(No Model.)

W. L. BROWN.

PROCESS OF TREATING REBELLIOUS ORES.

No. 590,801. Patented Sept. 28, 1897.

Fig. 1.

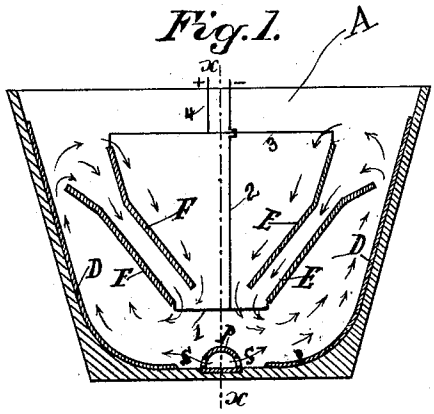


Fig. 2.

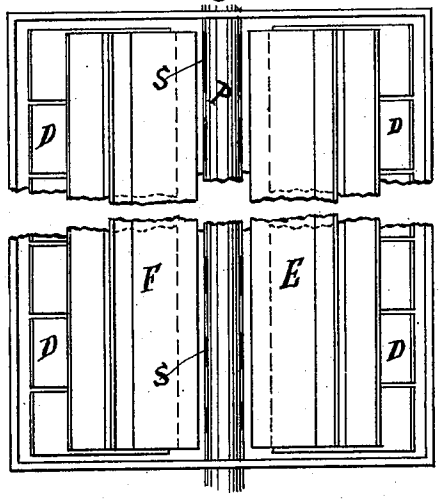
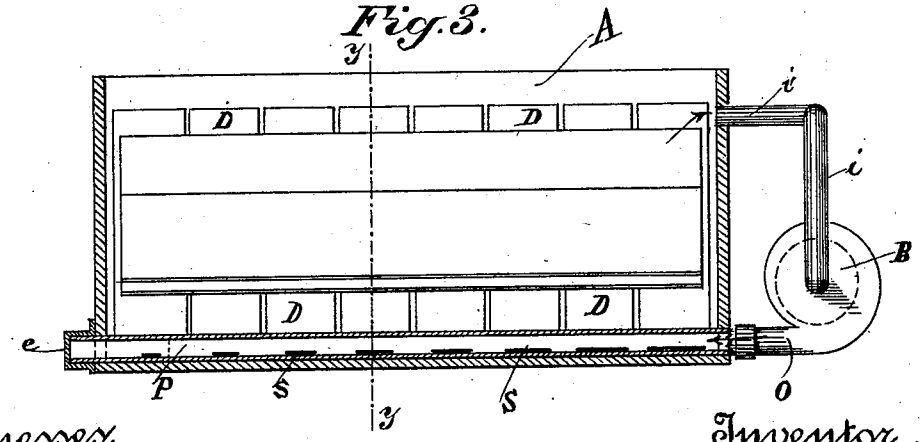


Fig. 3.



Witnesses,
L. Stowe
F. F. Ascheck

Inventor,
Wilfred L. Brown
By Dewey & Co.
Atty's

UNITED STATES PATENT OFFICE.

WILFRED L. BROWN, OF SAN FRANCISCO, CALIFORNIA.

PROCESS OF TREATING REBELLIOUS ORES.

SPECIFICATION forming part of Letters Patent No. 590,801, dated September 28, 1897.

Application filed November 25, 1896. Serial No. 570,023. (No specimens.)

To all whom it may concern:

Be it known that I, WILFRED LANGDON BROWN, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Processes for Treating Rebellious Ores; and I hereby declare the following to be a full, clear, and exact description of the same.

Heretofore in treating rebellious ores much difficulty has been experienced in separating the precious metals from the base constituents, arising from the fact that the said precious metals are so intimately blended with the base constituents that the bond between them is difficult to disrupt. These base constituents vary in different ores. If they can be separated from the precious metals, the latter, being left free, will amalgamate on plates and thereby be saved. I have discovered that this separation may be effected by the use of a proper compound when acted upon by a current of electricity, preferably an alternating current, and at the instant of separation the precious metals being freed can be saved by amalgamation.

My process may be practiced by various forms of mechanical devices, but the best form in which I have contemplated employing it is shown in the accompanying drawings, in which—

Figure 1 is a vertical transverse section. Fig. 2 is a plan view, and Fig. 3 a vertical longitudinal section through the line *x x* of Fig. 1.

