(No Model.)

M. G. FARMER.

APPARATUS FOR REFINING COPPER BY ELECTRICITY.

No. 322,169. Patented July 14, 1885.

Fig. 1.

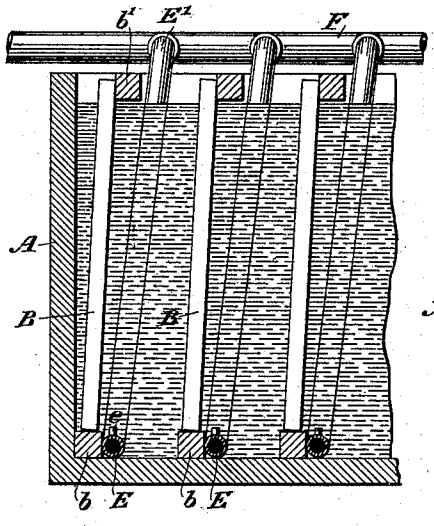


Fig. 2.

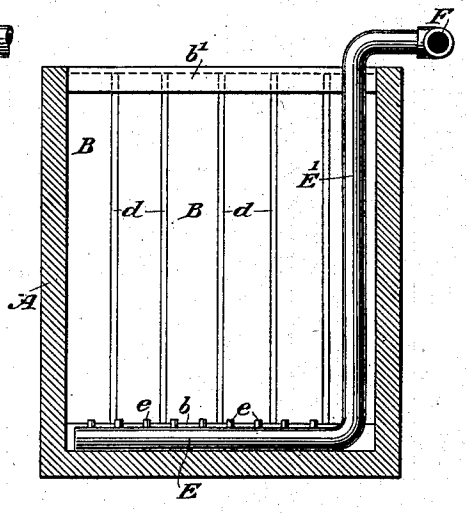


Fig. 3.

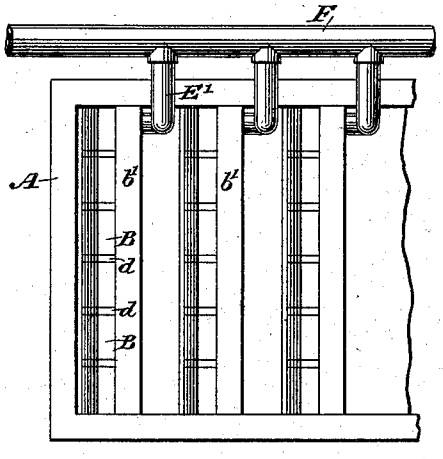


Fig. 4.

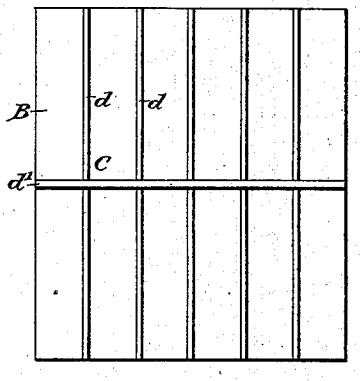
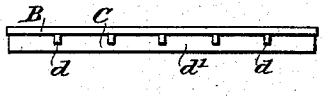


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR REFINING COPPER BY ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 322,169, dated July 14, 1885.

Application filed April 18, 1885. (No model.)

To all whom it may concern:

Be it known that I, MOSES G. FARMER, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Apparatus for Refining Copper by Electricity, of which the following is a specification.

The invention relates to the class of apparatus employed for refining copper by electro-deposition. It has been customary to place copper in an impure state into electrolyzing-vats, and to remove it from the anode of impure copper and deposit it in a pure state by the action of electric currents.

The object of the present invention is to provide means for dividing the deposited copper into ingots or blocks of convenient size for handling while it is being deposited.

The invention consists in placing against the surface upon which the deposit is to be made a series of slats or laths of non-conducting material, or else a reticulated frame. The deposit is made between these slats, and the gradual building up of the plates embeds the same between the blocks of pure copper. The plates, preferably, incline somewhat toward the cathode end of the series, and each plate preferably constitutes both a cathode and an anode. The copper is taken up from the anode side and as rapidly deposited upon the cathode side of the succeeding plate. When the copper has thus been refined the plates with the contained laths or bars are removed from the vat, and they are readily separated into the blocks or ingots determined by the positions of the laths or bars.

