be the speed at which the sheets pass through the tinning-pot. This enables me not only to coat the sheets accurately and uniformly with the desired thickness of coating, but also to very greatly increase the speed or capacity of the tinning-machine. The superheated compressed air applied to the surfaces of the sheet as it issues from the tinning-pot also effectually removes the palm-oil, grease, or other flux employed in the tinning operation from the surfaces of the sheet, so that tin-plate produced by my process requires very little, if any, subsequent cleaning. This effects a great saving in expense. By my process also the tin is prevented from collecting at the lower edge of the sheet and producing the customary selvage edge. I am thus enabled by my process not only to produce superior tin-plate, but also to save the loss incident to the excess of tin or metal on the sheet at its selvage edge.

To enable my process to be more fully and clearly understood by those skilled in the art to which it relates, I have in the accompany-

ing drawings, forming a part of this specification, shown an apparatus suitable for use in practicing my invention.

In said drawings, Figure 1 is a side elevation, partly in vertical section, of an apparatus which may be used in practicing my invention. Fig. 2 is a vertical section through a portion of the tinning-pot and through the device for projecting or applying superheated or compressed air to the freshly-tinned sheet as it passes from the tinning-pot. Fig. 3 is a top or plan view of the same. Fig. 4 is a detail front of the air-blast tube or nozzle, and Fig. 5 is a cross-section showing another construction of the air-blast tube or nozzle.

In practicing my invention any ordinary form of tinning-machine or tinning-pot and mechanism for conveying the sheets through the pot and of lifting or conveying the same upward as they pass out of the pot may be used, such as are now commonly in use and familiar to those skilled in the art. Ordinarily, however, I prefer to use the well-known form of tinning mechanism shown, for example, in the E. Norton patents, Nos. 535,394 or 535,395, and for convenience I have in the accompanying drawings indicated this form of tinning-machine or tinning-pot and lifter and for more full descriptions of which I would refer to said patents.

In the drawings, A represents the tinning-pot, furnished with the customary tinning and conveying rolls a a and finishing-rolls a' a' and guides a^2, by which the sheet is fed and guided through the molten tin A′ in the tinning-pot and up through the oil or flux A^2, which covers the surface of the molten tin.

B represents any customary form of lifting or conveying mechanism for grasping, lifting, and conveying the sheets upward as they pass out of the molten tin in the tinning-pot. A suitable form of lifting mechanism is fully described in said Patent No. 535,394 before referred to and being familiar to those skilled in the art needs no further description.

C represents an air compressor or pump, D a heater for heating the compressed air, and E E′ conductor-pipes leading to the air-blast tubes or nozzles F F, which are mounted just above the tinning-pot and one on each side of the freshly-coated sheet X as it issues from the tinning-pot and by which superheated compressed air is applied, projected, or delivered against the freshly-coated sheet as it issues from the molten tin in the tinning-pot and while the tin coating on its surfaces is yet in a fluid condition. The air-blast tubes F each have a slot or opening f extending the length of the same, which is substantially the width of the sheet, so that the superheated compressed air is projected or applied against the whole surface of the sheet as it passes upward between the compressed-air-applying devices or nozzles F F. The slot or opening f in each of the nozzles or air devices F is made adjustable by means of the nozzle-plate f', applied thereto by screws f^2. By using nozzle-plates of different thicknesses or by backing the same up with other similar plates of greater or less thickness the size of the nozzle-opening f may be adjusted as may be required. As illustrated in Figs. 5 and 6, the size of the nozzle slot or opening may be adjusted by an adjusting-screw f^3. To enable the superheated compressed-air-delivery tubes or nozzles F F to be swung back out of the way, their connecting-pipes F′ have a hinged or pivotal connection F^2 with the air-pipes E E′. The position of the slotted air-delivery tubes F F in respect to proximity to the sheet may be adjusted by adjusting the position of the hinged arms F^3 F^3 on the slotted brackets H H, which are attached to the tinning-pot. This adjustment is effected by the bolts h, which connect the hinged arms F^3 F^3 with said slotted brackets.

