(No Model.)

E. & G. ANDREOLI.

ELECTROLYTIC PRODUCTION OF AMALGAMS, &c.

No. 605,835. Patented June 21, 1898.

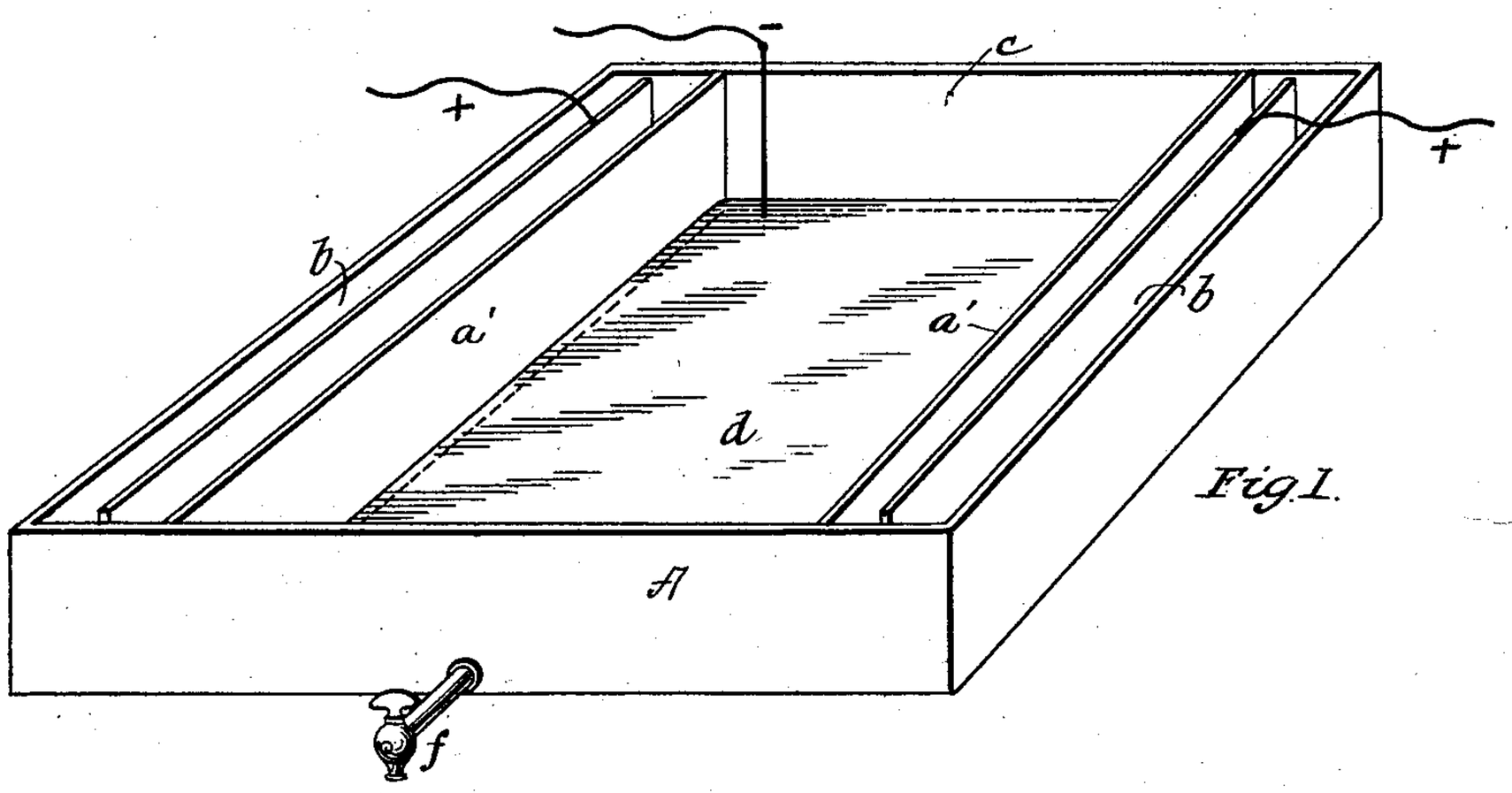

Fig. 1.

