No. 669,439. Patented Mar. 5, 1901.

H. A. FRASCH.

ELECTROLYTIC APPARATUS FOR RECOVERING METALS.

(Application filed July 30, 1900.)

(No Model.)

Fig. 1.

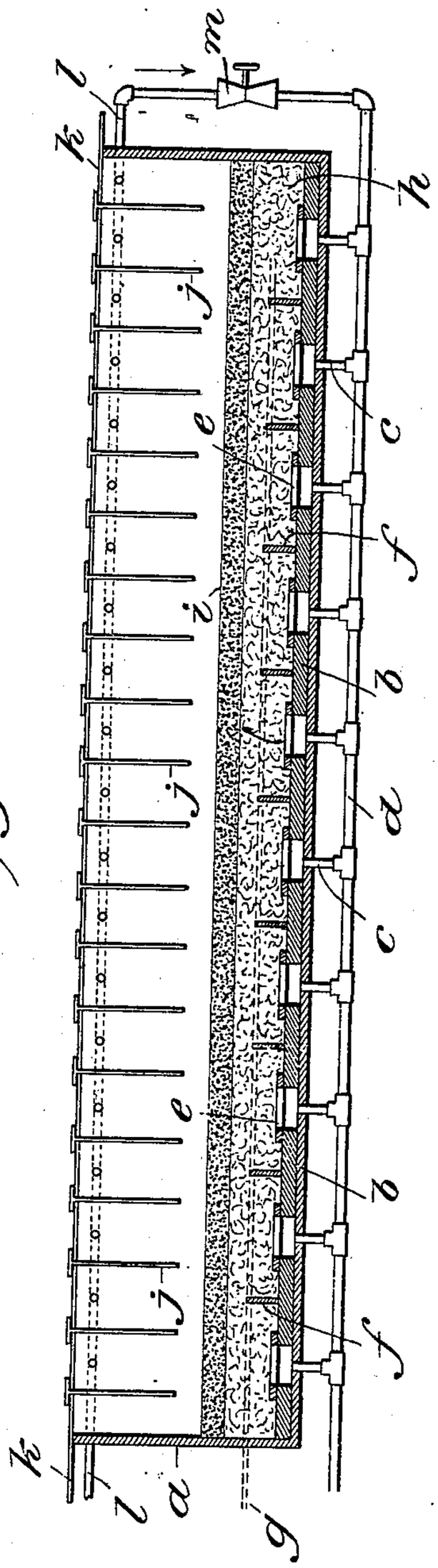
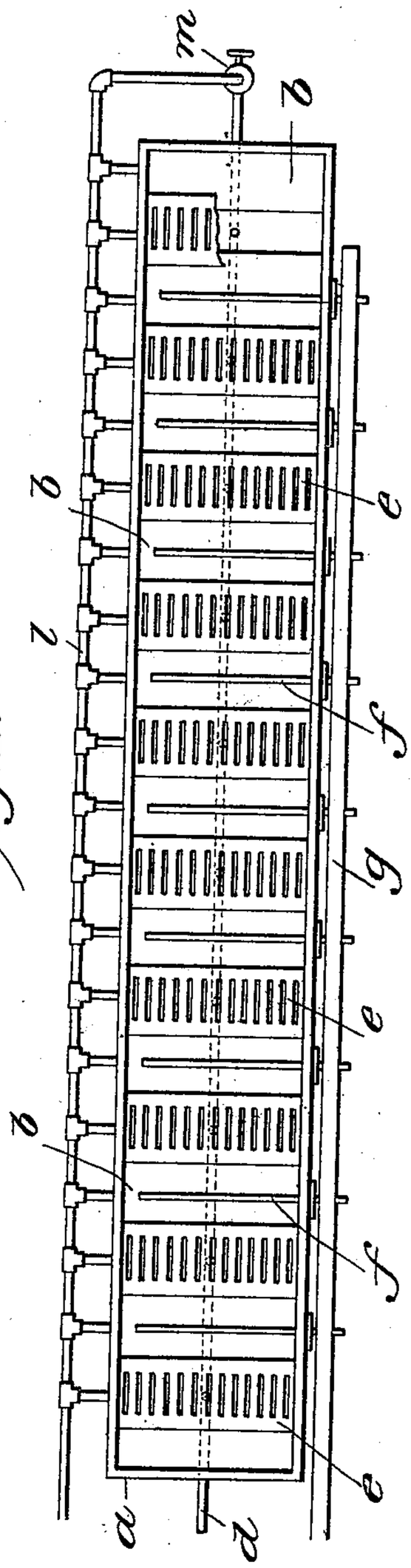


Fig. 2.



