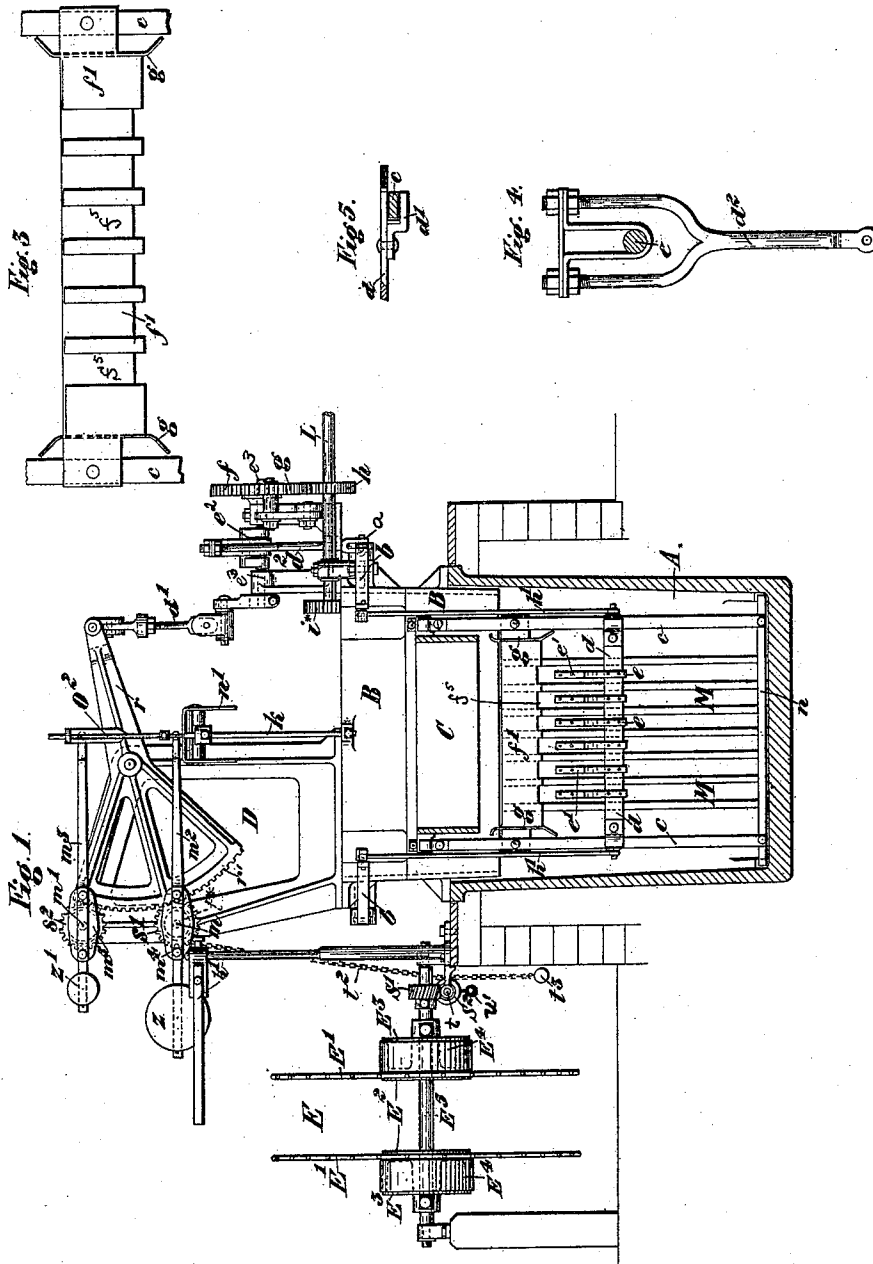


(No Model.)

4 Sheets—Sheet 1.

P. ROGERS & J. PLAYER.
APPARATUS FOR COATING METAL PLATES WITH TIN.
No. 471,437. Patented Mar. 22, 1892.



Witnesses.
Henry H. Field
H. S. Field

Inventors
Philip Rogers
John Player

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APPARATUS FOR COATING METAL PLATES WITH TIN.

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Fig. 2.

