

(No Model.)

C. R. FLETCHER.

PRODUCTION OF ALLOYS BY ELECTRO DEPOSITION.

No. 499,726.

Patented June 20, 1893.

Fig. 1.

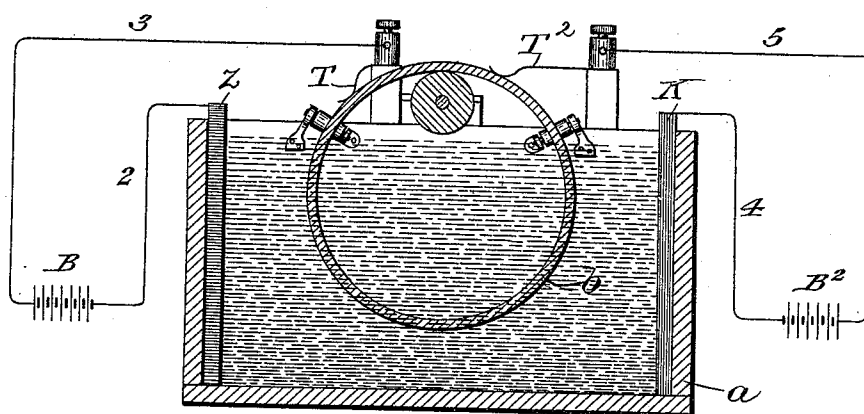
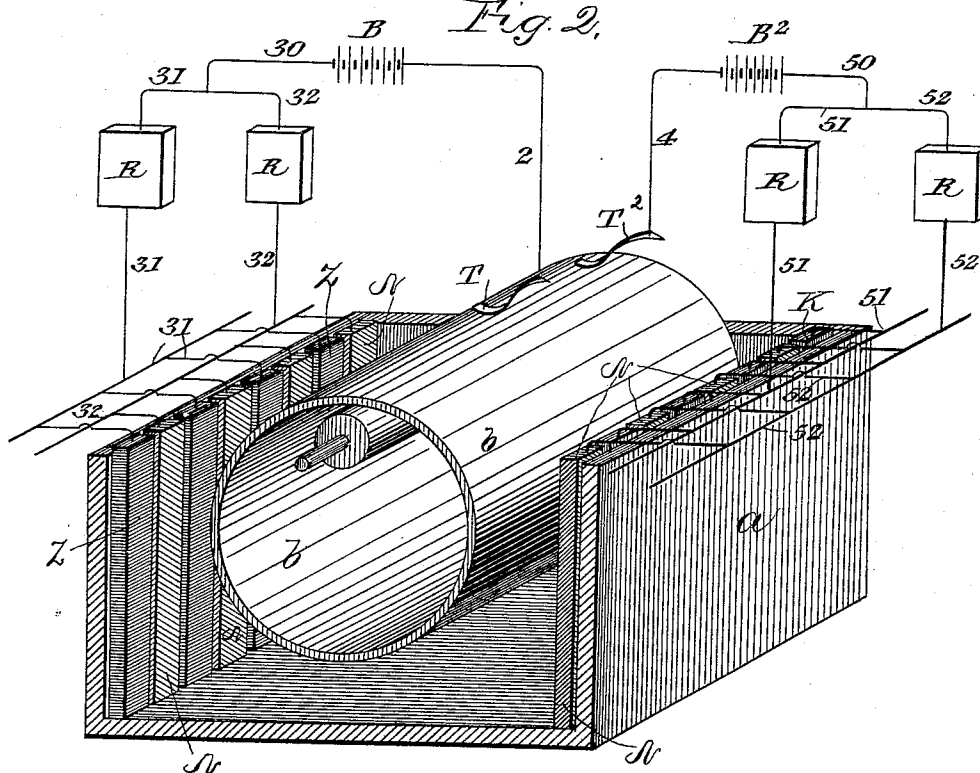


Fig. 2.



Witnesses
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PRODUCTION OF ALLOYS BY ELECTRO-DEPOSITION.

SPECIFICATION forming part of Letters Patent No. 499,726, dated June 20, 1893.

