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APPARATUS FOR ELECTROLYTICALLY REFINING PRECIOUS METALS

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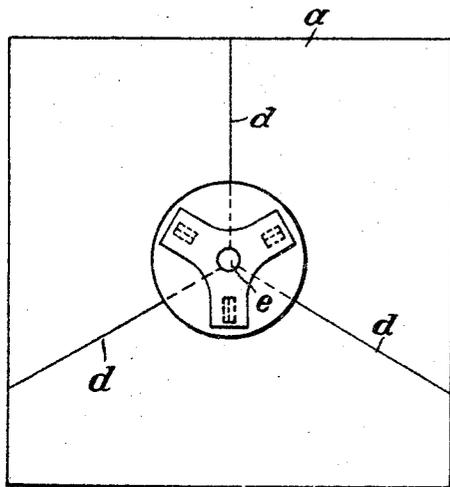
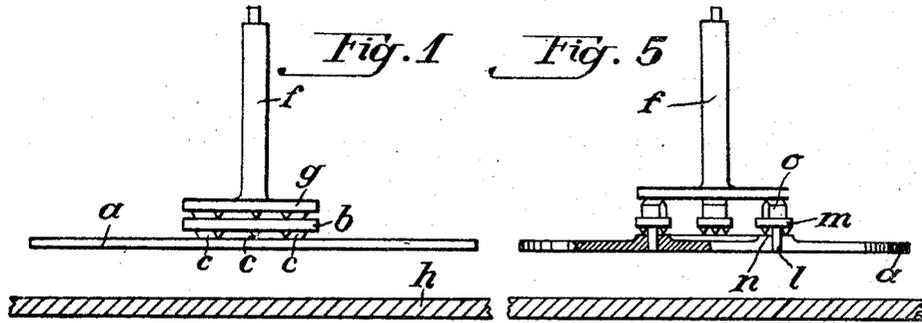


Fig. 2

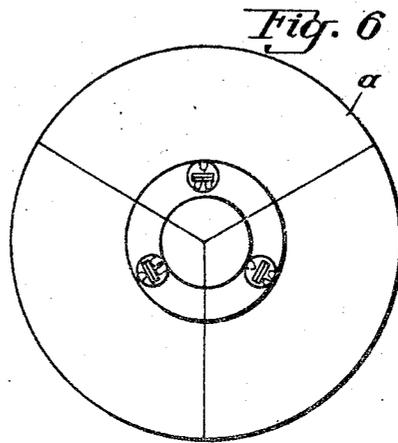


Fig. 3

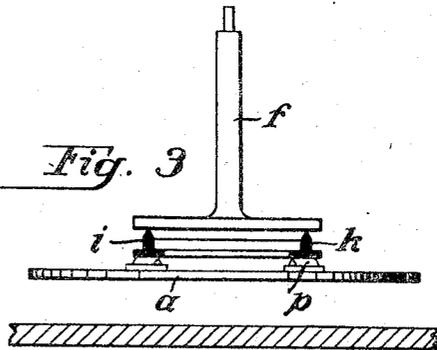


Fig. 7

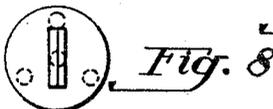
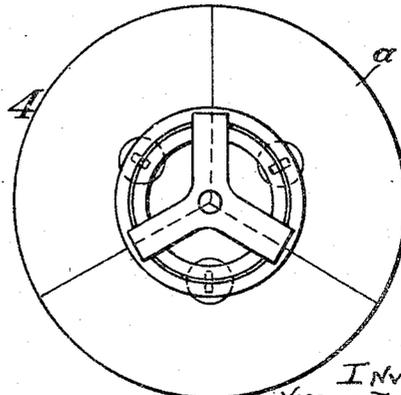


Fig. 8

Fig. 4



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UNITED STATES PATENT OFFICE

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APPARATUS FOR ELECTROLYTICALLY REFINING PRECIOUS METALS

Application filed May 3, 1929, Serial No. 360,072, and in Germany May 14, 1928.

Our invention relates to improvements in apparatus for electrolytically refining precious metals, more particularly silver with a contact pillar or post for leading the electric current to the anode plates.

