No. 683,263. Patented Sept. 24, 1901.

E. G. ELLIOTT & V. KISHNER.

ELECTROLYTIC PRODUCTION OF CATHODE PLATES.

(Application filed Dec. 29, 1900.)

(No Model.)

Fig. 1,

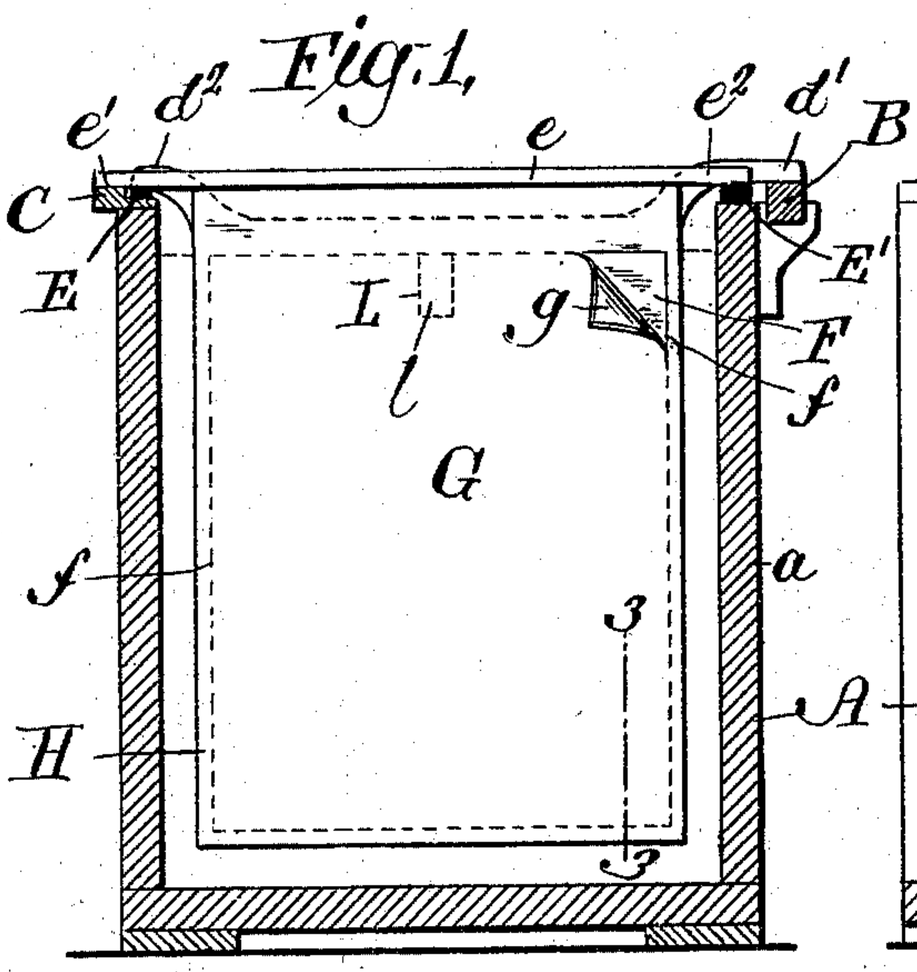


Fig. 2,

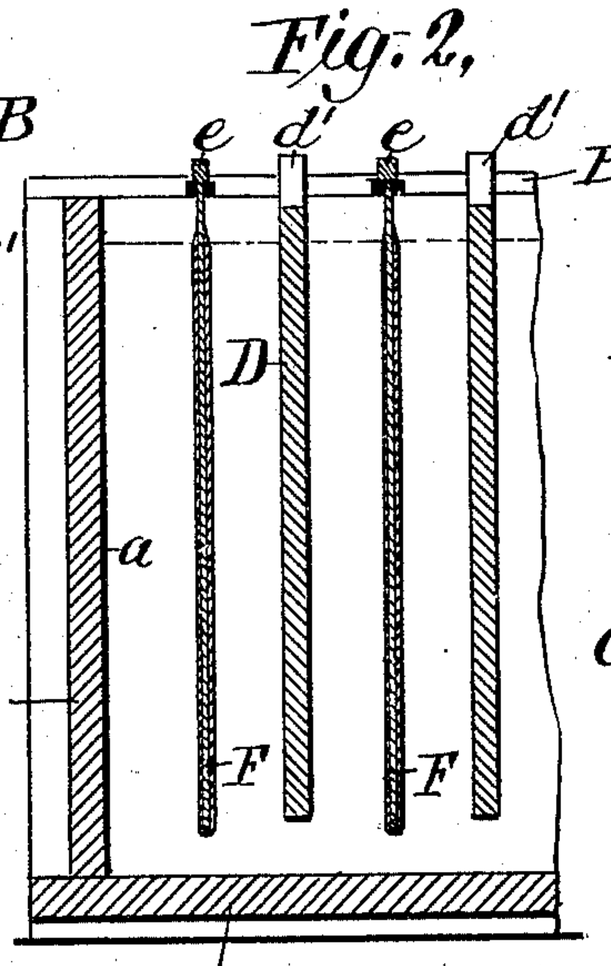


Fig. 3,

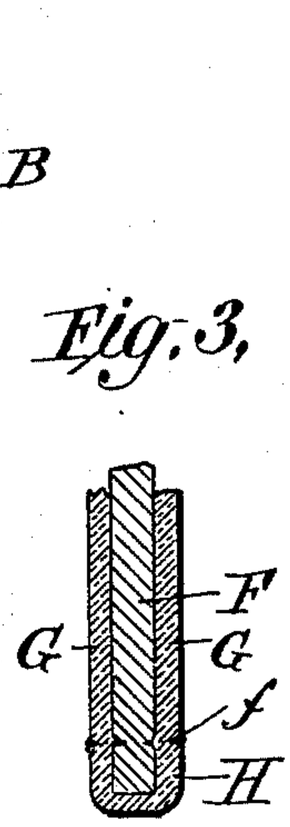


Fig. 4,

Fig. 5,

Fig. 6,

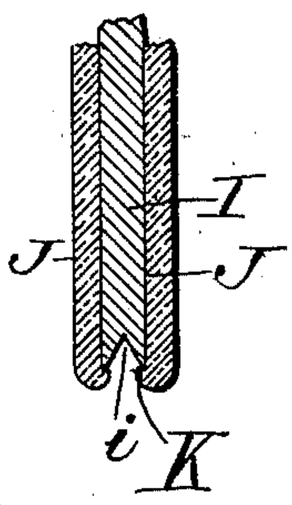


Fig. 8,

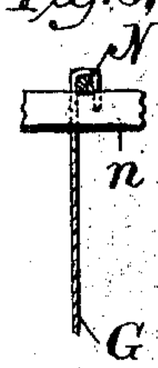
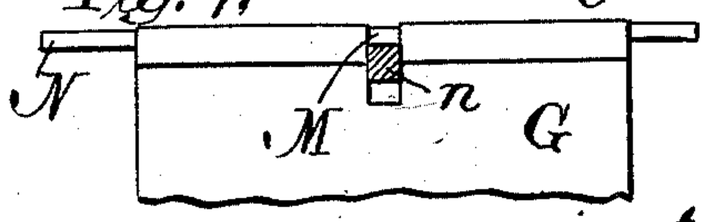


Fig. 7,



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ELECTROLYTIC PRODUCTION OF CATHODE-PLATES.

SPECIFICATION forming part of Letters Patent No. 683,263, dated September 24, 1901.

Application filed December 29, 1900. Serial No. 41,442. (No model.)

To all whom it may concern:

Be it known that we, ELMER G. ELLIOTT and VALENTINE KISHNER, citizens of the United States of America, and residents of Perth Amboy, county of Middlesex, State of New Jersey, (our post-office address being Perth Amboy, Middlesex county, New Jersey,) have invented certain new and useful Improvements in the Electrolytic Production of Cathode-Plates, of which the following is a specification.

Our invention relates to the production of thin metallic sheets by electrodeposition.

The sheets produced according to our invention and discovery may be used for any available purpose; but we will describe them as employed for the bases or starter-sheets which form the foundation for the cathodes in an electrodeposition-tank. It is desirable that the entire cathode-plate be of metal of the same character and purity, so that these plates are usually formed by electrodeposition, the improvements in the art of producing them constituting our invention. Ordinarily the starter-sheets