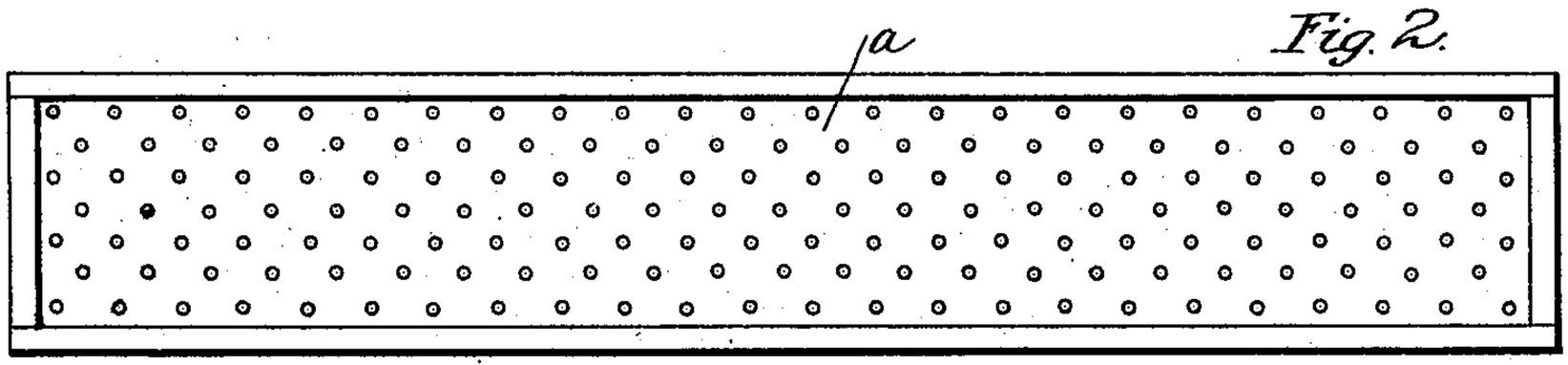

Fig. 2.

