E. MOREWOOD & J. H. ROGERS.

APPARATUS FOR METAL-COATING METAL-PLATES.

No. 172,148. Patented Jan. 11, 1876.

FIG. 2.

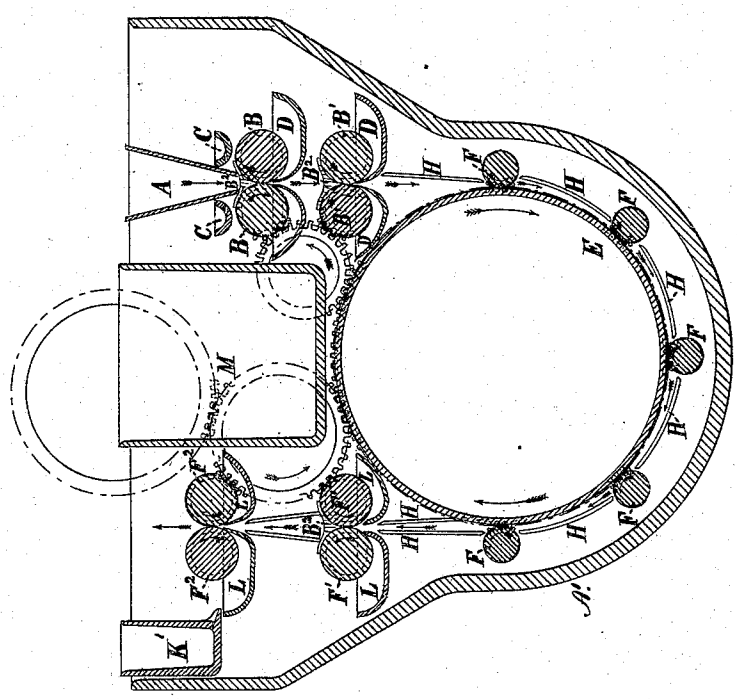
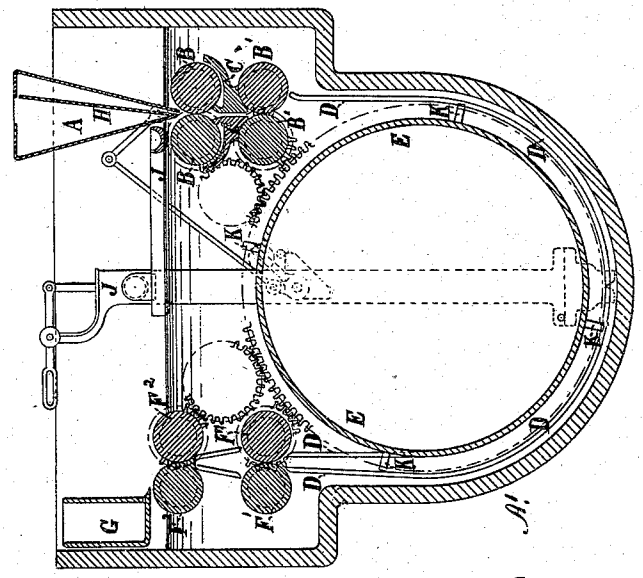


FIG. 1.



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UNITED STATES PATENT OFFICE.

EDMUND MOREWOOD, OF LLANELLY, AND JOHN H. ROGERS, OF LLANGENNECH PARK, NEAR LLANELLY, GREAT BRITAIN.

IMPROVEMENT IN APPARATUS FOR METAL-COATING METAL PLATES.

Specification forming part of Letters Patent No. **172,148**, dated January 11, 1876; application filed December 21, 1875.

No. 6.

To all whom it may concern:

Be it known that we, EDMUND MOREWOOD, of Llanelly, in the county of Carmarthen, and JOHN HENRY ROGERS, of Llangennech Park, near Llanelly, in the county of Carmarthen, Great Britain, tin-plate manufacturers, have invented certain improvements in applying tin or other coating metal to metal sheets and other surfaces of metal, of which the following is a specification:

In coating plates of iron with tin or other coating metal in a melted state, it is well known that there is a great loss by evaporation of the coating metal, especially from the first-coating or tinning pot, and also by the deterioration of the melted coating metal kept at the ordinary heat of the tinning or first-coating pot.