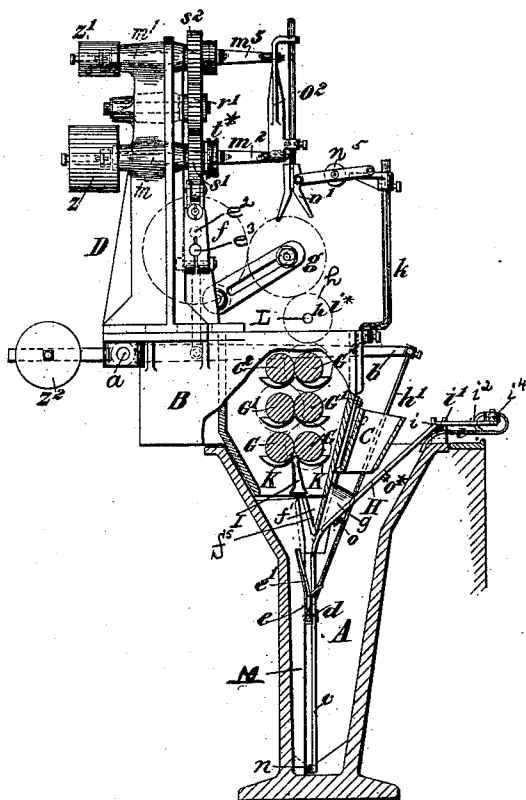


Fig. 11.

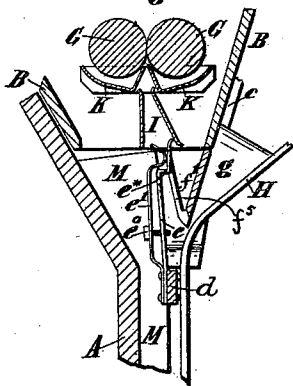
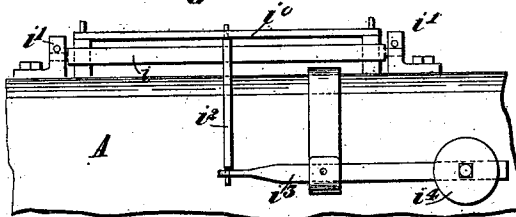


Fig. 6.



Witnesses.
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Fig. 7.

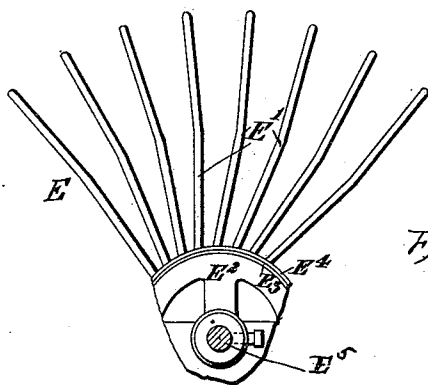


Fig. 17.

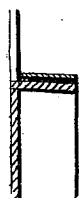


Fig. 12.

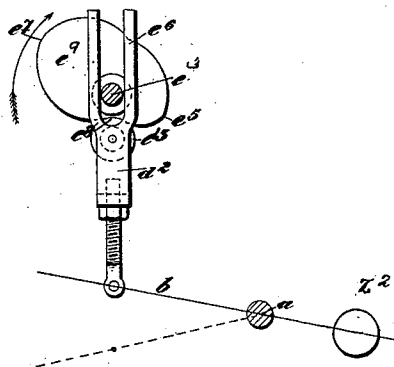


Fig. 13.

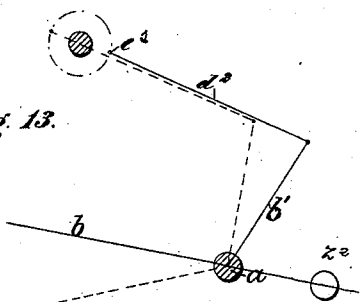


Fig. 9.

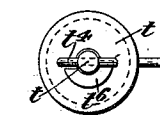


Fig. 8.