Besides the Möbius process working with vertical anodes the Balbach-Thum process is generally employed for electrolytically refining silver. In the latter process (see United States patent to Balbach No. 588,524) the anodes are located horizontally in a box or vat with a perforated bottom constructed of wood, for instance. Between the anode plates and the bottom of the box there is inserted a filter cloth. While the process is being carried on the silver of the anodes which has passed into solution is deposited on the cathode, usually consisting of graphite, located below the bottom of the box in the electrolyzer proper whence it is removed periodically. In this process well known in the art the current is generally supplied to the anode plates by placing on these plates one or a plurality of contact pillars, posts or rods, which consist of the raw silver to be refined or of fine silver.

A disadvantage of this process lies in the fact that the current is rather unequally distributed over the individual anode plates. The stock of silver required for carrying out this process is, furthermore, bound to be very considerable, since the contact pillar as well as any intermediate member placed between it and the anode plates must consist of raw or fine silver and are thus exposed to the danger of becoming likewise dissolved during the process.

In the process described by Möbius, United States Patent No. 532,209, the material to be refined is placed upon plates formed as diaphragms. Metallic contact arms which at one end engage a current conductor rail and at their other ends rest on the material to be treated serve to lead the current to the electrolytic bath. As these contact arms are permanently positioned at the electrolyzing vessel and cannot be removed therefrom, they are frequently in the way of the operator. They also suffer from the disadvantage that they do not always make good contact with

the anodes. As the contact arms rigidly engage the current conductor rail, it often happens that an arm remains suspended in its original position even after the metal below it has been dissolved away by electrolytic action, so that contact between the arm and the mass of metal remains broken. A metallic arm can remain so suspended particularly when the surface of the conductor rails has become rough, which can scarcely be avoided in chemical operations.

The object of our invention is to eliminate these drawbacks. According to our invention the contact pillar or post is constructed of a non-precious metal and between it and the anode plates consisting of the precious metal to be refined one or a plurality of intermediate members is or are placed in such a manner that the passage of the current to the individual anode plates takes place uniformly. The anode plates may, furthermore, be cast in the form of sectors and be so arranged in relation to one another that their contacting edges extend radially from a center in the manner of the rays of a star. A contact pillar or post consisting of copper, for instance, and the intermediate members are then arranged in such a manner, that they are supported upon the three anode plates at three points or places designed as spikes or knife edges, one for each anode plate. As intermediate member a disc, dish or ring may be employed, or separate intermediate members in the form of short pillars may be provided for this purpose and be fitted into holes or recesses, one in each anode plate.

Various embodiments of our invention are illustrated in the drawings affixed hereto and forming part of our specification. In the drawings.

Fig. 1 illustrates a side elevation, and Fig. 2, a plan of one embodiment; Fig. 3, a side elevation, and Fig. 4, a plan of a modification; Fig. 5, a side elevation, and Fig. 6, a plan of a further modification; Fig. 7, a side elevation of the intermediate members employed in Figs. 5 and 6, and

Fig. 8, a plan of these intermediate members on an enlarged scale.

Like parts are indicated by like letters of reference in the various figures of the drawings.

Referring to Figs. 1 and 2 of the drawings it will be observed that on three sector-like anode plates *a* consisting of the precious metal there is mounted an intermediate member *b* likewise consisting of the precious metal to be refined in such a manner, that it touches with one contact knife edge *c* each of the anode plates *a*.

The contacting edges *d* of the individual anode plates *a* radiate from a center *e* in the manner of the rays of a star. Upon the intermediate member *b* is placed the contact pillar or post *f* designed as tripod, by means of small contact knife edges *g*, preferably in such a manner that the extension of its axis passes through the center *e*. In this arrangement the contact pillar *f* may consist of a less precious metal, such as copper, if the level of the liquid is so chosen, that it is flush with the upper edge of the intermediate member *b*. In this way the stock of silver of such a plant is considerably diminished and a very uniform distribution of the current is attained over the individual anode plates. The cathode located underneath the anode plates *a* is indicated at *h*.

