E. MOREWOOD.

MANUFACTURE OF TIN AND OTHER METAL-COATED PLATES.

No. 176,032. Patented April 11, 1876.

FIG. 1.

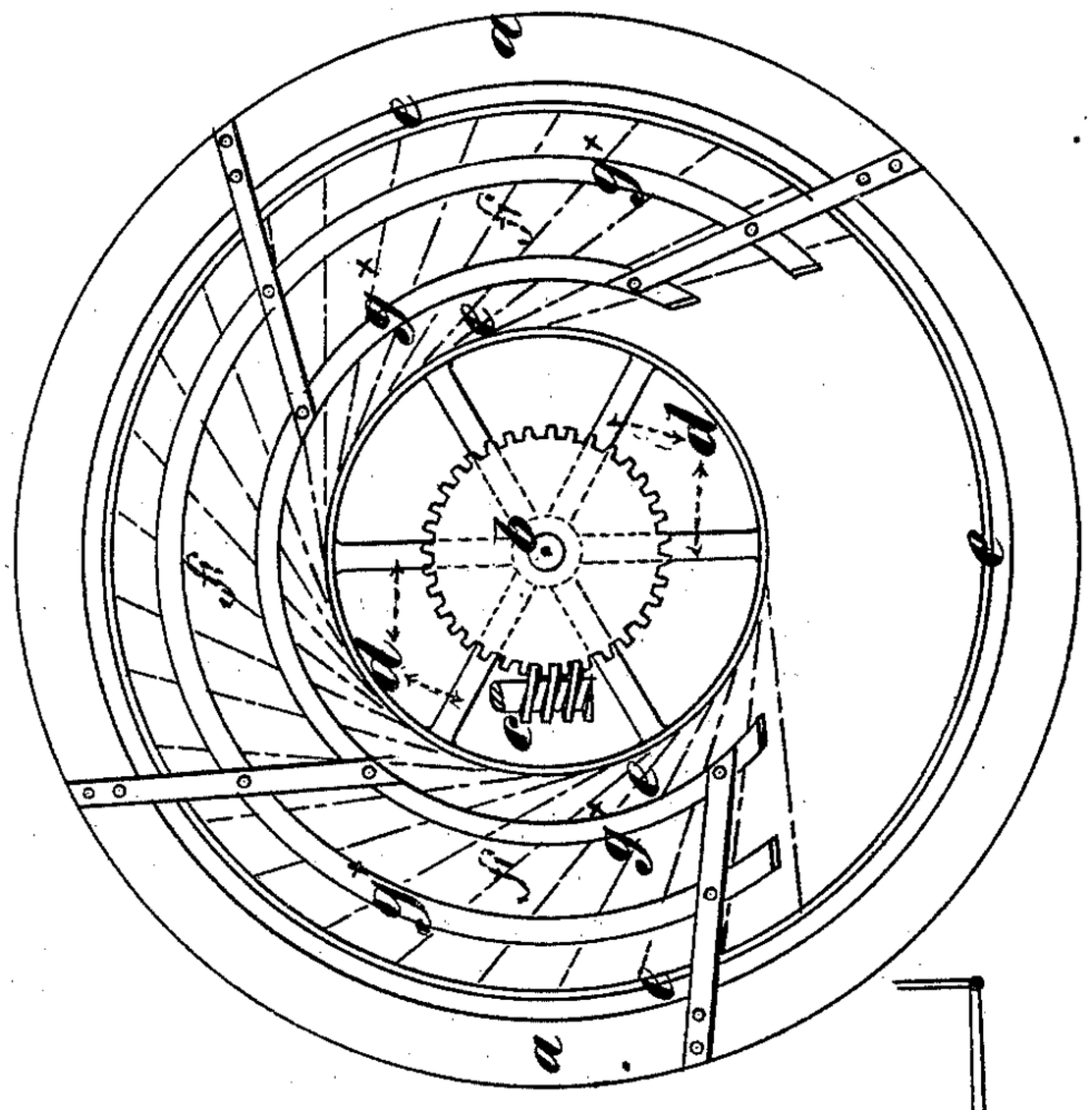


FIG. 3.