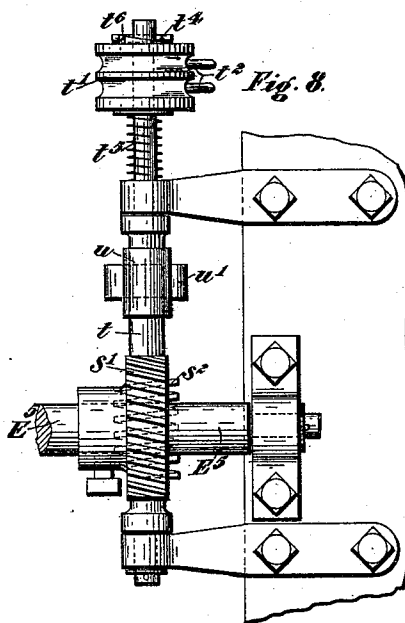


Fig. 10.



Witnesses.
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 Philip Rogers
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(No Model.)

4 Sheets—Sheet 4.

P. ROGERS & J. PLAYER.

APPARATUS FOR COATING METAL PLATES WITH TIN.

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Fig. 15.

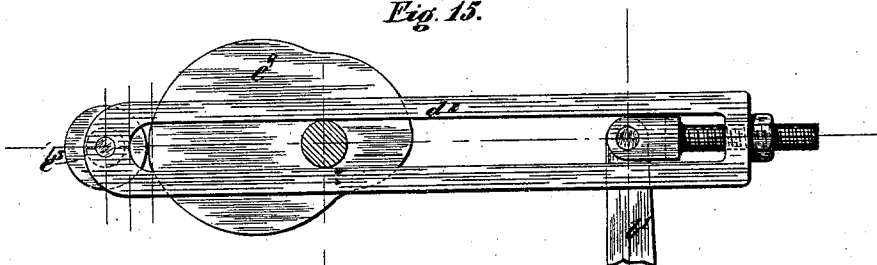


Fig. 16.

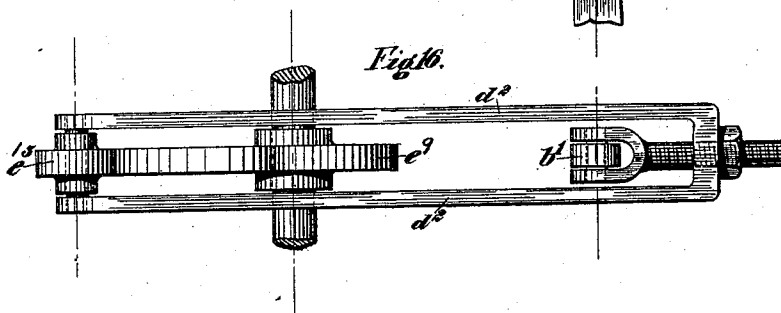
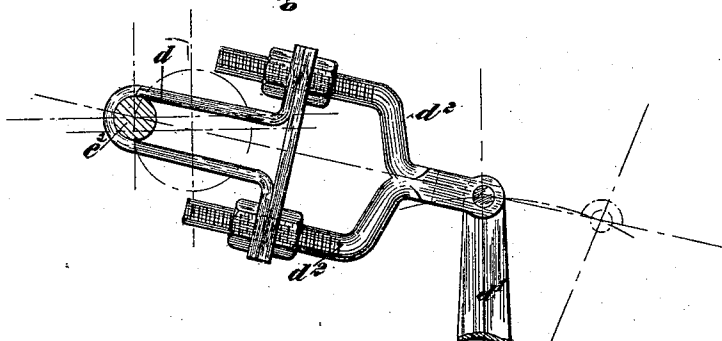


Fig. 14.



Witnesses.

E. C. Bluffy
H. E. Peck

Inventors

P. Rogers
J. Player
per E. C. Bluffy
Atty

UNITED STATES PATENT OFFICE.

PHILIP ROGERS, OF SWANSEA, AND JOHN PLAYER, OF CLYDACH, NEAR
SWANSEA, ENGLAND.

APPARATUS FOR COATING METAL PLATES WITH TIN.

SPECIFICATION forming part of Letters Patent No. 471,437, dated March 22, 1892.

Application filed August 12, 1890. Serial No. 361,844. (No model.)