are formed by electrodeposition upon a lead plate, which said plate has been treated with a thin coating of oil and plumbago in order to prevent too close adhesion, and the said lead plate has been provided with a narrow frame or binding composed of strips of wood or other suitable insulating material secured about its edges and placed there for the purpose of stiffening the thin and otherwise easily-distorted lead plate usually employed and also to prevent the copper deposit from extending around the edges of the lead plate and uniting the deposit on both sides thereof, so that two sheets of deposited copper, one on each side of the lead plate, would be separated by the wooden strips and could therefore be easily stripped—that is, removed from the plate upon which they were formed. According to our invention the application of wooden strips to the lead plates, which is both costly and cumbersome, is dispensed with and means provided whereby the copper is deposited over the entire surface and edges of the lead plate, and that nevertheless the starter-sheets can be stripped off therefrom and without disturbing the metal deposit around the edges of the lead plate, which is retained to form a strengthening binding or frame therefor. Copper base-plates are also used upon which to deposit the starter-sheets, and in this instance also the said base-plates are provided, according to our invention and discovery, with means whereby the said deposited sheets can be readily stripped therefrom without it being necessary to previously provide the parts or supporting-plate with strips or other similar means to accomplish this end, as will hereinafter more fully appear in connection with the accompanying drawings, in which—