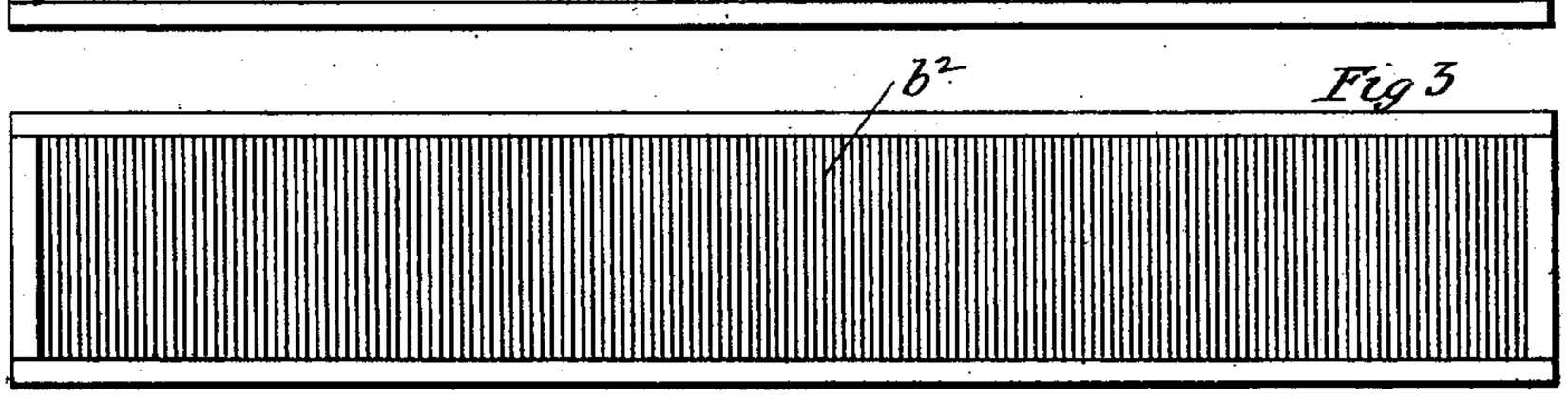

Fig 3

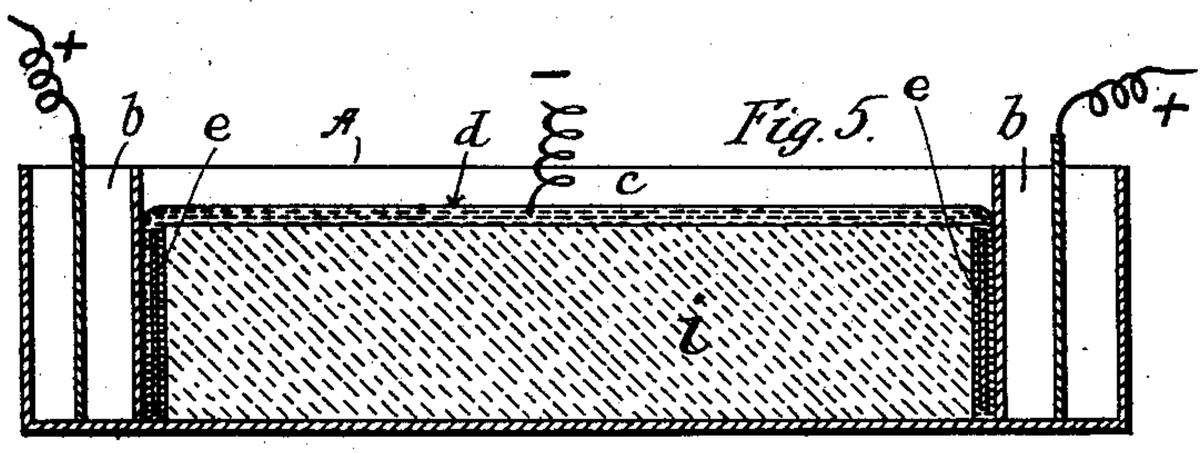

Fig. 5.

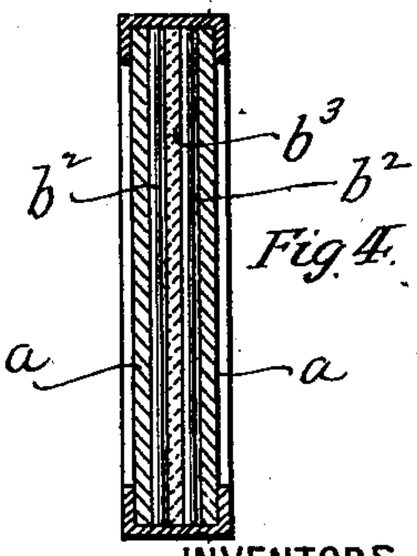

Fig. 4.

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ELECTROLYTIC PRODUCTION OF AMALGAMS, &c.

SPECIFICATION forming part of Letters Patent No. 605,835, dated June 21, 1898.

Application filed September 17, 1895. Serial No. 562,814. (No model.) Patented in England August 9, 1895, No. 15,024.

To all whom it may concern:

Be it known that we, EMILE ANDREOLI and GABRIEL ANDREOLI, citizens of France, residing at London, in the county of Surrey, England, have invented certain new and useful Improvements in Electrolytic Production of Amalgams and their Utilization, of which the following is a full, clear, and exact description, the same having been patented in England August 9, 1895, No. 15,024.

The object of this invention is the electrolytic production of amalgams and their utilization with or without the electric current for coating copper or other metal plates in a simple, economical, and instantaneous manner, and thus rendering them available for the recovery of gold or silver by amalgamation, or in the mortar-mill where the auriferous ores are crushed, or for other suitable purposes.

We shall hereinafter describe the formation of an amalgam of sodium and a process for coating copper or other metal plates with mercury, so as to render them available for amalgamating gold or silver. In the ordinary way this coating requires skilled labor and consists of troublesome operations for scouring and pickling the copper plates before they can absorb quicksilver; but according to our invention as soon as the amalgam comes in contact with the plates of copper or other metal they become thoroughly amalgamated without having been submitted to any scouring, cleaning, or pickling.

In the accompanying drawings, Figure 1 is a perspective view of what I call the "electrolyzer." Figs. 2 and 3 are side elevations of a partition. Fig. 4 is a cross-section of the same, and Fig. 5 is a cross-section of a special form of amalgamator.

One of our apparatuses consists of a vessel where the amalgam is prepared, which we will call the "electrolyzer," and another is a tank or vat which we will call the "amalgamator."

Fig. 1 shows the electrolyzer ready for working.

A is a vat made of slate or earthenware or other convenient material, which is divided into positive and negative compartments by porous partitions a'.

In the following description of the working of the electrolyzer we will take as an illustration the formation of an amalgam from a concentrated chlorid-of-sodium solution and the coating of copper plates with mercury under the influence of the electric current in the cathode-compartment.

The positive compartments $b\ b$ contain anodes made of iron or copper plates or other suitable material. As soon as the current passes through the solution chlorin is formed in the positive compartments, which may be collected or allowed to pass off. The sodium goes through the partitions to the negative compartment c, which contains mercury d, with which it unites and forms a sodium amalgam.

