

(No Model.)

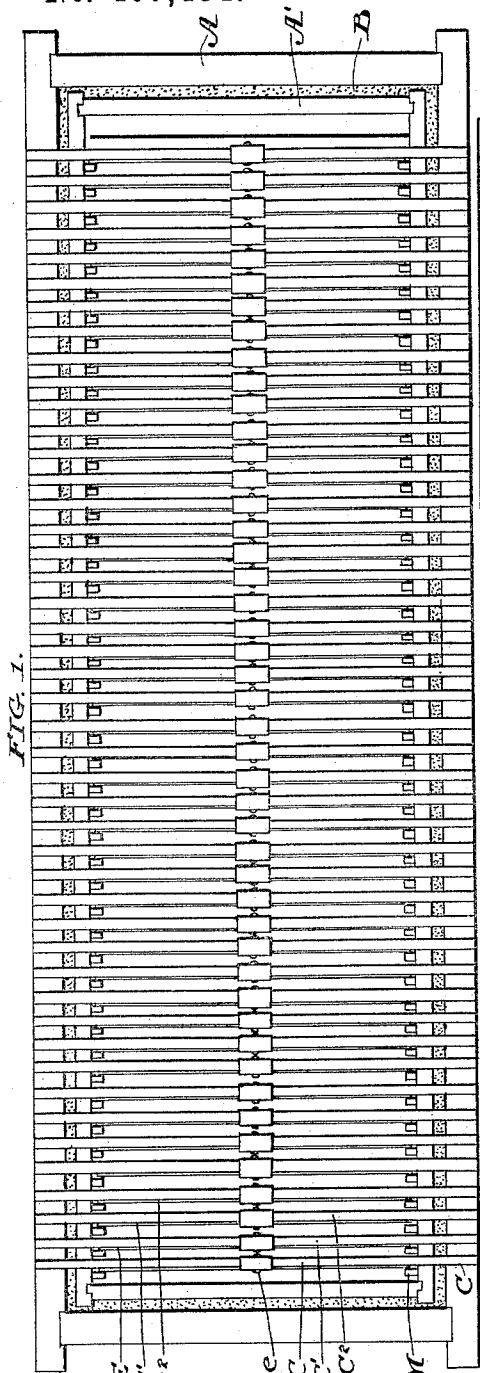
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O. STALMANN.

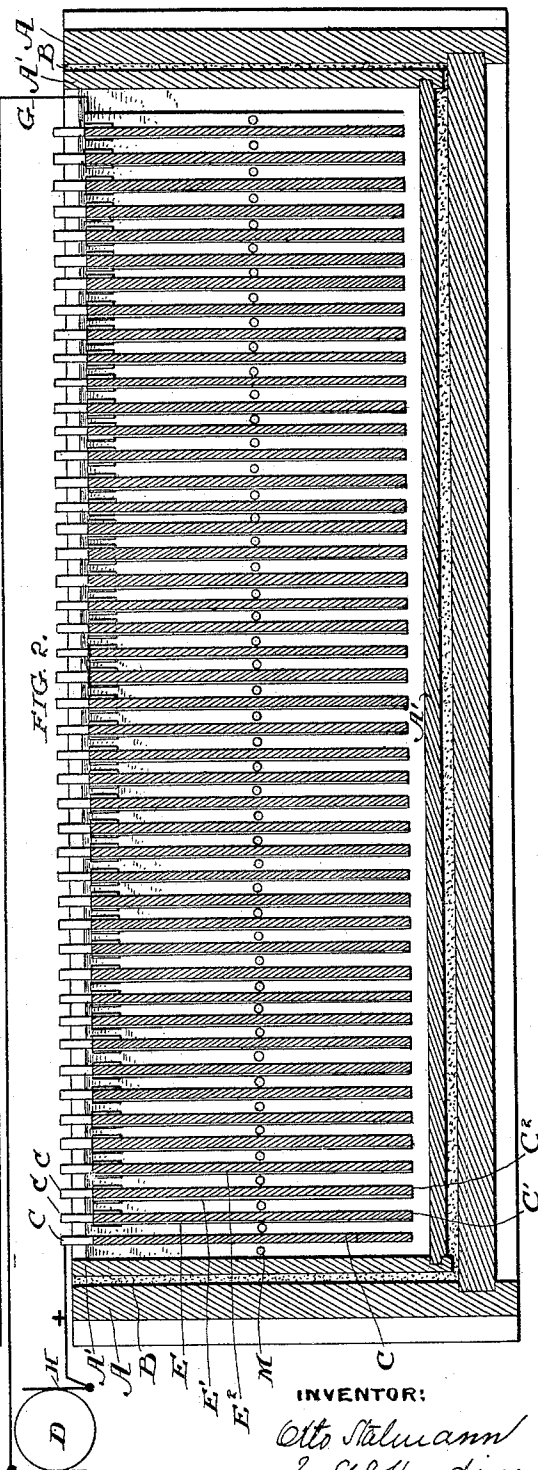
ELECTROLYTICAL PROCESS AND APPARATUS FOR CARRYING OUT
SAID PROCESS.