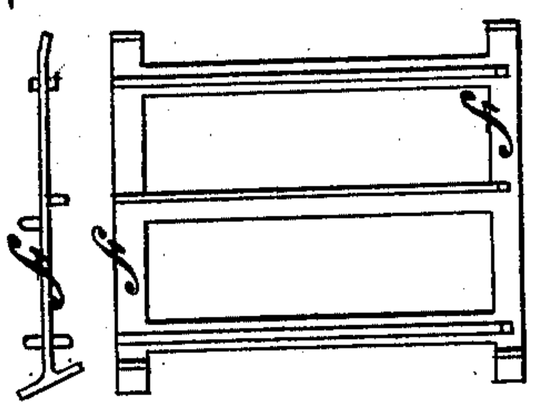
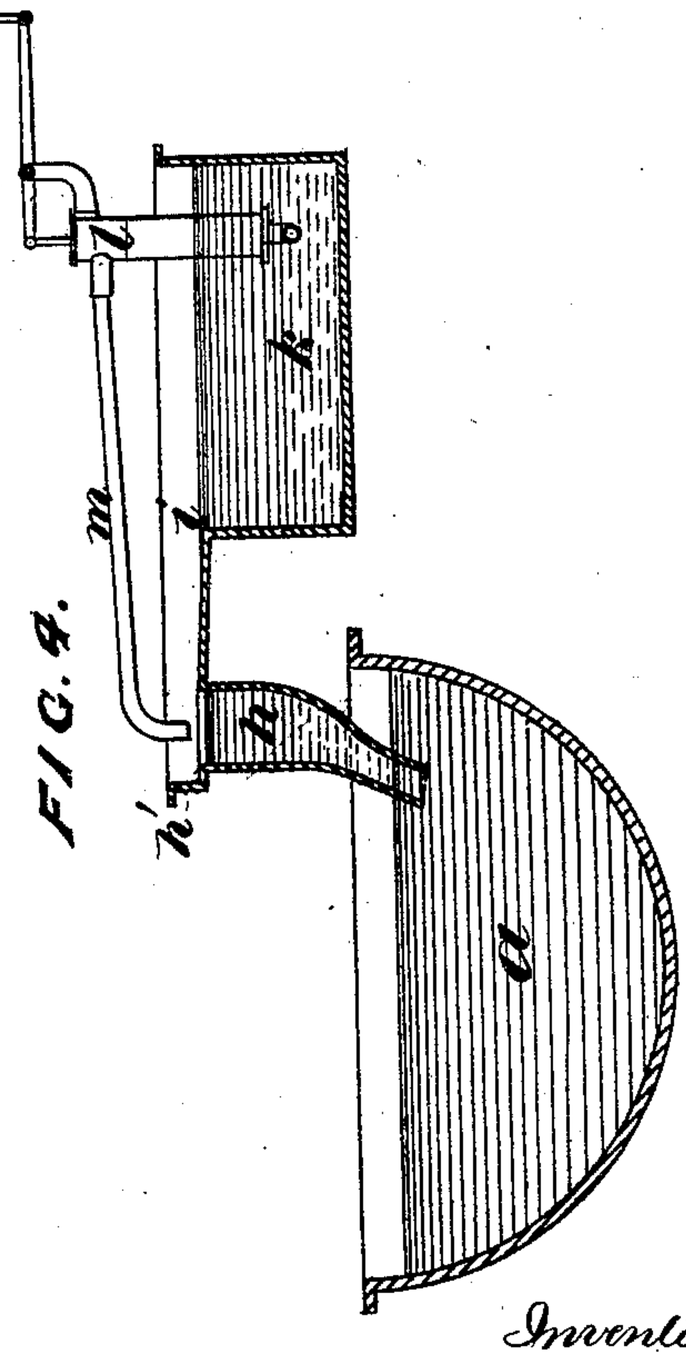


FIG. 2.

FIG. 4.



Witnesses

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EDMUND MOREWOOD, OF LLANELLY, GREAT BRITAIN.

IMPROVEMENT IN THE MANUFACTURE OF TIN AND OTHER METAL-COATED PLATES.

Specification forming part of Letters Patent No. **176,032**, dated April 11, 1876; application filed January 21, 1876.