To all whom it may concern:

Be it known that we, PHILIP ROGERS, residing at Swansea, and JOHN PLAYER, residing at Clydach, near Swansea, in the county of Glamorgan, Wales, subjects of the Queen of Great Britain and Ireland, have invented Improvements in Apparatus for Coating Metal Plates with Tin, of which the following is a specification.

This invention has reference to improvements in machinery or apparatus of the kind described in the specification of former Letters Patent granted to us, dated April 29, 1890, No. 426,962, for coating metal plates with tin, lead, or other metals, or metallic alloys.

The invention has for its object to improve the construction and operation of such machinery or apparatus and to increase the working capacity thereof.

In order that our present improvements in the above-mentioned machinery or apparatus may be clearly understood, reference is made to the accompanying drawings, wherein we will in referring to certain parts of the original specification distinguish them by the same reference-letters with which they are marked in the drawings annexed to the specification of our before-mentioned patent.

Figures 1 and 2 are elevations at right angles to each other, and both partly in vertical section, of our improved machine. Figs. 3 to 10, inclusive, are detail views. Fig. 11 is a sectional detail view illustrating a modification. Figs. 12 and 13 are diagrammatic views hereinafter referred to. Figs. 14, 15, and 16 are detail views of various modes of operating the clip-bar. Fig. 17 is a detail sectional view of the hub of the receiving-rack. Figs. 1 and 2 are to a smaller scale than the remaining figures.

A machine of the kind referred to comprises a pot A for the molten coating metal or alloy, a flux-box C, a grease-box B, containing several pairs of finishing-rolls G G' G², each working in a roll-feeding trough K, a cradle H, a clip-bar *d*, with spring-clips, which receive the plates to be coated one at a time through the flux-box, carry them down into the molten metal in the pot A and deliver

them through a box I and the grease-box to the lower pair of finishing-rolls G, a pick-up apparatus marked, collectively, D, provided with mechanical fingers and adapted to automatically remove the finished plates one at a time from the top pair of finishing-rolls G² and either deposit them in a suitable rack, such as E, or otherwise dispose of them, and mechanism for operating the several parts mentioned.

The cradle H consists of a series of bent bars secured together by transverse bars *o o*, and the outermost of which are secured to a third bar *i*, the ends of which are journaled in bearings *i' i'*, as shown in Figs. 2 and 6. The ends of the transverse bar *o*, secured to the cradle-bars, are extended far enough on each side to come in contact with guide-plates *g*, and so prevent the lower ends of the cradle-bars touching the clip-bar *d*. To bar *d* are secured, at points opposite the spaces between the ribs M at the back of the pot A, a number of bent bars *e*, each carrying at one end a spring-bar *e'*, that bears against the other end, the whole forming a spring-clip adapted to receive and hold a plate while the same is being carried down through the metal in pot A. The clip-bar *d* is guided vertically by guide-bars *c*, which, instead of being each made double, as in our former machine, are made single and enter recesses in the ends of the clip-bar, these recesses being each formed by a jaw-piece *d'*, secured to the bar, as shown in sectional plan in Fig. 5. The upper and lower ends of each guide-bar *c* are secured to the grease-box and to a cross-bar *n*, respectively, as in our former machine.

By making the guide-bars single they can be more readily withdrawn than heretofore from the pot A, together with the spring-clips, for the purpose of regulating the latter or for cleaning purposes. The clip-bar *d* is raised and lowered, as in our former machine, by side levers *b*, pivoted at *a*, which are connected to bar *d* by links *h'*. These levers are depressed by a slotted connecting-rod *d²*, Fig. 4, which is connected to one of the levers and acts solely by compression, being operated from the driving-shaft L, through toothed

wheels h , g , and f and crank e^2 on the shaft e^3 . The longer arms of the levers are raised by the counter-weights z^2 .

i is a toothed wheel for driving the finishing-rolls.

