E. MOULTON.

PROCESS FOR EXTRACTING METALS.

APPLICATION FILED APR. 18, 1916.

1,315,982.

Patented Sept. 16, 1919.

Fig. 1.

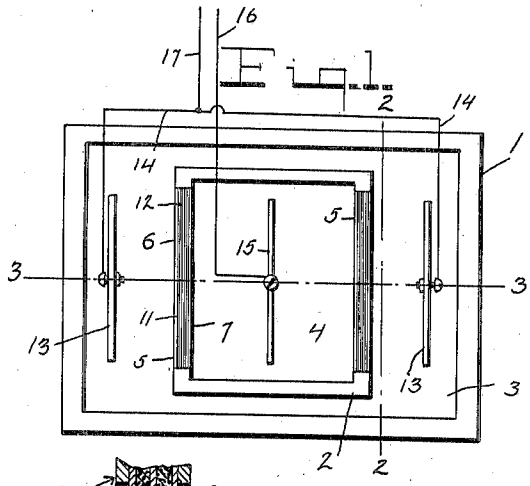


Fig. 2.

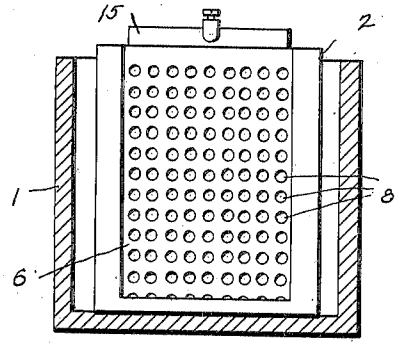


Fig. 4.

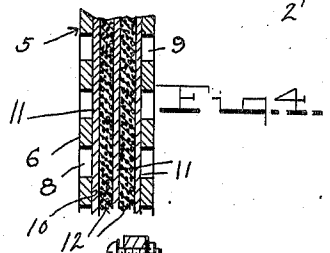


Fig. 5.

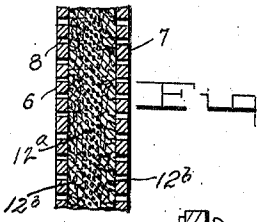
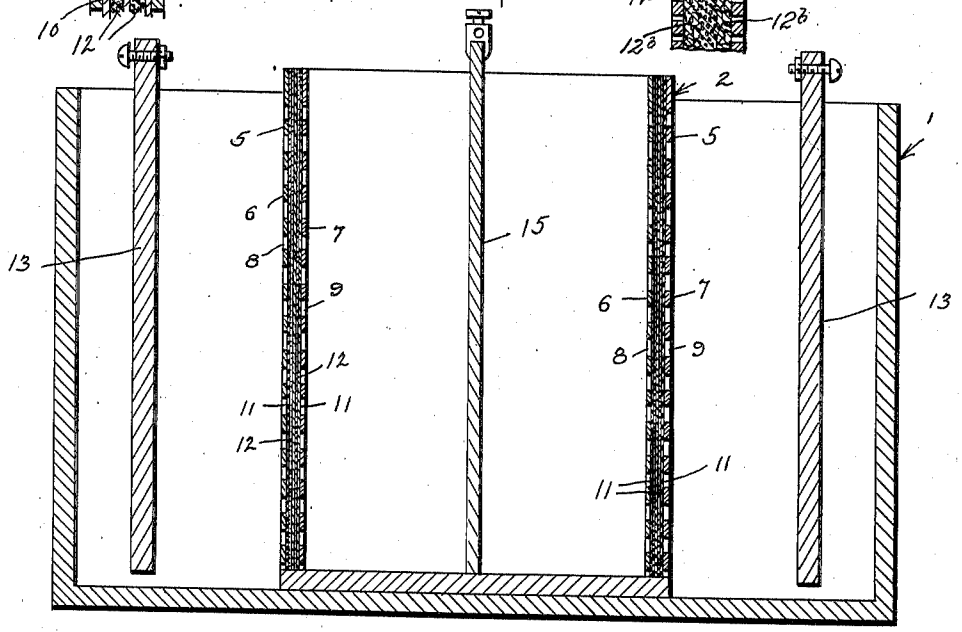


Fig. 3.



Witness

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PROCESS FOR EXTRACTING METALS.

1,315,982. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed April 18, 1916. Serial No. 91,902.

To all whom it may concern:

Be it known that I, ERNEST MOULTON, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Processes for Extracting Metals; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to a process and an apparatus for separating zinc from zinc sulfate and zinc chlorid.