The superheated compressed-air slotted delivery-tubes F F are downwardly inclined toward the sheet, and thus project the blast of superheated compressed air downwardly or at an angle to the tinned plate X as it passes up out of the tinning-pot. The angle at which the hot air is projected against the sheet may be regulated by the adjusting-screws h'. The superheated compressed air thus delivered downwardly or at an angle against the freshly-tinned sheet as it issues from the tinning-pot is preferably heated by the furnace or heater D′ to a temperature approximating that of molten tin. While in practicing my invention I prefer to use air as the heated fluid projected against the freshly-tinned sheet to remove the surplus tin coating therefrom, to regulate the thickness of the coating and make the same uniform throughout the surface of the sheet other fluids than air may be used for this purpose without departing from the principle of my invention.

Valves K K′ K^2 in the pipes E E′ regulate the pressure and quantity of superheated compressed air delivered against the tinned sheet as it issues from the tinning-pot. The air-heating chamber D is provided with a gage d for indicating the pressure and a thermometer d' for indicating the temperature to enable the same to be regulated.

By adjusting the air-delivery devices F F to or from the sheet passing between them by varying the angle or inclination at which the hot air or other heated fluid is delivered against the sheet X and by properly regulating the pressure and temperature of the hot air or other fluid and the size of the delivery slot or opening f any desired thickness of tin or other metallic coating on the sheet X may be produced, and this independent of the speed of the tinning-machine, or, in other words, the speed of the sheets X passing through the tinning-pot. This enables the

tinning mechanism to be run at a high speed and at its full and proper speed as a mechanism. By my invention the capacity of the ordinary tinning-machine may thus be very greatly increased, also in this way diminishing the cost of manufacturing tin-plate or other metallic coated sheets.

To give room for the lifting-fingers *b b* of the lifter B to grasp the sheet at its edges, as is customary, the slotted hot-air-delivery tubes or devices F F are furnished with notches f^4 at their extreme ends.

I claim—

1. The process of tinning or coating metal sheets with metallic coatings, consisting in passing or conveying the metal sheets to be coated through the molten coating metal and the oil or flux thereon, and subjecting the sheets as they pass with their lower edges horizontal up out of the coating metal and the oil or flux thereon, to superheated compressed air projected in a wide blast approximately the width of the sheet against the surfaces of the sheet while the tin or metal coating thereon is yet fluid, whereby the tinning operation is facilitated, the thickness of the tin coating regulated and made uniform; surplus tin removed; selvage edges at the bottom edges of the sheets prevented, and the surface of the sheet cleaned from grease, oil or flux substantially as specified.

2. The process of tinning, consisting in passing with their lower edges horizontal sheets to be tinned up through molten tin and the oil or flux thereon and projecting superheated compressed air in a wide blast approximately the width of the sheet against the surfaces of the sheet as they issue upwardly from the tinning-pot, and while the tin coating thereon is yet fluid, substantially as specified.

3. The process of coating metal sheets with a metallic coating consisting in passing the sheet with its lower edge horizontal upwardly through molten metal and the oil or flux thereon, and projecting heated compressed fluid in a wide blast approximately the width of the sheet against the surfaces of the sheet, as it issues upwardly from the molten metal and the oil or flux thereon, whereby the tinning operation is facilitated; the thickness of the tin coating regulated and made uniform; surplus tin removed; selvage edges at the bottom edges of the sheets prevented, and the surface of the sheet cleaned from grease, oil or flux substantially as specified.

4. The process of tinning metal sheets consisting in passing the sheet with its lower edge horizontal upwardly through molten tin and the oil or flux thereon and between wide blasts of heated fluid projected downwardly against the sheet as it issues from the molten tin and the oil or flux thereon, substantially as specified.

5. The process of coating metal sheets with metallic coating, consisting in passing the sheet with its lower edge horizontal upwardly through the molten coating metal and the oil or flux thereon between wide blasts of heated air projected downwardly against the surfaces of the sheet, whereby the tinning operation is facilitated; the thickness of the tin coating regulated and made uniform; surplus tin removed; selvage edges at the bottom edges of the sheets prevented, and the surface of the sheet cleaned from grease, oil or flux substantially as specified.

6. The process of tinning metal sheets consisting in passing a sheet with its lower edge horizontal upwardly through molten tin and the oil or flux thereon between wide blasts of hot air as it issues from a tinning-pot, and while the tin coating thereon is yet molten, substantially as specified.

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