Application filed February 18, 1892. Serial No. 421,918. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. FLETCHER, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in the Production of Alloys by Electro-Deposition, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

My invention relates to the art or method of producing alloys of metals by electro deposition as for example, producing brass by the deposition of copper and zinc. Alloys have been produced by fusion in the ordinary manner, by melting together two or more metals. This method has been in some instances unsatisfactory when zinc is employed because being a volatilizable and also an oxidizable metal it tends to pass into the air instead of alloying with other metals, copper for instance, in the making of the alloys called brasses. To prevent oxidation charcoal is used in the melting pot which being sometimes impure presents a source of impurity to the brass. Attempts have been made to produce electro deposits of an alloyed metal usually by employing the required alloy as an anode and causing the same to be decomposed and deposited upon a cathode in the same manner as a single metal, and a plan has also been disclosed in which separate anode plates of the different metals to enter into the alloy are used, the deposits from which are made simultaneously upon a given portion of the surface of the cathode so that a deposit of all the metals entering into the alloy is produced upon any given part of the surface at any given moment. By this plan a homogeneous deposit is produced at a given point on the cathode surface but the deposit throughout the entire surface of the cathode is not homogeneous or a uniform mixture of the different metals as will be explained.

The methods of electro depositing alloys that have been heretofore practiced are deficient owing to the defect in controlling the percentages of the metals entering into the alloy, as it is by no means certain that the metals will be deposited in the same proportions as those existing in the alloy employed as an anode from which the deposit is made, and when separate anode plates of the dif-

ferent metals are employed it is difficult to obtain a homogeneous alloy as each anode plate must necessarily be nearer some parts of the cathode than the other since two anode plates cannot occupy the same place at the same time and it is found necessary to use great care and to frequently adjust the position of the separate anode plates in the solution as the composition of the alloy is observed to vary.

The present invention consists mainly in employing separate anodes each composed of one of the metals to enter into the alloy to be deposited, and a revolving cathode which is kept continually in movement during the deposition so that each part of its surface is presented first in proximity to one of the anodes and then in proximity to the other, and in employing separate currents or currents of different density between the different anodes and the cathode so that the deposit from each anode may be regulated independently of the deposit from the other anode or anodes in order to produce the desired percentage of the different metals in the resulting deposit upon the cathode.

In another application, Serial No. 407,681, filed October 9, 1891, I have shown and described an electrolytic apparatus in which a revolving cathode is employed and means provided for using currents of different density in forming the deposit, but in that apparatus the anode although composed of separate parts was of a single metal so that the resulting deposit was a single metal and not an alloy, the object of the employment of the different currents being in that case to produce a superior texture of the resulting deposit and not as in the present case, to control the composition of the said deposit.

Figure 1 is a sectional view of an electrolytic apparatus adapted to be used for the production of a metal alloy by electro deposition, in accordance with this invention, and Fig. 2 a perspective view showing a modified arrangement of the anodes.

The apparatus employed for depositing metallic alloys in accordance with this invention may be of usual construction and is shown as comprising a vat or tank *a* to contain the electrolytic solution, and a revolving cathode *b* which may be supported and revolved in

said solution in the usual manner, the specific construction of said apparatus constituting no part of the present invention. On one side of the cathode, are anodes K of one metal, copper for instance, and on the other side of the cylindrical cathode are anodes Z of another metal, zinc for instance, arranged in the vat which contains the electrolyte. The electrolyte is a solution containing salts of all the metals serving as anodes, and of course varies accordingly. The anodes are connected with a suitable source of electricity, preferably separate currents as indicated in my former application referred to. In the latter case I find it advantageous to have separate brushes or trailers T, T², to conduct the currents from the cathode. The cathode is made of suitable material from which the deposited alloy may be separated if desired, when formed of sufficient thickness.

In Fig. 1 the sources of electricity are indicated by the conventional representation of batteries B, B², the former having one pole connected by wire 2, with the anode Z, and the other pole connected by wire 3, with the contact brush T while the battery B² has one pole connected by wire 4, with the anode K, and the other by wire 5, with the brush T².

By revolving the cathode, each part of its surface first passes the anodes of copper, and is acted upon by a current of sufficient density to deposit the required percentage of copper, and then immediately afterward passes the anodes of zinc, through a current of sufficient density to deposit the required percentage of zinc, and I am thus enabled to produce alloys of beauty and usefulness.