The object of the present invention is to provide a process and an apparatus for separating zinc from acid solutions such as zinc sulfate and zinc chlorid and it is adapted to enable low grade ores to be advantageously worked.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawing, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing

Figure 1 is a plan view of a double cell constructed in accordance with this invention for carrying out the process,

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1,

Fig. 3 is an enlarged vertical sectional view on the line 3—3 of Fig. 1,

Fig. 4 is an enlarged detail sectional view of a portion of one of the porous walls of the inner receptacle,

Fig. 5 is a similar view illustrating another form of filtering or porous packing.

Like numerals of reference designate corresponding parts in the several figures of the drawing.

In the accompanying drawing is illustrated the embodiment of a preferred form of apparatus for carrying out the process of this invention. This apparatus comprises in this construction a double cell consisting of an outer receptacle or tank 1 and an inner receptacle or tank 2 which is constructed separate from and arranged within the outer tank or receptacle 1 to enable it to be readily placed therein and removed therefrom. The outer tank or receptacle 1 forms a compartment 3 for the reception of an acid solution of zinc and the inner receptacle forms an inner compartment 4 for the reception of an alkaline solution of zinc but instead of forming the separate compartment by different receptacles, one placed within the other they may be partitioned off in other desired manner as will be readily understood, the arrangement illustrated in the drawings being preferable as it permits the current to flow inwardly into the central receptacle from opposite sides thereof thereby increasing the capacity of the apparatus.

The inner receptacle is provided with opposite walls 5 consisting of frames composed of inner and outer wall plates or members 6 and 7 provided at intervals with registering openings 8 and 9 and spaced apart to form a recess or pocket 10 for the reception of a porous packing or diaphragm composed of sheets 11 of porous material such as filter paper, canvas, burlap or the like and a stratum 12 of granular material such as sand, saw-dust or the like. Ordinary sand may be employed and also sand from the tailings from leaching tanks may be utilized. The sand may be used with or without the sheets of porous filtering material and when sand is employed independently of the sheets of filtering material coarse sand 12^b will be arranged adjacent to the frame plates or members 6 and 7 and finer sand 12^a between the coarse as clearly illustrated in Fig. 5. The porous packing or diaphragm separates the acid and alkaline solution and while permitting the passage of the electric current through the electrolyte it will prevent the mixing of the acid and alkaline solutions. The upper ends of the pockets 10 are open to permit the application and removal of the porous packings or diaphragms.

The outer compartment contains a pair of electrodes 13 of carbon with which are connected wires 14 and the central or intermediate compartment contains an electrode 15 consisting of a zinc, copper or iron plate and connected to the other terminal of the electric circuit. The wires 14 branch from a common wire 17 and the electric current flows through the electrolyte and passes into the inner compartment from opposite sides of the same thereby increasing the capacity of the plate 15. While the anode 13 and the cathode 15 are described as being constructed

of carbon and copper, zinc or iron plates, electrodes of any other suitable material of sufficient difference in polarity may of course be employed. The inner and outer tanks or receptacles may be constructed of wood or metal and will be painted or otherwise coated to render them acid proof.

The zinc formed by the decomposition in the anode chamber migrates into the cathode chamber through the diaphragm, which in consequence of the well known action of zinc solution and of alkaline zinc solution in particular upon paper has been converted into a kind of vegetable parchment, thereby effectively preventing a ready diffusion of the two electrolytic liquids into each other. In the cathode chamber the zinc is converted first into zincate, or in the case of lead into plumbate, from which, by decomposition the metal is separated and deposited upon the cathode, hydrogen being also formed and collecting upon the cathode. By this means it has been found that a more coherent and more uniform deposit is formed than it is possible to obtain by using exclusively acid solution of the metal as an electrolyte. The alkaline solution also causes hydrids to be formed, which protect the metal deposit. The employment of an alkaline catholyte has the advantage, moreover, that such foreign metals as iron, aluminum, calcium and the like are precipitated and are prevented from entering the zinc deposit as impurities.

The process and apparatus enable low grade zinc ore to be worked profitably, and may also be employed for extracting lead and other metal.

What is claimed is:—

1. The hereindescribed process of separating metals, consisting in separating an acid and an alkaline solution of a metal so as to prevent the mixing of the solutions and to permit the passage of an electric current from one solution to the other, and in subjecting the solutions to the action of an electric current through the medium of a cathode in the alkaline solution and an anode in the acid solution.

2. The hereindescribed process of extracting metals which consists in immersing the terminals of an electric circuit respectively in an acid solution and in an alkaline solution of the metal and passing the electric current through said terminals.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST MOULTON.

Witnesses:

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