According to this invention we dispense with the pivoted switch or guide described in our former specification for directing coated plates while being raised to the finishing-rollers, and use in lieu thereof a guide f' , which in cross-section is approximately V-shaped. This guide f' is fixed (it may be by rivets extending through lugs at each end) to the guide-bars c , as shown in Figs. 1 and 3, and to its ends are secured the guide-plates g . The front of the guide f' is plain, but the back has grooves f^5 cast in it, as shown in Fig. 3, to correspond with the spaces between the cradle-bars and the spaces between the ribs M . The guide f' may be cast in one with the grease-pot B ; but this is open to the objections that a larger percentage of wasters are obtained in casting the grease-pots, and the V-shaped guide is not readily accessible for cleaning. With the arrangement described, after a plate to be coated has been passed through the flux-box C , between the guide-plates g , and inserted in the spring-clips e' it is carried by the clips down into the molten metal, and is caused by the bent bars of the cradle H , bearing against it, to assume a vertical or approximately vertical position, so that when it is afterward raised its top edge will be guided by the grooved side of the guide f' and the ribs M into the guide I , and thence to the finishing-rolls G G' G^2 .

When makingterne plates, the greater buoyancy of the molten alloy renders the working of the cradle H rather heavy. To obviate or neutralize this to a certain extent, a bar i^0 at the upper end of the cradle is connected by a rod i^2 to one arm of a lever i^3 , the other arm of which carries an adjustable counter-weight i^4 , which is so adjusted that the cradle will yield to allow the plates to pass down into the spring-clip without bending them, but will afterward push over the top edge of the plates beyond the lower edge of the guide f' before they begin to rise.

To adapt the machine to work smaller plates than can be worked with the spring-clips shown in Figs. 1 and 2, the modified form of clip shown in Fig. 11 can be used. In this arrangement the bars e and spring-bars e' are connected to the clip-bar d , as shown, so that they can pass upward within the spaces between the guide-piece f' and the ribs M without coming in contact with the lower edge of such guide-piece. The upper end of each bar e is bent, as shown, to form a shoulder at e^x to support a plate, and the upper end of each of the spring-bars e' is bent so as to press against the upper bent end of the corresponding bar e . Screws e^0 , one only of which can be seen in Fig. 11, are provided for adjusting the degree of pressure between the upper ends of each pair of bars e and e' .

As the plates to be treated cannot be inserted in place in this modified form of clip when the same is in its highest position, it is necessary to impart a different motion to the clip-bar shown in Fig. 11 than that imparted to the clip-bar shown in Figs. 1 and 2. Fig. 12 shows, diagrammatically, an arrangement for this purpose in which a cam e^9 on the shaft e^3 is used instead of the crank e^2 , Fig. 1. This cam works in contact with a roller e^{13} , journaled to the forked end of the connecting-rod d^2 , which is jointed to one of the two connected side levers b , the roller being kept always in contact with the cam by counterbalance-weights, such as z^2 , Fig. 2. The cam is so formed that assuming the clip-bar d to be in the position shown in Fig. 11 and the cam to be turning in the direction of the arrow, Fig. 12, the cam will gradually depress the lever b and bar d until the point e^5 of the cam comes into contact with the roller e^{13} , when the bar will be sufficiently depressed to enable a plate to be inserted in the clip through the flux-box. The clip-bar will then remain stationary or "dwell," while the periphery of the cam from e^5 to e^6 , which is concentric to the cam-center, travels in contact with the roller, thereby affording sufficient time for the insertion of the plate. The clip-bar is then depressed by the action of the cam-surface from e^6 to e^7 to a sufficient extent to enable the top edge of the plate to be carried down below the lower edge of the guide-piece f' , and the plate is then caused by the cradle H to assume a vertical position. From e^7 to e^8 the periphery of the cam is such as to allow the levers b to be raised by their balance-weights z^2 and thus cause the bar d and clip to rise into the position shown in Fig. 11, and so feed the coated plates to the finishing-rolls G , whence they are automatically taken and deposited in the rack E by the pick-up apparatus D .

The side levers b , instead of being operated by a crank and a connecting-rod directly attached to one of them, as in Figs. 1, 2, and 4, or by a cam, as in Fig. 12, may be operated by a lever b' , secured to the shaft a , upon which the levers b are fixed, and coupled by a slotted connecting-rod d^2 to a crank e^2 , (or eccentric-strap,) as diagrammatically illustrated in Fig. 13 and in end view in Fig. 14; or the rod d^2 may be operated by a cam e^9 , as shown in side elevation and plan in Figs. 15 and 16, respectively. In this arrangement the rod d^2 is in the form of a double fork carrying at one end a roller e^{13} , and jointed at the other end by an adjustable pin to the lever b' . In each of these arrangements the levers b are depressed by a pull on the rod d^2 , but are raised by a counterbalance-weight, as in the previous arrangements.