A is a tank or receptacle in which the operation takes place. In this instance it is made of prismoidal shape with inclined exterior sides and curved interior sides, as shown in Fig. 1. The ends are made vertical.

D D D are removable amalgamating-plates placed upon the curved interior sides of the tank and accurately conforming thereto.

P is a pipe laid in a groove axially along the middle of the bottom of the tank. It is perforated with slits S S, placed opposite the sides of the tank, so that jets of water forced through them from the interior will impinge upon the amalgamating-plates. These slits are graduated in size from the pump end to the opposite end to facilitate uniform action of the circulation. This pipe P passes through the ends of the tank, and at one end is provided with a coupling for attachment to the discharge of the pump B and at the other end with means for attachment of the cap *e*.

B is a centrifugal pump placed at one end and outside of the tank. Its discharge-outlet O is connected with the pipe P and its inlet *i*, by means of the pipe *i'*, is connected with the tank at a point near its top just below that to which the surface of the fluid contents of the tank reaches in actual operation.

E E and F F are two pairs of electrodes connected by wires 1, 2, 3, and 4 with a source of electric energy. These electrodes are preferably made of flat sheets of cast-iron and extend throughout the length of the tank, being attached in any suitable manner at each end thereof. These two pairs of electrodes converge downward toward each other, as shown in Fig. 1, but do not touch, thus leaving circulating-passages for the fluid contents of the tank. (Indicated by the arrows.)

The operation of the device is as follows: The ores in a finely-pulverized state are placed in the tank and a sufficient quantity of water is added to render the mass fluid and amenable to the action of the pump. I then place in the mixture a suitable compound, the selection of which is dependent on the character of the ores under treatment as to their chemical constituents, which is determined beforehand by analysis—that is to say, before treating the ore I analyze it and thereby ascertain its chemical constituents. I then select for treatment of that particular ore a compound which contains an element known to have chemical affinity for the base constituents of the ore. For instance, with ores having irons as base constituents I have used with success black oxid of manganese. The oxid is decomposed and a great proportion of the oxygen is liberated from it and unites with the iron, making an oxid of iron. The peroxid of manganese is thus reduced to a lower degree of oxidation and remains in that condition, both the oxid of iron and the lower oxids of manganese remaining as inert powders, which escape with the pulp and material afterward.

In carrying out my process I do not confine myself to an alternating current, but may use

a direct current, although it is found in practice that the alternate current is preferable.

When the necessary electric connection is made and the pump set in operation, the following takes place: The electric current causes the compound to separate into its constituent elements, and the liberated element thereof, which has affinity for the base constituents of the ore, immediately unites chemically therewith and thereby the precious metals are set free. During this operation the pump B maintains a continuous circulation of the fluid contents of the tank by a constant exhaust through the pipe *i'*, and discharge through the pipe O into the pipe P, and through the slits S S against the amalgamating-plates D D D D. The discharge against the plates is with considerable impact and the liquid current is given an upward travel along the surface of the plates and then a downward travel between the electrodes or through the field of electrolytic action, all as shown by the arrows in Fig. 1. In this way I obtain a perfect and continual circulation of the fluid contents of the tank and impingement against the amalgamating-plates, upon which the precious metals will adhere and be saved in the usual manner. When the operation is complete, the plates are taken out and the amalgam is removed in the usual manner.

In using an alternating current of electricity the rate of alternation may be from ten to twenty-five per second.

I do not herein claim the apparatus shown and described, as the same forms no essential part of the present invention.

What I do claim, and desire to secure by Letters Patent, is—

1. The process of treating ores finely divided and mixed with water, which consists in adding a suitable compound to said ores and water, which compound contains an element which has a chemical affinity for the base constituents of the ore, then passing an electric current through said material to unite the said element chemically with the base constituents and to liberate the precious metals, then circulating the material over an amalgamated surface which is not in the electrical circuit and finally returning the material again through the field of electrolytic action.

2. The process of extracting valuable precious metals from ores in which they are associated with base metals, which consists, essentially, in liberating the precious metals from their base constituents in the presence of an electric current, then passing the material over an amalgamated surface not in the electric circuit and finally passing the material back through the field of electrolytic action.

In witness whereof I have hereunto set my hand.

WILFRED L. BROWN.

Witnesses:
CHAS. A. WAGNER,
CHAS. D. WHEAT.