To all whom it may concern:

Be it known that I, EDMUND MOREWOOD, of Llanelly, in the county of Carmarthen, Great Britain, formerly of Rock Cottage, Britton Ferry, in the county of Glamorgan, have invented certain Improvements in the Manufacture of Tin and other Coated Plates, of which the following is a specification:

Hitherto, in the process of coating sheets or plates of iron with tin or terne metal, it has been customary to immerse several together in the first tinning or coating pot, and, in consequence, those parts of the iron plates which are fully exposed to the action of the melted coating-metal are longer in contact with it than is necessary or desirable, and other parts, which press more or less against the surfaces of other plates, have only just, or perhaps scarcely, sufficient time to acquire their coating. Therefore I find it advantageous to cause every part of the surface of plates undergoing the process of coating to be in contact with the coating-metal while acquiring their coating. In order to accomplish this, and to give every part of the surface of each plate as short a length of time under the coating-metal as is consistent with giving them a sound coating, I arrange the framing in a round pot, so that each plate shall fall into its separate and allotted space or division, which travels so that each plate is carried round to the exit side of the bath, and contact with any other plate or surface is as much as possible avoided. Further, by this means any flux or foreign matter has the opportunity of rising from the surface of the plate to the top of the melted metal. When oil, grease, or fatty matter is used as a flux on the surface of melted coating-metal, the introduction of damp or wet sheets or plates of iron through it into the melted coating-metal causes it to boil up, and the oil, grease, or fatty matter becomes for some time afterward open and spongy, and in this state it does not sufficiently or suitably take hold of and act upon the surface of the iron plate, so as to fit it for readily and properly taking or receiving the coating when the plate or sheet of iron becomes immersed in the melted coating-metal; and one of my improvements consists in so arranging the apparatus, machinery, or pots for coating iron with other melted metal that I am enabled to pass damp or wet plates or sheets to be coated through a flux of oil, grease, or fatty matter into the melted coating-metal while still maintaining sufficiently non-porous greasy or oily or fatty matter on the surface of the melted metal at the point at which the plates enter into the coating-metal. This I do by keeping up a circulation of the grease by drawing off continually the grease which has become frothy or porous, and introducing more solid non-porous grease. The frothy or porous grease is allowed to stand for a short time, and is then fit to return to the surface of the coating-metal. I immerse the plates so that they may lie or travel singly or a few together under the coating-metal, and be removed in rotation out of the melted coating-metal, in order that each plate may be immersed a shorter and more equal length of time in the melted coating-metal than in the old way; and I so arrange the said machinery, apparatus, or pots as to enable the oil, grease, or fatty matter to recover sufficiently from the open, spongy state into which it is thrown by the wet plates or sheets of iron being passed into it, so that the metal-pot may be fed with a regular and steady succession of damp plates or sheets, and the oil or fatty matter on its surface kept in suitable condition, or the damp plates may receive their coating of grease in a first separate grease-pot made in partitions, so that the plates may be introduced and removed in succession, and kept as far as possible from contact with other plates or surfaces while under the grease.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Figure 1 is a plan, and Fig. 2 is a transverse section, of a first tinning or coating-metal pot with its apparatus arranged according to my invention.

a is an annular pot. It is set in brick-work and heated by a furnace. *b* is a vertical axis, with a worm-wheel upon it, driven by a worm on an axis, *c*. *d d* are arms on the axis *b*, supporting a circular frame, consisting of two sheet-iron cylinders, *e e*, to which are fixed a number of inclined partitions, *f f*. One of

these partitions is shown separately at Figs. 3. I prefer to make them in cast-iron. The hoops *g g* are fixed to the bottom edges of the partitions for the plate to rest upon. In this way an open frame is constructed, passing all around the pot, and divided over its entire circumference into cells, each suitable to receive a single plate. More than one plate may be put in a cell; but it is not desirable to do so, for by arranging the apparatus as shown and described accommodation is provided for a sufficient number of plates in the pot at one time. While the plates are kept entirely out of contact the one with the other, and are supported only at a few points by the ridges of the partitions. $g^{\times}$ $g^{\times}$ are fixed bars, which are used when coating with terne metal, to prevent the plates floating to the surface of the metal.

The axis *b* is driven at a speed of twelve revolutions in the hour, more or less, depending on the surface and gage of the iron plates in process of coating, a thin plate, as a rule, requiring less time in the coating-metal than a thicker one. Cone-pulleys may advantageously be provided for regulating the speed, so that the plates may be kept in the pot a suitable time for obtaining a complete coating. The time is best adjusted from observation of the process, as it varies with the heat of the metal and the surface and thickness of the plate in process of coating.