In order to avoid much of this loss, and to perform the tinning or coating with a smaller quantity of coating metal in a melted state, we arrange machinery, vessels, and melted metal so as to make it unnecessary to submerge the plates, either partially or wholly, in the melted metal; and this we do by causing the molten coating metal to be supplied to the sheets or other surfaces while they are traveling through a bath of heated flux, which is effected by rollers which are kept perpetually supplied with coating metal. The plates are thus, as it were, coated by transfer and adhesion, while the ordinary method acts more by soaking and combination, the coating metal entering the pores of the plate.

We make the bottom of the coating-pot of cylindrical form, and place within said pot a cylinder of such size as to leave but a narrow channel or passage-way between said pot and cylinder for the plates to pass through from the entrance to the delivery rollers. This arrangement lessens the amount of flux and coating metal required in the pot, and there is but a small extent of surface of the flux in direct contact with the melted metal, and, hence, prevents largely the deterioration of said flux.

In applying coating metal according to our invention to metal sheets or suitable surfaces, (which we shall speak of as plates,) by means of coating-rollers, we proceed as follows: We first clean or pickle the plates of metal with hot and strong acid, or, as it is usually termed, "high," and after washing them well in clean water, we use them fresh, say an hour or two after they have been cleaned, and without allowing them to stand long in water. We then place them wet or damp, and, by preference, separately, in a grease pot or vessel heated to about the melting-point of the metal with which they are to be coated. The grease-pot is provided with an overflow gutter or pipe, and an arrangement for the return in a more solid state of the grease which froths up and flows over when the wet iron plates are deposited in the hot grease. Such an arrangement as that described in Edmund Morewood's British Patent of 22d June, 1870, No. 1,780, will answer, but is not claimed here. In this grease-pot we usually have at one time, say, forty or fifty iron plates of the size technically described as 20×14, C thickness, keeping them as much apart as we conveniently can by means of pins or otherwise. The plates are deposited and removed as nearly as may be in rotation, and while in this grease-pot they are immersed in hot and tolerably solid grease. From this grease-pot we withdraw the hot plates, and treat them by our improved process, according to which we pass them through the flux-box, and between a pair of coating-rollers contained in a bath of suitable flux, such as grease, if coating with melted tin, such grease or other flux being kept, say, at about 100° Fahrenheit above the melting-point of the coating metal. These rollers pass the plates in succession to other rollers, all contained in the same bath of flux. We keep the coating-rollers on the entrance side of the coating-bath of grease or other flux well supplied with coating metal.

We regulate the height of the coating metal in the roller-supply troughs by the supply produced from the pump working at a quicker or a slower speed.

The quality of that pumped up from the bottom of the bath will be inferior, in consequence of use, to the fresh melted metal from the reservoir, which is supplied to the exit-rollers.

Before starting the process we completely

coat the surface of the coating-rollers by immersing them in stale grease, at a temperature above that of the molten metal, and keeping them revolving while coating metal is supplied to them.

Figure 1 represents the coating-grease pot, with troughs and rollers and machinery, together with a reservoir, also with a revolving drum or rim and arms and guides. Fig. 1 is a vertical section.