In the accompanying drawings, Figure 1 is a section of a portion of a vat involving the features of the invention. Fig. 2 is an end view of the same, showing the vat in section. Fig. 3 is a plan view of the vat; and Figs. 4 and 5 illustrate an arrangement of slats.

Referring to the figures, A represents a vat of any suitable form and construction, adapted to receive plates B of the metal which it is designed to refine. Across the bottom of the vat there extend bars *b*, of non-conducting material—such, for instance, as wood. A similar series of bars, *b'*, is placed at the top of the vat. The bars *b'* are not directly above the bars *b*, but are preferably at one side of the same, as shown in the drawings. It is designed each plate B shall rest upon a bar *b* and bear against a corresponding bar, *b'*, at its upper end. A slight incline is thus given to each plate. It is designed that an electrolyte consisting of some solution of copper salts shall be placed in the vats and surround the plates. The vat is then connected in an electric circuit in such manner that the upper surfaces of the plates shall be the cathode surfaces and the under surfaces the anode surfaces. Pure copper is then taken up from the anode surfaces and deposited upon the cathode surfaces, while the impurities fall to the bottom of the vat between the bars *b*. In this manner the plates are converted from an impure to a refined metal.

For the purpose of obtaining the refined copper in a convenient shape and size for handling, a reticulated frame-work of slats or lattice C is placed against the cathode surface of each plate B when they are first placed in the cells. The deposit is then made upon the exposed portions of the cathode surfaces between the slats or bars of the frame. The plate is thus gradually built up on the cathode side, embedding the bars of the frame, and meanwhile the anode surface is gradually eaten away. When the plates have been thus entirely converted they may be removed from the vat and readily separated into the divisions formed by the frame.

In Figs. 4 and 5 a convenient form of slat-frame is illustrated. This consists of a series of vertical bars, *d*, held in position by a transverse bar, *d'*. It is evident, however, that the number and arrangement of the slats or bars may be varied as desired—for instance, they may be separate laths as shown in Fig. 2. They are preferably of wood or other equivalent material which will not be affected by acid.

The impurities which might otherwise adhere to the anode surfaces of the plates are removed by currents of air or steam forced through perforated pipes E, which are made of non-conducting material. One of these pipes is placed at the base of each plate in such position that air forced therethrough will escape against the anode surface thereof. These

pipes have upwardly-projecting jets or openings *e*, and they are connected by vertical extensions E′ with a common supply-pipe, F, which is provided with any suitable means for supplying air, or, if it is desired, steam under pressure. The currents of air thus wash off the anode surfaces of the plates and create a circulation of the fluid, which removes the free acid which might collect upon the cathode surfaces, carrying it over to the anode surfaces.

In another application of even date the system of pipes is described and claimed.

I claim as my invention—

1. In an apparatus for refining metal by electrolysis, the combination, substantially as hereinbefore set forth, of an electrolytic vat, and one or more slats of non-conducting material within the vat and lying against the cathode surfaces, substantially as described.

2. In an apparatus for refining copper by electrolysis, the combination, substantially as hereinbefore set forth, of an electrolytic vat, and a reticulated frame of wooden or equivalent bars or slats within the vat adapted to rest against the cathode surface of each plate.

3. In an apparatus for refining copper by electrolysis, the combination, substantially as hereinbefore set forth, of an electrolytic vat, a reticulated frame of laths or slats of non-conducting material, and means for holding the same in an inclined position against the cathode surfaces.

4. In a vat for refining copper by electricity, the combination, substantially as hereinbefore set forth, of a series of bars at the bottom of the vat, for supporting the plates, and a corresponding series of bars at the top of the vat respectively located out of the vertical planes of the first-named bars, against which the plates may lean in inclined positions, substantially as described.

In testimony whereof I have hereunto subscribed my name this 16th day of April, A. D. 1885.

MOSES G. FARMER.

Witnesses:
WILLIAM B. HEATHERTON,
A. BOURNE.