Figure 1 is a transverse sectional view of an electrolytic tank, showing in elevation a lead cathode-plate with deposit. Fig. 2 is a longitudinal sectional elevation of a portion of an electrolytic tank, showing anode and cathode plates therein. Fig. 3 is an enlarged sectional detail on the line 3 3 of Fig. 1, showing part of the edge of a lead cathode-plate and deposited sheets in place. Fig. 4 is a transverse sectional view of an electrolytic tank, a copper cathode-sheet appearing therein in elevation. Fig. 5 is a longitudinal sectional elevation of an electrolytic tank, showing anode and cathode plates therein, the cathode-plates being of copper. Fig. 6 is an enlarged detail on the line 6 6 of Fig. 4, illustrating the formation of the base where copper is substituted for lead. Fig. 7 is a detail showing a starter-sheet formed with an opening to receive hoisting devices. Fig. 8 is an edge view of sheet and supporting-bar shown in Fig. 7.

A indicates an electrolytic tank of any convenient size and construction. The sides of the tank A are indicated at *a* and the bottom at *b*. The metallic bus-bar B is arranged on one side of the tank and the negative or return conductor C is attached upon the opposite side thereof. The anode-plates D may be and are indicated as heavy copper castings, from which the pure metal is deposited upon the cathode. The anodes D are provided with lugs d' d^2, by which they are suspended in the tank A, one lug d' resting upon and being in metallic contact with the bus-bar B, supplying current to the anode. The

exit of current therefrom by the opposite lug is prevented by the interposition between said lug and the negative or return conductor C of a layer of insulating material E. The cathode-plate is in the form of a thin sheet of lead F, Fig. 3, or copper I, Fig. 6; but in either event it is secured to a metallic bar *e*, one end of which *e'* rests upon and is in metallic contact with the return-conductor C, its other end e^2 being sustained upon the opposite edge of the tank and insulated therefrom by a layer of insulating material E'. The supply-current enters the anode-plate from the bus-bar through its lug *d'* and passes upon the said plate through the electrolyte, the solution with which the tank is filled, to the adjoining cathode-plate, from which it passes to the negative conductor C and back to the source. The desired metal, copper being herein referred to by way of illustration, is then deposited upon the cathode-plate in the ordinary and well-known way, and the deposition is continued until the desired thickness is reached, which for the purpose of starter-sheets for the cathode-plates that are subsequently melted down for commercial purposes is ordinarily about one thirty-second of an inch in thickness; but this is determined by the weight of deposit which the said plates are required to sustain in the final-deposition tanks. Furthermore, the starter-plates are made sufficiently large to allow of their upper edges being folded over or otherwise connected with the supporting cross-bars in an electrolytic tank. (See Figs. 7 and 8.) The lead plates F are formed with a small groove *f*, extending around their sides and bottom and above the solution-line and a short distance inward from the said edges. The groove *f* should not extend through the plate F and is quite small, being in the nature of a scratch made with a knife or other pointed instrument and hereinafter referred to as a "scratch-groove." We have found that when a lead or copper plate is so provided with scratch-grooves that although the electrolytic deposit appears to be continuous in point of fact it is not so along the lines of the grooves except to a very limited extent, and we find, further, that after a lead plate has received a deposit of the desired thickness—for instance, one thirty-second of an inch of pure copper—that after raising a corner *g* of the deposit-sheet G, as with the blade of a knife, it can be stripped and removed from the lead plate F with the greatest ease, the edges of the sheet G separating readily from the frame of deposited metal H, which extends from the groove to the edge of the plate, around said edge, and to the groove on the opposite side, as is more distinctly seen in Fig. 3. The deposited frame or binding H is allowed to remain upon the lead plate to strengthen and stiffen it until it grows to a thickness which is cumbersome and inconvenient, when it is broken off from said plate and allowed to begin its growth again.