Instead of machinery revolving, as here shown, horizontally, it is obvious that other machinery, revolving in other directions, such as vertically, may be employed, the same objects being kept in view—viz., that the pot is supplied with a regular and steady supply of wet plates by a revolving frame or wheel, which delivers the plate on one side, and, after keeping it a regulated time under the melted metal, brings it over to the other side. I work with the melted coating-metal in this pot at about or slightly over the usual heat of the ordinary washman's pot. The sheets, wet as they come from washing after pickling, (or it may be, in some cases, from a preparatory process of deposition of metal upon them from a solution, as is well understood,) are introduced into the metal through a flux. Chloride of zinc may be used as a flux, if care is taken to prevent any trace of it remaining on the surface of the plate after it is removed from the coating-metal. At the taking-out point, the plates are removed with tongs, and the workman takes care to keep the surface of the metal free from the chloride-of-zinc flux at this point. This care, however, is comparatively unnecessary when grease, or oily or fatty matter, is used as the flux. When I use grease, or oily or fatty matter, as a flux on the surface of the coating-metal, it is contained in a flux-box, as shown at Fig. 4, fixed to the first coating or tinning pot. This flux-box *h* is of a length to allow the plates to pass down readily through it, and I make it about fifteen inches wide, if I am coating plates twenty by fourteen inches in size. The flux-box is open at the bottom, and dips down into the molten metal in the pot. Its depth is such as to maintain about six inches of grease over the coating-metal. There are guides within the flux-box, to direct the plates as they are passed down through the grease into the cells of the rotating frame beneath, if cells are used in the first tinning or coating pot, as already described; and index-points are also, in this case, provided on this frame, to indicate to the workmen the arrival of each cell into position to receive a plate. Around the top of the flux-box is a horizontal ledge, *h'*, some inches wide, to give room for the froth forming on the grease to flow freely away. There is a rim around the ledge, except at one end or side of the flux-box, where a lip or outlet-pipe, *i*, is formed, for the froth to flow or pass away and escape through into a cistern or other vessel, *k*. This vessel *k* may be about four times the capacity of the flux-box, with its froth-chamber. It contains a pump, *l*, which is driven continually by power. This pump draws the grease from the lower part of the cistern, and returns it to the flux-box by a pipe, *m*, passing along it just over the surface of the grease which it contains. The quantity of grease raised from the cistern by the pump is capable of regulation, so that it may keep up such a supply of suitable and sufficiently-solid grease in the flux-box as is desirable, while the outflow lip or channel of the flux-box carries away the froth as it is formed in the cistern, thus constantly recovering and righting the grease in the flux-box without unduly cooling it. Occasionally I add a little fresh grease to that in the cistern, to make up for loss and waste.

In place of the froth being merely allowed to flow away through a lip or outlet-pipe, as above described, it may be drawn or carried away, as it is formed, by a revolving endless band with blades or buckets upon it, or by a revolving screw above the lip; or other suitable arrangements may be adopted for constantly removing the froth and discharging it into a convenient receiver, and the froth, as it becomes sufficiently solid or righted, may be continuously pumped or otherwise mechanically passed back into the flux-box, and a supply of suitable and sufficiently-solid grease in the flux-box thus kept up. When the grease is used in this manner, the passage of the sheets to be coated through sufficiently-solid, or rather homogeneous, grease into the molten metal is insured, and the grease will be found to act upon the surface of the plates passing through it, so as to cause the coating-metal to take very freely to the plates.

When terne metal is employed, the coating is not quite so readily effected as with tin, and the coating is facilitated, especially in this case, by passing tne plates into a separate grease-pot before introducing them into the first metal-pot. The plates are introduced into the grease through a box corresponding

with the flux-box, already described, and similarly provided with an overflow or outlet. The overflow or outlet to carry off the froth is, in this case, on a level with, or, by preference, slightly below, the grease in the pot, so that the froth may freely pass out, and the froth is received into a cistern to recover itself, as already described, and returned to the pot by a pump. The heat of the grease in this pot is that of the grease in the first grease-pot, in the ordinary mode of tinning. The plates, as they are taken out of this pot and passed into the flux-box of the first metal-pot, will carry over with them some of the grease, and to compensate for this the pump in the receiving-cistern is caused to return some or all of the grease which flows out of this flux-box into the preparatory grease-box.

The plates, as they are taken out of the first metal-pot, may be finished by brushing and dipping them, and passing them through rollers revolving in grease, or by other well-known process.

Having thus described the nature of my invention and the manner of performing the same, I would have it understood that what I claim as my improvements in the manufacture of tin and terne plates is—

1. The annular pot *a*, vertical axis *b*, arms *d*, and cylinders *e e*, in combination with the partitions *f* and fixed bars $g^{\times}$ $g^{\times}$, substantially as and for the purposes set forth.

2. The settling-vessel *k*, in combination with mechanical means for returning, or withdrawing and returning, the flux to the flux-box, all substantially as and for the purpose set forth.

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Witnesses:

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