In the pick-up apparatus constructed according to this invention the arms m^2m^3 , that carry the rod o^2 , with mechanical fingers n' , are each directly operated from the lever v . For this purpose the arms m^2m^3 are connected

to flanges or plates $m^4 m^5$, fixed to or cast in one with the toothed wheels $S' S^2$, respectively. These wheels are fixed upon shafts $m m'$, and are each in gear with the toothed segment r' of the lever r . To the shafts $m m'$ are fixed arms carrying counterbalance-weights $z z'$, respectively. By this arrangement a steady parallel motion can be imparted to the arms m^2 and m^3 without subjecting them to unequal strains liable to derange their working, and the working of the apparatus is rendered more uniform and even than when one of the toothed wheels s^2 and one arm m^3 only are directly driven, and motion is transferred from these to the other arm through crank-arms and a connecting-link, as in the arrangement described in our former specification. The lever r is oscillated by a connecting-rod d' , the length of which can be adjusted as desired and which is operated from the driving-shaft L through the toothed wheels $h g f$ and crank-shaft e' , as in our former machine.

$k k$ are vertically-adjustable touch-rods, as in our former machine, for opening the mechanical fingers n' when these are brought over the finishing-rolls G and rack E , respectively. The mechanical fingers are held normally closed by weight n^5 and are opened by the touch-rod.

Our improved form of circular rack E consists of two or more sets of bent rods E' , Fig. 7, each set being fixed by casting to a disk E^2 , formed with an annular flange E^3 , around which is a tire or band E^4 , of elastic or flexible material—such as india-rubber—that is protected by a sheath of metal—as, for example, black or tinned plate. The two disks are fixed at a suitable distance apart upon a shaft E^5 , the space between them being left open. By this construction an elastic bed or support is provided for the lower edges of the finished plates to fall upon when released from the mechanical fingers n' , and the liability of these edges being damaged by falling on a rigid support is thus obviated.

s' is a worm fixed upon the rack-shaft E^5 and in gear with a worm s^2 on the shaft t . Upon this shaft is loosely mounted a sheave t' , around which is wound a chain t^2 , the upper end of which passes partly around and is secured to a sheave t^4 , Figs. 1 and 2, fixed upon the shaft m of the pick-up apparatus. The lower end of the chain carries a weight t^3 . The sheave t' is pressed outward against a pin t^4 on the shaft t by a spring t^5 , and is formed with an inclined cam t^6 , that engages the pin t^4 and rotates the shaft t when turned in one direction by the chain t^2 and sheave t' , but slips idly past the pin t^4 when turned in the other direction by the weight t^3 , the sheave then moving inward a short distance and compressing the spring t^5 . By this means an intermittent step-by-step movement can be imparted from the pick-up apparatus to the rack E each time the mechanical fingers pass from a position above the rack to the position shown in Fig. 1, the rack E remaining stationary

when these fingers move in the opposite direction, the slack then produced in the chain t^2 being taken up by the weight t^3 . To prevent the shaft t being turned during this latter movement by reason of the friction between the cam-sheave t' and the pin t^4 , we employ a brake, Fig. 10, consisting of a strip u of flexible material—as, for example, leather or india-rubber—that partly surrounds the shaft t and carries a weight u' .

What we claim is—

1. In a machine for coating metal plates and sheets by passing them through molten metal, a pick-up apparatus comprising two arms $m^2 m^3$, fixed upon shafts, the rod pivoted to the outer portions of both arms, gripping-fingers n' , carried by said rod and adapted to grip a coated plate, toothed wheels $s' s^2$, fixed upon said shafts, a lever r , with toothed segment in gear with each of said wheels, and means for oscillating said lever, substantially as herein described, for the purpose specified.