The plate is placed in the flux-box A, and at the right moment the finger H, acted upon by a catch and suitable levers, as shown, allows the plate to fall into the nip of the rollers B B and B^1 B^1. Below B B there is an iron receiver, C C, which collects the coating metal as it drops from the rollers B B, and brings it into contact with the plate as it passes downward in the space between said troughs C C. The rollers B B are supplied with melted coating metal by the pump and gutter J, and may suitably be from six to eight inches in diameter. There may be more than one pair of lower coating-rollers B^1. After the plate leaves the lower rolls B^1 B^1 it falls onto pegs K, fixed in the drum E, and is carried round between the drum E and the guides D D, until it enters the nip of the rollers F^1 F^1 and F^2 F^2, through which it makes its exit. The rollers F^2 F^2 are supplied with coating metal of good quality from the tank G. The supply to the tank G may be by means of a pump. Any metal which falls from the rollers F^2 F^2 supplies the lower rollers F^1 F^1 with coating metal, and any metal which falls from the lower rollers F^1 F^1 is taken up by the pump J, or in any other suitable manner, and supplied to the rollers B. Thus the rollers F^1 F^1 and F^2 F^2 always receive the fresh metal, and after being used upon them the metal passes to the rollers B B; or the supplies may be kept entirely distinct, that to the rollers F^1 and F^2 being of the better quality.

The bottom or lower part of the coating pot or vessel A′ is made rounded or cylindrical, in order that the space between said pot and the drum E may be lessened, and thereby have as little grease and coating metal in the pot *a* as possible. The space in the pot A′ may be filled with flux or grease, and the plates only receive the coating metal from the rollers B B^1 F^1 F^2, except that which they receive as they pass between the cylinder E and pot A′, and which drips from said rollers; or a regulated quantity of coating metal may be kept in the bottom of said pot for the plates to pass through. In either case the rollers *f* aid in transferring the metal to the plates as well as propelling them along.

Fig. 2 shows a vertical section of a somewhat different arrangement. Here the plate passes through the flux-box A into the nip of the rollers B B and B^1 B^1. These are fed with coating metal from the gutters C C, which are supplied by a pump or by other convenient means. The rollers also revolve in troughs D D, which contain melted coating metal, and are replenished by the metal supplied to the rolls. The plate then passes on, by guides H H, between rollers F F and the drum E; thence, through the guides H H, into the nip of the rollers F^1 F^1 and F^2 F^2, which also revolve in troughs of melted coating metal L L, and from between the upper pair of rollers F^2 F^2 the plate makes its exit. The troughs L L of the upper pair of rollers F^2 F^2 are supplied with melted coating metal of a better quality from a small tank, K′. At the ends of the rollers B B B^1 B^1 and F^1 F^1 there are nip-pieces B^2 B^2, which ride in grooves in the rollers, and hinder the coating metal or flux from running out at the ends of the rollers as fast as it would do otherwise. The drum and rollers are all driven by wheels gearing into each other, so that they have the same surface speed. The hollow box M displaces a large amount of grease or flux, so that by raising or lowering it the level of the grease is readily altered.

It will, for some qualities of iron, be desirable, after the sheets are delivered by the upper or exit rollers F^2 F^2, Fig. 2, or F^2 F^2, Fig. 1, to submit them to a finishing process, which may form a separate operation; but we prefer that it should be performed as the sheets rise out of the pot from the said upper rollers. These rollers may, if necessary, be placed somewhat lower than the drawing shows, in order to admit of the finishing-rollers and apparatus being placed above them. In some cases we may dispense with the entrance coating-rollers, and also, if desired, with the propelling coating-rollers, and, after passing the plate through the flux, cause it to pass between two or more coating exit-rollers in succession. The coating metal may be of the same or different qualities. If we are coating with tin only, and if it is important that the plates should have the usual color, finish, and appearance of tin plates made in the ordinary way, we finish them by bringing them out through coated rollers which revolve in contact with grease up to and an inch or two above their nip. When we use a sharper flux than grease for coating with tin or terne metal, say rosin or chloride of zinc, we omit the soaking of the plates in a preparatory pot of hot grease. If we use chloride of zinc we add a little water to it occasionally, if it becomes dry, and from time to time we strain and clean it. We make the upper pair of the coating-rollers on the entrance side of the coating-pot about six to eight inches in diameter. Above and between the nip of these rollers we place a flux-box about ten inches high, which we keep supplied with the rosin or chloride-of-zinc flux. The metal into which the mouth of the flux-box dips keeps the flux in the flux-box above the general level of the bath. We keep the nip of these rollers well supplied with coating metal, and the nip-pieces, as described before, are useful in this respect. We also keep about two to four inches of coating metal at the bottom of the bath, and from this supply, which is further fed by the droppings from the rollers,