No. 467,484.

Patented Jan. 19, 1892.



WITNESSES:
And O. Williams
Walter Parnass



INVENTOR:

Otto Stalman
by G. P. Harding

(No Model.)

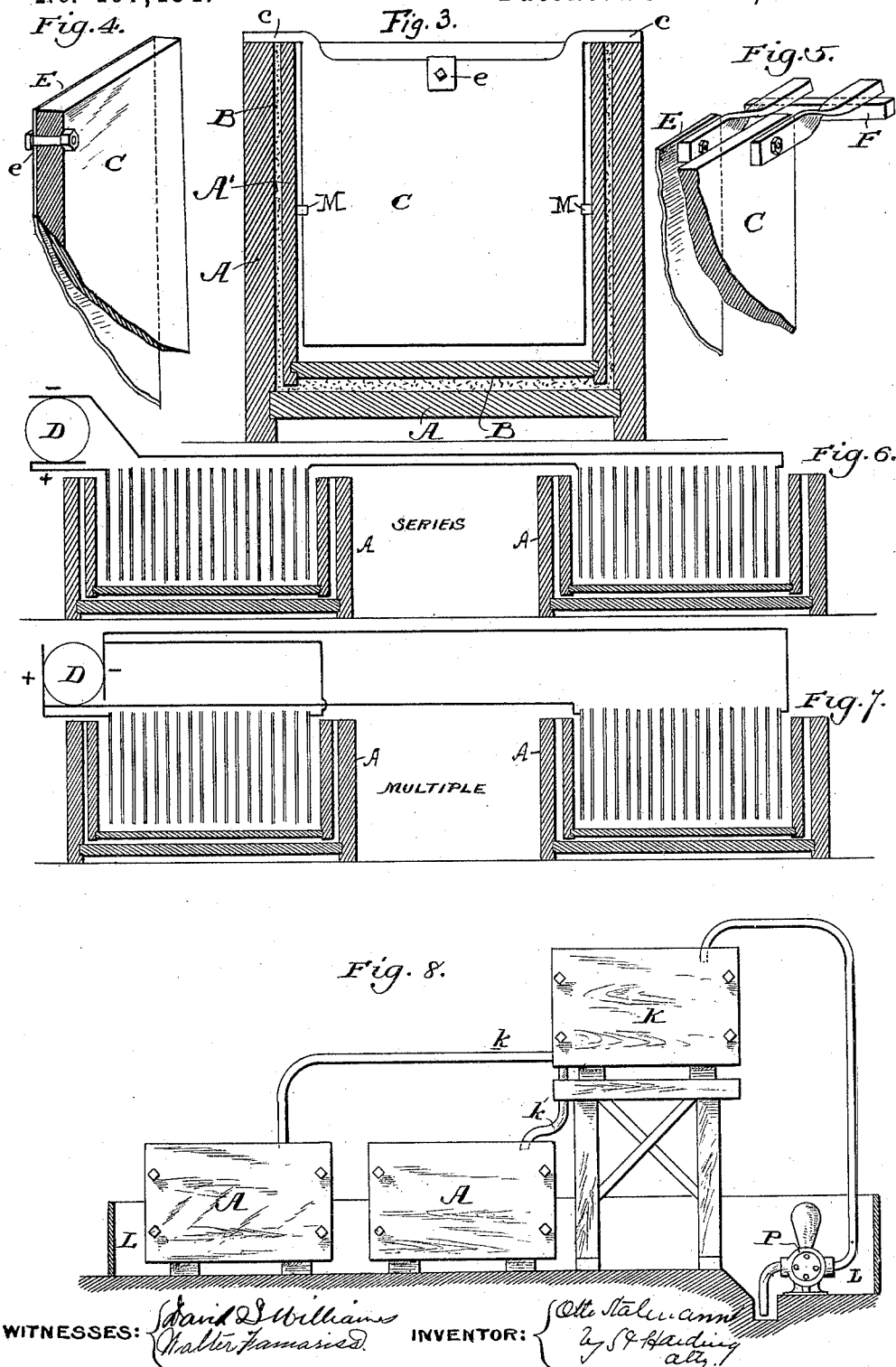
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WITNESSES:

David L. Williams
Halter Farnes

INVENTOR:

Otto Stalman
by J. H. Harding
att'y.

UNITED STATES PATENT OFFICE.

OTTO STALMANN, OF ANACONDA, MONTANA, ASSIGNOR TO MARCUS DALY,
OF SAME PLACE.

ELECTROLYTICAL PROCESS AND APPARATUS FOR CARRYING OUT SAID PROCESS.

SPECIFICATION forming part of Letters Patent No. 467,484, dated January 19, 1892.

Application filed October 1, 1890. Serial No. 366,794. (No model.)

To all whom it may concern:

Be it known that I, OTTO STALMANN, a citizen of the United States, residing at Anaconda, county of Deer Lodge, and State of Montana, have invented a new and useful Improvement in Electrolytical Processes and Apparatus for Carrying Out Said Processes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention is especially applicable for refining copper, although it may be used for other purposes. The description will be in reference to its use in refining copper.

In the drawings, Figure 1 is a plan view of an electrolytic vat with plates in position; Fig. 2, longitudinal vertical section of same. Fig. 3 is a vertical section at $x x$, Fig. 1. Fig. 4 is a perspective view of one method of connecting the anode and cathode plates. Fig. 5 is a perspective view of another method of connecting said plates; Fig. 6, section showing two or more vats connected in series; Fig. 7, section showing two or more vats connected in multiple; Fig. 8, side elevation showing electrolyte-tank and method of distributing electrolyte to vats.

A A' are two wooden tanks, the tank A' being smaller and placed within tank A. The space between the tanks A and A' is filled with material B, which is of such character as to prevent leaking, such as asphaltum, cement, or hydraulic cement. It is preferable that this material should be an insulating material.

C C' C², &c., are the anode-plates, which are cast in molds, preferably iron molds, and are provided with ears, as c . A solution of sulphate of copper is placed in the vat or tank A', and the anode-plates are suspended in the solution by means of the ears c , which rest either directly on the sides of the vat or on a piece of rubber or wood or any non-conducting material.

E E' E², &c., are the cathode-plates, formed of thin plates of copper or other metal, and these cathode-plates are also suspended in the liquid in the tank.

D is the dynamo, and the first anode-plate

C is connected to the positive conductor H of said dynamo. The first cathode-plate E is connected with the second anode-plate C' either directly by one or more bolts or rivets e , as shown at Fig. 4, or at a small distance by means of wires or copper plates F, as shown at Fig. 5. The second cathode-plate E' is connected with the third anode-plate C², as above described. The cathode and anode plates are connected together throughout the plant, as described, and the last cathode-plate is connected with the negative conductor G from the dynamo. As may be seen, the first anode and the last cathode plates stand by themselves.

The apparatus may be arranged in a single pair of tanks, as shown at Figs. 1 and 2, or distributed over two or more tanks, as shown at Figs. 6 and 7. In Fig. 6 the tanks are connected in series, the last cathode of one tank or vat being electrically connected with the first anode of the next vat, the last cathode of the last vat being connected to the negative conductor from the dynamo. In Fig. 7 the tanks are in multiple connection, each tank having its independent connection with positive and negative conductors from the dynamo.