In the modification illustrated in Figs. 3 and 4 a ring *i* is provided as intermediate member. This ring carries on its upper face three contact knife edges *k* and rests with its lower broadened face on three contact knife edges *p* cast or fixed on the anode plates *a*. The anode plates are in this embodiment so arranged that they form a complete circle. The contact pillar or stem *f* consists in this embodiment likewise of a less precious metal, such as copper. The ring *i* may be constructed either of the precious metal to be refined or of a less precious metal coated with a precious metal. For the refining of silver a copper ring may, for instance, first be coated with silver and then with gold. This has the advantage that the ring *i* need be provided once only and that thus the stock of silver of the plant is still further reduced. Instead of this ring a dish or bowl may be provided into which the contact pillar *f* is placed by means of three knife edges.

Referring to Figs. 5 and 6, it will be observed that three separate intermediate pieces *m* are provided in this embodiment of our invention, which by means of pins *l* are inserted into holes provided in each anode plate *a*. These separate intermediate pieces *m* are themselves designed in the manner of small pillars or posts. Besides the pins *l* they carry at their lower faces three contact spikes or contact knife edges by means of which they rest upon projections *n* of the anodes *a*. At the top they are provided with

contact knife edges *o*, which serve as abutments for the pillar or stem *f*. The intermediate pieces *m* are manufactured in substantially the same manner as described with reference to the intermediate members *i* in Figures 3 and 4. If desired, the knife edges *p* in the embodiment shown in Figs. 3 and 4 may be constructed similar to the intermediate pieces *m* of Figs. 5-8. The arrangement according to the Figs. 5 and 6 has the advantage that the points of contact of the intermediate members cannot slide on the anode plates, since the intermediate pieces are firmly held in position by the pins.

It will be readily understood that the anode plates might equally well consist of less or more pieces than the three shown throughout the drawings, for instance of four squares or rectangles, each provided with a projection. Upon these projections would then be placed one or more intermediate members, for instance plates designed in the manner illustrated in Figs. 1 and 2, and upon these the contact pillar or stem constructed as tripod. Such an embodiment of our invention is, however, less favorable as regards the supply of current than the preferred constructions illustrated in the drawings.

Various modifications and changes may be made without departing from the spirit and the scope of the invention, and we desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

We claim as our invention:

1. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a plurality of anode plates located adjacent to each other in a common horizontal plane and adapted to be supported within an electrolytic tank, a contact pillar of base metal for conducting the electric current to said plates, and one or more intermediate members having a surface of noble metal and provided with tapered projections for positioning said members between said contact pillar and said plates in spaced relation thereto.

2. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a central contact pillar of base metal for leading in the electric current, said pillar being in the form of a tripod, three sector-like cast anode plates so disposed that their contacting edges radiate from a central point, and members intermediate said pillar and the anode plates and consisting at least in part of the precious metal to be refined, said members being formed and arranged to rest upon each of said plates at at least one point.

3. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a central contact pillar of base metal for leading in the electric current, said pillar

being in the form of a tripod, three sector-like cast anode plates so disposed that their contacting edges radiate from a central point, a member intermediate said pillar and the anode plates and consisting at least in part of the precious metal to be refined, and a contact member between each of said plates and said intermediate member.

4. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a central contact pillar of base metal for leading in the electric current, said pillar being in the form of a tripod, three sector-like cast anode plates so disposed that their contacting edges radiate from a central point, separate members intermediate said pillar and said anode plates and consisting at least in part of the precious metal to be refined, pins on said members fitting holes in said anode plates, and spikes at the upper as well as at the lower face of said members adapted to establish contact between said anode plates and said contact pillar.

5. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a central contact pillar of base metal for leading in the electric current, said pillar being in the form of a tripod, three sector-like cast anode plates so disposed that their contacting edges radiate from a central point, small pillars intermediate said central contact pillar and the anode plates and consisting at least in part of the precious metal to be refined, pins on said small pillars fitting holes in said anode plates, three projections on the lower face for contacting with the anode plates and a single projection on the upper face of said small pillars for establishing contact with said central contact pillar.

6. In an apparatus for electrolytically refining precious metals, such as silver, in combination, a central contact pillar of base metal for leading in the electric current, and members intermediate said pillar and the anode plates and consisting at least in part of the precious metal to be refined and adapted to distribute the current equally over the individual anode plates, said intermediate members consisting of copper coated first with silver and then with gold.

7. The combination as set forth in claim 3, wherein said intermediate member is in the form of a ring.

In testimony whereof we affix our signatures.

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