2. In combination, the molten-metal pot, the grease-box at the top thereof, the cradle composed of a series of rods extending through the open end of the pot down into the lower portion thereof, cross-bars connecting said bars, the upper cross-bar being journaled at the top of the pot to allow the portion of the cradle in the pot to swing, a counter-weight at the exterior of the pot, lever connections to the upper portions of the cradle to depress the lower end of the cradle, as set forth, the vertically-movable plate-carrier in such pot, and a guide to direct the plates up into the grease-box, substantially as described.

3. In a machine for coating metal plates, the rack consisting of the hub having the radial arms, the elastic or soft packing around said hub, and the protective sheathing around said packing, as set forth.

4. In a machine for coating metal plates, the combination of the molten-metal pot, the grease-box above the open top thereof and having the bottom opening and guide therein, means, substantially as described, in the pot to guide the plates, a vertically-movable plate-carrier in the pot, and a stationary horizontal guide f' beneath the open end of said box and formed in one piece, with upwardly-extending grooves in its rear face and the two guides on the front face, for the purposes set forth, and to one side of the guide therein and in the said pot above the plate-guiding means, said guide f' being V-shaped in cross-section to guide the plate from the pot to the grease-box.

5. In a machine for the purpose set forth, the combination of the molten-metal pot, the grease-box at the top of said pot containing the rolls, the pivoted cradle extending down into said pot to guide the plates, the vertically-movable plate carrier or holder in said pot, and the stationary guide f' , extending across one side of the bottom of the grease-box, said guide being V-shaped in cross-section and having its front plain and carrying

guides *g'* and its back provided with grooves corresponding with the spaces between the cradle-bars, substantially as described and set forth.

5 6. In a machine for coating metal plates, the combination of the molten-metal pot, the grease-box in the open top thereof containing the rolls, the cradle extending down toward the bottom of said pot beside the grease-box
10 and hinged at its upper end, said cradle being composed of bars, as set forth, to guide the plates in the pot and having its outer end provided with a counter-weight mechanism acting to throw the cradle down and over-
15 come its buoyancy, a vertically-movable plate-carrier, and a guide at the lower end of the grease-box to direct the plates upwardly into the same.

7. In a machine for coating metal plates,
20 the combination of the molten-metal pot, the pivoted cradle therein for the plates, and the vertically-movable plate carrier or holder consisting of the horizontal bar *d*, having forked ends embracing the vertical guide-rods *c*, the
25 vertical bent bars *e*, secured at their lower ends to the bar *d*, and the spring-bars *e'*, secured at their lower ends to the lower ends of each bar *e* and bearing against the opposite upper ends of the bar *e*, as shown and de-
30 scribed.

8. In a machine for coating metal plates, the combination of the molten-metal pot, the grease-box at the top of said pot provided with the rolls, the horizontal stationary guide ex-
35 tending across said pot beneath said box and having its rear face inclined up, as set forth, said guide tapering downwardly to an edge,

so that the plates will pass from its front face and up at its rear face, the vertically-movable plate-carrier, the pivoted cradle in said pot
40 to guide the plates, as set forth, the lower edge of said horizontal guide being notched by grooves to correspond with the space between the bars of the cradle to receive the plate-carrier.

9. In a machine for coating metal plates,
45 the combination of the molten-metal pot, the grease-box at the top thereof having rolls, the horizontal stationary guide extending across the pot at the outer side of the bottom of said
50 box, so that its front face forms a downward continuation of the outer side of said box and its rear face is inclined up from the lower sharp edge of the guide toward the rolls in
55 said box, a flux-box, the guides for the edges of the plate on the front face of said horizontal guide beneath the flux-box, the cradle ex-
60 tending down into the lower portion of the pot beside said horizontal guide to guide the plates and direct their upper edges, the ver-
65 tically-movable plate-carrier in the pot, and means to coact with the horizontal guide in guiding the plates to the rolls.

In testimony whereof we have signed our names to this specification in the presence of
65 two subscribing witnesses.

PHILIP ROGERS.
JOHN PLAYER.

Witnesses:

HENRY H. FIELD,

Notary, Swansea.

H. G. FIELD,

His Clerk, Swansea.