No. 857,378. PATENTED JUNE 18, 1907.

A. G. BETTS.

ELECTROLYTICALLY REFINING METALS.

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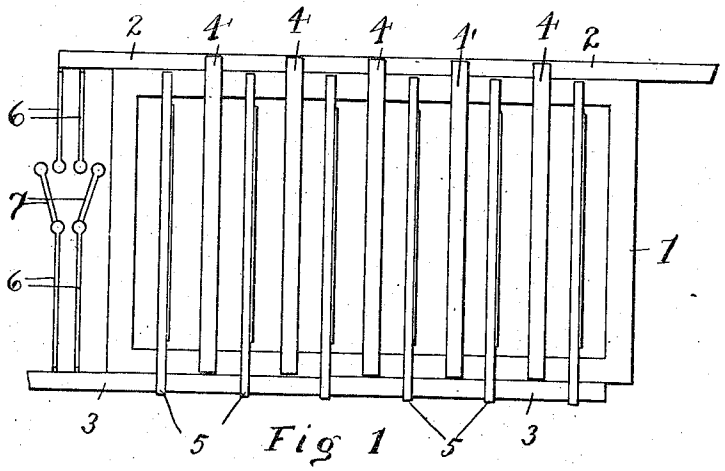


Fig 1

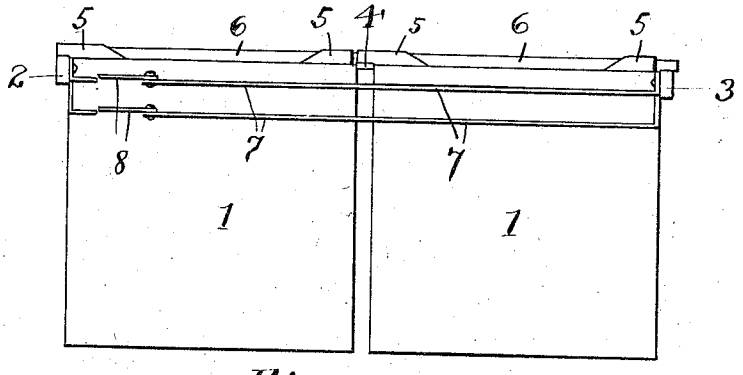


Fig 2

Witnesses

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ELECTROLYTICALLY REFINING METALS.

No. 857,378. Specification of Letters Patent. Patented June 18, 1907.

Application filed February 20, 1905. Serial No. 246,453.

To all whom it may concern:

Be it known that I, ANSON GARDNER BETTS, a citizen of the United States, residing at Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Electrolytically Refining Metals, of which the following is a specification.

Reference may be had to the accompanying drawings, and the reference characters thereon.

Similar characters refer to similar parts in the drawing.

Figure 1 of the drawings is a view in top plan of an electrolytic metal refining tank, arranged for carrying out my invention. Fig. 2 is a view in elevation showing two electrolytic metal refining tanks, arranged for carrying out my invention.

This invention relates to a method of lessening the amount of anode scrap produced in electrolytic metal refining operations.

Certain objects of my invention are to decrease the costs and difficulties in electrolytically refining metals.

In electrolytically refining metals such as copper, to which the anode residue does not ordinarily stick, the anode area in a tank finally becomes reduced while considerable anode copper still remains undissolved, thus increasing the anode current density, and in certain parts of the cathode surface the cathode current density. As the refinery contains a large number of tanks in the same electrical series, it is not desirable to reduce the current passing for the sake of maintaining a proper current density in one or a few tanks to make pure copper, and as a consequence the anodes are removed from the tanks as scrap before they are well used up.

As a preferred means for carrying out my new method I have provided one or more shunts, with a switch for each, to shunt part of the current around any individual tank, or set of a few tanks, when the anode area becomes reduced. The shunts are preferably of such dimensions that when all the shunts provided for one tank or set of tanks are in use, the resistance is about the same as that of the tank or tanks when freshly charged with electrodes. Thus, when the tank is first used, the shunts are disconnected and the current entirely passes through the electrolyte. Toward the last, when the anode area begins to diminish considerably, I connect a shunt in circuit, and when only a small part of the anode surface is left, all the shunts are used, when the electromotive force at the bus-bars is practically the same as it was at first, and the small anode area remaining is undergoing electrolysis at the same rate as on the start. By having two or more parallel shunts in a set I am able to economize in electric energy, so that the full shunt capacity, with its loss of energy, need not be used, when the anode area has been reduced to, say, only one-half the original area. By having half the shunt capacity in use at this time, the electromotive force of the tank or set of tanks is the same as when the tank is charged.

In refining metals, such as lead containing 5% of impurities, the impurities in which remain sticking to the anodes, I secure additional advantages. When refining lead, if the current density, and consequently the electromotive force, become too high, copper, etc., dissolve in the electrolyte, and spoil the cathode lead. Also the anode residue has to be wiped from the scrap produced by the hitherto used process, but I am now able to dissolve the scrap entirely and do away with the wiping process. I need not have shunts arranged for all the tanks in a refinery, and may charge those provided with shunts with anodes already partially dissolved in other tanks.

Having reference to the accompanying drawings, Fig. 1, 1 is a tank, 2 the positive bus-bar, 3 the negative bus-bar, 4 are anodes, and 5 cathode-supporting bars. Electric connection may be established between the positive and negative bus-bars by one or both of the shunts 6, when one or both of the switches 7 are closed.

In Fig. 2 the tanks 1 are fitted with bus-bars 2 and 3, and intermediate copper strip 4, which supply the electric current to the anodes 5, and the cathode-supporting bars 9. Electric connection may be established between the bus-bars 2 and 3 by one or both of the shunts 7, when one or both of the switches 8 are closed. After connecting a shunt on a tank or set of tanks, the diminishing area of the anodes has a tendency of raising the voltage, thus sending an increasing current through the shunts, so that the remaining current passing through the electrolyte is in amount a function of the diminishing area of the anode surface.

What I claim as new and desire to secure by Letters Patent, is:

1. The process of electrolytically refining a set of metal anodes arranged in multiple, which consists in first passing from said anodes through a suitable electrolyte to suitable cathodes practically the full volume of the refinery circuit until the active anode area begins to diminish largely, and then shunting around the tank containing said anodes, part of the refinery current, which part increases thereafter functionally with the diminishing active anode area.

2. The process of electrolytically refining a set of metal anodes arranged in multiple, which consists in passing from said anodes through a suitable electrolyte to suitable cathodes an electric current of volume which does not change to an appreciable extent functionally with variations of resistance of the bath, and when the active surface of said anodes has been reduced to a considerable extent shunting through another conductor an increasing portion of the current.

In testimony whereof I have hereunto set my hand this 16th day of February, 1905.

ANSON GARDNER BETTS.

Witnesses:

FREDERICK CLARK,

EDWARD F. KERN.