In order to expose a large area of mercury to the electrolytic action, the mercury is preferably covered with water deep enough to fill the negative compartment to the level of the liquid in the positive compartments. As soon as the mercury has absorbed a sufficient quantity of sodium—*i. e.*, when the sodium amalgam is rich enough to amalgamate the copper—we open the tap f to allow it to run out and through a suitable pipe into the amalgamator. The electrolyzer is refilled with fresh mercury and the electrolytic operation continues in the same manner with the formation of chlorin or chlorin compounds at the positive and sodium amalgam at the negative poles.

From time to time the chlorid-of-sodium solution is strengthened by the addition of more salt.

The partitions a' can be made of porous porcelain or similar material. We may also have them constructed in the following manner: Fig. 2 shows a framed perforated slate plate a. On the side facing the anolyte, where chlorin is formed, we cover this perforated plate with rods b^2, made of glass, porcelain, ebonite, paraffined wood, or the like, Fig. 3, which we fix on the slate close to one another, so as to form a sort of wall, which allows electrocapillarity, but not diffusion of liquids.

To make sure that there is no liquid passing from the positive to the negative compartments, we may cover the glass or other rods with a layer of peroxid of manganese b^3, which is kept *in situ* by a second perfo-

rated plate *a*, of slate, ebonite, or other similar material, provided with glass, porcelain, or other rods, as hereinbefore described.

The amalgamator is a large shallow vat divided into three compartments and is of the same general construction as the electrolyzer. The two outer compartments are filled with a concentrated solution of chlorid of sodium and are provided with suitable annodes, while in the middle compartment the sodium amalgam arrives from the electrolyzer. It is connected to the negative pole of the source of electricity, so that while the amalgamating process is going on more metallic sodium is being supplied to the mercury from the outer compartments and partly keeps the strength of the amalgam.

The amalgamator can be used dry; but it is sometimes advisable to cover the mercury amalgam with water.

Our apparatus can be embodied in any convenient shape or size, and we do not confine ourselves to any particular form or dimension.

We generally find it preferable to do without the electrolyzer and to produce and apply the amalgam in the same vessel.

Our preferred apparatus, which will now be described, enables us to produce sodium amalgam on a large scale and to amalgamate large surfaces of metal plates with a comparatively small amount of mercury.

The apparatus, which may be of any dimensions, is divided into three compartments by means of porous partitions, as hereinbefore stated. Under ordinary circumstances the central compartment would require an enormous quantity of mercury to be proportionate with the surface of the porous diaphragms which separate the annode and cathode compartments, and this would not be practicable on account of the expense; but we overcome this difficulty by fixing in the central compartment a rectangular mass *i* of cement or other substance in such a manner as to leave only a small interspace between it and the porous partitions, which a small quantity of quicksilver will fill up. The top of this mass *i* is covered with a layer of mercury, which extends down into and fills the said interspaces, forming a continuous body of mercury. The sodium being lighter rises as fast as it is produced by the electrolysis between the sides of the above-mentioned amalgamated mass *i* and the porous diaphragm. Thus however wide and long may be the thin layer of mercury on the top of the amalgamated mass, however shallow or deep may be the compartments, the conductivity and efficiency of the electrolytic apparatus will be at the maximum, and plates forty square feet would be as well and rapidly amalgamated as if their surface was only four feet. The reaction which takes place is so well known that we need not state it. The sodium is deposited on the vertical mecurial cathodes and rises to the surface, where the layer of mercury which covers the amalgamated mass absorbs it and forms an amalgam as rich as required, which may be used with or without the aid of the electric current either for mercurizing copper or other metal plates or in the mining districts for the recovery of gold in batteries or in amalgamating-pans. The copper plates, when undergoing the amalgamating process, are dipped into the vertical portions of the mercury-cathode, as indicated at *e*, and this may be done simultaneously with the formation of the amalgam.

Other arrangements of the same kind can be devised for obtaining a large surface with a minimum quantity of quicksilver in the commercial production and application of amalgam.

Having now described our invention, what we claim is—

An apparatus for the production of amalgam consisting of a cell provided with positive and negative compartments separated by porous diaphragms, the negative compartments having a raised middle portion in the form of a table or block between the sides of which and the said partitions are narrow vertical spaces, the top of the block or table and the vertical spaces being covered and filled with a continuous body of mercury forming a cathode, substantially as described.

In testimony whereof we subscribe our signatures in presence of two witnesses.

E. ANDREOLI.
GABRIEL ANDREOLI.

Witnesses:
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J. F. GRAVES.