Brass and some few alloys have been electro-deposited at various times, and by myself, by using solutions of the alloy and anodes of the same alloy. The great difficulty in electro-deposition of brass lies in preserving the uniformity of color of the deposit. Each salt in the electrolyte offers a different resistance to the current, and hence its intensity varies or tends to vary, the composition and the color of the deposited brass. In practice a feeble current chiefly decomposes the copper salt, the deposit being very reddish; on the other hand, a current of too great an intensity decomposes the solution of zinc too rapidly and the resulting deposit is whitish, or bluish-white. But by my invention, the alloy may be formed and built up to any desired thickness as indicated; and by increasing or diminishing the relatively unlike densities of either of the currents, passing through the different anodes, I am enabled to increase or lessen the deposition and alloying of the corresponding metal and thus to vary at will the composition of the resulting alloy.

In cases where I wish to deposit three metals, to form an alloy, I prefer to arrange (as shown in Fig. 2) alternate anodes N of one of the three metals on each side of the revolving cathode, and between the anodes K of the second metal on one side, and between the

anodes Z of the third metal on the otherside of the revolving cathode. And I adapt the length and width of the several anodes of several metals to my desires concerning the resulting alloy and to the solution of these several metals which form the electrolyte.

When four or more different metals are employed as anodes, arrangement of them is carried out in a similar way and by so doing I find apparently almost no limit to the variations of this method of depositing alloys.

I prefer to use separate sources of electricity as indicated at B, B², Figs. 1 and 2 (the currents of dynamo electric machines being generally preferable) the said sources of electricity each having one terminal connected by wires 2 and 4, respectively with contact brushes T, T², engaging the cathode, and when more than two metals are employed as anodes as shown in Fig. 2, the conductors 30, 50 leading from the other terminals of the said sources of electricity may be branched as shown at 31, 32, and 51, 52, said branches containing resistance R by which the current delivered through the said branches to the anodes Z and N from the course B, and to the anodes K and N from the course B² may be properly controlled, and it is obvious that a single source of electricity might be employed by a similar branching of the conductors and control of the portion of the current flowing therethrough. It will be perceived that bars, sheets or slabs of alloy can be made directly according to the surface, form and preparation of the revolving cathode. The alloys may be so deposited as to adhere, and permanently coat the revolving cathode surface, when desirable as in the case of pipes or tubes. It appears, taking the alloying of copper and zinc for an example, that the film deposit of copper first deposited, as the cathode revolves through the current and electrolyte at the copper anode surface, being succeeded almost instantly by the film deposit of zinc, or copper with zinc, deposited as the cathode revolves through the current and electrolyte at the zinc anode surface, is at once alloyed and thus the process of deposition, alloying, and building up goes on, to the desired thickness.

I am aware that brass has been formed by a thick deposit of zinc upon a thick deposit of copper over a stationary iron or steel object, and then submitting to heat until the metals become alloyed with each other; then repeating these three steps if desirable, but this is quite different from my invention and method, in which the different metals entering into the alloy are deposited successively so to speak, but each succeeds the other so immediately that the two practically constitute a homogeneous and uniform alloy, the relative percentage of any metal being varied by a corresponding control of the current affecting it, without changing the action upon the other metal or metals.

I claim—

1. That improvement in the art or method
of producing alloys by electro-deposition of
metals, which consists in passing a current
from separate anodes of the several metals to
5 enter into the alloy through an electrolyte to
a cathode and so moving the cathode that its
surface is repeatedly and successively pre-
sented to receive the deposit from the several
separate anodes, whereby the metals of the
10 several anodes are built up and alloyed on
the cathode, substantially as and for the pur-
pose described.

2. The combination of an electrolytic vat

and revolving cathode therein, with anodes
of different metals and independent circuit 15
connections between said anodes and the re-
volving cathode, whereby currents of differ-
ent density may be employed for the different
anodes, substantially as described.

In testimony whereof I have signed my 20
name to this specification in the presence of
two subscribing witnesses.

CHAS. R. FLETCHER.

Witnesses:

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M. E. HILL.