It has been customary to prepare the lead base-plates for the reception of the deposited starter-sheets or sheets of copper by applying a thin coating of machine-oil or other convenient oleomargarous matter for the purpose of partially insulating the said plates, and thereby preventing the deposit from adhering too closely thereto. We find, however, that our invention is not limited to the use of any material of this kind and that copper can be deposited directly upon a lead plate which is ordinarily clean and that even when the same is provided with scratch-grooves which are entirely fresh and quite clean that the line of separation is as well defined and available as though said grooves had previously been coated with oil. Copper plates can be used as cathode-bases for the formation of starter-sheets, as is illustrated in Figs. 4, 5, and 6, in which I is the copper cathode-base and J is the starter-sheet deposited thereon, which is partially removed at its upper corner *j*. Where a copper sheet is used, the stiffening binding or frame is dispened with and a detaching scratch-groove *i* is formed in the edge of the plate, as is more clearly shown on enlarged scale in Fig. 6, in which I is the sheet of copper. J J are the starter-sheets which have been deposited thereon, and *i* is a scratch-groove similar to the grooves *f*, but in this instance is formed in the edge of and extending around the plate I. The edges of the plates J come so close together as to present the outward appearance of being in contact. As seen in Fig. 6, their separation is exaggerated in order to show the bur K and groove *i*, which could not be well shown in the other figures; but they seem to be so granular that actual metallic union does not form across the scratch-groove *i*, so that the plates J can be stripped off from the base E as readily as in the case of the plates G from the bases F. Upon one side of the edges of the plates J there is a slight roughness or bur K, produced by the overlapping of the deposit into the groove *i*. This slight bur K can be flattened by rolling or otherwise, if desired; but in the use of these electrodeposited sheets of metal as starter-sheets for the cathodes of an electrodeposition-tank the product of which is to be melted for commercial use it is of no importance whatever, and the said sheets are used in the condition in which they are removed from the base-plates upon which they are formed.

Under some circumstances it is convenient and desirable to have an opening or slot in the upper part of each of the cathode-plates contained in the tank, so that they could be engaged by a hook for the purpose of removing them from the tank or so that a bar could be run through all or any desired portion of the cathode-plates in a tank, said bar to be connected to a hoisting apparatus—

as, for instance, a traveling overhead crane—for lifting and transporting them. This is provided for by the auxiliary scratch-groove L, which is similar to groove *f* and is indicated in dotted lines in Figs. 1 and 4 in the base-plate at about the center of the plate and near to the solution-line or extending from the solution-line downward a short distance, so that when the sheet which is subsequently to form the base for the cathode is stripped from its base a notch or opening M will be formed at about the middle of its upper edge, as indicated in Fig. 7, or the opening may be a little below the upper edge, if preferred.

When the starter-sheets G and J are applied as bases for deposited cathode-plates, their upper edges are bent or folded over a metal bar N, as indicated in Figs. 7 and 8, the said bar serving to sustain the said sheets and their deposited accumulations and also to form part of the circuit supplying the electric current thereto, as in the case of the bar *e*, Figs. 1 and 4.

The notch M in the upper part of the starter-sheet should be of such depth that when the top edge of said sheet is folded over the bar N an opening will be left in the sheet below the lower side of said bar to admit of the insertion of the hoisting hook or bar *n*. The small piece *l* of the starter-sheet corresponding to the opening may remain on the base-plate when the sheet is removed and is then separately stripped off, or it may adhere to the sheet when detached, in which event it can readily be separated therefrom or bent over to one side, so as to leave the desired opening.

We claim the invention herein set forth broadly. Various minor modifications and changes may, however, be made by those skilled in the art to which it relates without departing therefrom.

Having described our invention, what we claim is—

1. A metallic cathode-plate for receiving removable sheet-metal deposits upon its immersed surface and formed with one or more scratch-grooves therein whereby the deposited coating is rendered separable along said grooves.

2. A metallic cathode for receiving removable sheet-metal deposits upon both its sides throughout its immersed surface said plate being partially immersed in an electrolytic solution from which metal may be deposited from a suitable anode and formed with a scratch-groove upon its exterior, whereby the metal electrodeposited upon said cathode while covering its immersed surface is rendered separable along the line of the groove during deposit.

3. An electrodeposited starter sheet or base for a cathode element formed with a detachable portion adjacent to the central part of its top edge.

4. A cathode-plate of soft metal provided with an electrodeposited metal frame or binding extending continuously about its immersed edges together with a sheet or coating substantially continuous therewith upon the surface of the plate, and means for rendering the deposited sheet or coating separable along the inner edges of the binding.

Signed by us at Perth Amboy, New Jersey, this 27th day of December, 1900.

ELMER G. ELLIOTT.
VALENTINE KISHNER.

Witnesses:
HENRY MCCULLOUGH,
GEO. L. TICE.