In Fig. 8 is shown one arrangement for operating a series of tanks, in which K is the tank for containing the electrolyte (sulphate of copper) and A A the vats. The electrolyte passes through pipes $k k'$ to either vat A. The overflow from both of these tanks passes into the reservoir L, from which it is pumped back into the tank K by pump P. In the tank A', in order to prevent the pair of plates touching each other, I interpose knobs of glass or porcelain M, placed between the pairs of plates and fastened onto the side of the inner vat or tank.

The operation is as follows: In refining copper in my improvement the anode-plates are composed of crude copper to be refined and the cathode-plates of pure copper or other metal. The current travels from the dynamo along the positive conductor to the first anode-plate, with which said conductor is directly connected, and decomposes the solution between the first anode and first cathode plates,

which said current has to traverse, and deposits the copper at the cathode-plate, while the sulphuric acid set free dissolves an amount of copper from the anode-plate equal to that deposited upon the cathode-plate. The current thus travels from the anode-plate through the solution of sulphate of copper to the cathode-plate, along the cathode-plate, and along the connection of the same with the anode-plate to this anode-plate, thence through the solution between this anode-plate and the next cathode-plate, and so on until the last cathode-plate in the series is reached, which plate is connected with the negative conductor from the dynamo. The copper to be refined may contain silver and gold, and this falls to the bottom of the vat or tank in a highly-concentrated state, and may be collected as a by-product without extra expense.

If the cathode-plate be of copper, the copper will be deposited upon it, so that it will be necessary only to melt the compound plate for future use. If any other pure metal be used for the cathode, (as, for instance, brass,) the copper deposited upon it can be readily stripped off.

In the ordinary electrolytical plant a leaden vat is used, and each of the anodes is connected with the positive conductor from the dynamo, and each of the cathodes is connected with the negative conductor from the dynamo. This system is very costly, requiring a lead lining for the vats, large and cumbersome copper conductors for the current, and a large space for the plant, and it requires a comparatively long time to refine the copper and, in consequence, large amounts of copper in the vats for a given product.

In the ordinary electrolytical plant for refining copper the cathode is formed of a crude material upon which the decomposed copper deposits irregularly, and unless the cathode be entirely decomposed also the compound bar is not ready for future use, and if the cathode is entirely decomposed the process is long and expensive. By my improvement the copper from the anode is deposited either upon pure copper or upon a pure metal. In the first case the copper bar is pure copper and in the latter case the pure copper may be stripped from the metal bar upon which it is deposited.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The method of separating from copper and like metals foreign matter which may be incorporated with them, which consists in arranging in an electrolytic bath an initial anode connected to the positive pole of the source of current-supply and a terminal cathode connected to the negative pole, securing together by conductors intermediate anodes and cathodes in independent pairs, each pair consisting of an anode of crude material and a cathode of refined material, interposing said independent pairs between the initial anode and terminal cathode of the bath, and passing an electrolyzing current from the initial anode to the terminal cathode through the bath and paired plates, substantially as described.

2. An electrolytic bath comprising a containing-vessel, an electrolyte, an initial anode, a terminal cathode, and intermediate pairs consisting each of an anode of crude material and an independent cathode of refined material removably connected thereto and in metallic conductive connection therewith, the several pairs being independent of each other, substantially as described.

3. An electrolytic bath comprising a containing-vessel, an electrolyte, an initial anode, a terminal cathode, and intermediate pairs consisting each of an anode of crude material and an independent cathode of refined material removably connected thereto and in metallic conductive connection therewith, the several pairs being independent of each other and being separated on their sides and bottoms from the containing-vessel, substantially as described.

4. An electrode consisting of a plate of refined material and an independent plate of crude material removably connected thereto and in metallic conductive connection therewith, substantially as described.

In testimony of which invention I have hereunto set my hand.

OTTO STALMANN.

Witnesses:

JAMES MCGREGOR,
D. J. FITZGERALD.