we keep the coating-rollers on the entrance side of the bath supplied. We shape the troughs so that there is a space of four or five inches of melted metal or flux surface behind the rollers, and by a tool shaped like a very small spade, with an iron handle, we are enabled to keep the surface clean and free from scruff. Hoop-iron may be coated in a similar way to that shown in Fig. 2, by passing it between a series of coating-rollers from the commencement to the completion of the process, also wire, if passed between rollers with suitable grooves. As already indicated, the coating metal or flux which the plate gathers in the first stages of coating may be of a quality less suited to give finish and color to the plates than that contained in the troughs of the after or finishing rollers. Thus we give the first coating of tin with tin of a thicker or inferior character, and the after or finishing coating with metal of better color, more liquid or more free from impurity. If coating with terne metal, the mixture for the first coating may contain rather less than one-third tin to two-thirds lead. In the mixture for finishing or the after-coating we use two-fifths tin to three-fifths lead.

When using grease flux, that which we use in the flux-box is thick and stale, as it acts more efficiently in causing the plates to take the coating metal. That in the troughs which feed the rollers for finishing is more fresh or clean, or liquid. If we use chloride of zinc in the early stages of the process for coating with lead, tin, or terne metal, we pass all the plates through two coating-baths, and leave them to stand ten or twelve hours in tanks of water between the first and second baths, as described in the specification of Edmund Morewood's British patent of 4th February, 1869, No. 349, but which is not claimed here. If coating with spelter or zinc, we use muriate of ammonia or sal-ammoniac as a flux mixed with a little of the chloride of zinc which the sal-ammoniac or muriate of ammonia gathers from the surface of melted zinc when used as a flux upon it, and we refresh it with fresh sal-ammoniac, and clean it from time to time.

When coating iron of heavy gage, or of such a nature as to take the coating less readily, we sometimes form a deeper trough or channel of coating metal between the rollers by raising the nip-pieces (which we place between the ends of the rollers) to a level with the top of the coating-rollers on the entrance side of the bath, and we keep the trough or channel thus formed supplied with coating metal by a pump; but to this we make no claim here. In such case the plates in process of coating pass through this trough or channel of melted metal on their way to the nip of the coating-rollers, and immediately before reaching them.

We are aware that exit-rollers by which plates are withdrawn from baths of flux and passed from the nip of the rollers instantaneously into the air, have heretofore been supplied with coating metal by means more or less imperfect. Such rollers are described in the specification of a British patent granted to Edmund Morewood 14th January, 1863, No. 123.

Our invention does not consist in the use of such exit-rollers, as it is essential to our method that a plate, after coating metal has been applied to its surface by rollers, should travel for a considerable distance through flux before emerging, so that the flux may have time to act on and repair the imperfections of the coating. Whenever a plate is withdrawn from the coating-bath while the coating is imperfect, the air acts upon it and forms a film, which it is difficult afterward to displace.

We claim—

1. The coating-rollers B^1 B^1 and F^1 F^1, in combination with the pot A′ and drum E, substantially as and for the purposes set forth.

2. The rotary drum E in the coating-pot A′, filling up the middle of said pot, and leaving a narrow channel or space for the passage of the plates, substantially as and for the purposes set forth.

3. The coating-rollers F and rotary drum E, in combination with the pot A′, substantially as and for the purposes set forth.

4. The troughs C C, with a narrow channel between them, through which a stream of coating metal is caused to flow, in combination with the coating-rollers B, substantially as and for the purposes set forth.

5. The coating-rollers B F^1, receiving the melted coating metal or flux, which is retained thereon by nip-pieces B^2, in combination with the troughs D or L, substantially as set forth.

6. The hollow vessel M, placed within the coating-pot, in combination with the drum E and coating-rollers, substantially as set forth.

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