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HANS A. FRASCH, OF HAMILTON, CANADA.

ELECTROLYTIC APPARATUS FOR RECOVERING METALS.

SPECIFICATION forming part of Letters Patent No. 669,439, dated March 5, 1901.

Application filed July 30, 1900. Serial No. 25,292. (No model.)

To all whom it may concern:

Be it known that I, HANS A. FRASCH, a citizen of the United States, residing at Hamilton, in the county of Wentworth and Province of Ontario, Canada, have invented a certain new and useful Improvement in Electrolytic Apparatus for Recovering Metals, of which the following is a full, clear, and exact description.

Heretofore in the extraction of metal from matte or ores by the electric current the electrolytic solutions have been obtained by the action of mineral or halogen acids upon matte or ores, either by direct chemical action or by means of an electric current, the electrolyte consisting of the sulfates or chlorids of the metals.

My invention relates to the production of an electrolyte of greater purity than has been obtained before by providing for the direct extraction of such metals whose hydroxids are soluble in a solution of alkali or ammonia. I have discovered that by the direct action of an electric current upon a solution of a salt of ammonium in the presence of an anode bearing the metal to be extracted, such as copper or nickel, the corresponding ammonium salt of the metal is obtained at the anode, while the metal itself is deposited on the cathode and the ammonium salt originally employed is recovered.

Instead of an ammonium salt the salt of an alkali may be used which is capable of forming the double salt with the metal to be extracted.

In the present invention I employ an apparatus in which the anode is composed of suitable conductors covered over with a layer of the metal-bearing matte or ore in a granular or powdered condition and this layer of matte or ore in turn covered by a diaphragm of a material or substance which is electrically neutral or inert, such as sand. The cathode may be of any approved construction, such as a series of plates suspended within the vessel and capable of removal in any usual or approved manner. The electrolyte, of whatever nature, is preferably supplied through perforated pipes and is introduced through the matte, which is freely permeable, and the overflow (which is at the upper portion of the vessel and may be composed of a series of perforated pipes) returns the electrolyte to the point of distribution, and thereby establishes a circulation of the same. The electrolyte may be a sulfate or chlorid of the metal or, in fact, be of any well-known composition.

In the accompanying drawings, illustrating my invention, in both figures of which like parts are similarly designated, Figure 1 is a vertical section; and Fig. 2 is a top plan view with the cathodes, diaphragm, and matte removed.

A vessel *a*, of suitable construction and dimensions, has a brick-lined bottom *b*, provided with openings into which project branch pipes *c* from a main pipe *d*, by which the electrolyte is introduced. The openings are covered by perforated tiles *e*. *f* represents a series of carbon bars or other anodes extending across the bottom of the tank or vessel and connected with the conductor *g*. Upon the foundation formed by the bricks and tiles is laid a mass of granular or pulverized matte or ore *h*, containing the metal to be extracted, and above this mass or layer of matte or ore is spread a diaphragm *i*, of sand or other electrically neutral or inert permeable material. *j* represents a series of cathodes, preferably composed of like metals to those to be extracted, which may be suspended from the top of the tank or vessel in any suitable way providing for their ready removal, and these are connected with the conductor *k*. The conductors *g* and *k* lead from any suitable source of electricity. The pipe *e* is continued upwardly and connected with a pipe *l*, extending lengthwise of the tank or vessel and opening into the side of the tank between the cathodes. Interposed between the pipes *d* and *l* is an injector or pump or other suitable apparatus *m*, by means of which the circulation of the electrolyte may be insured.

In operation the electrolyte is introduced into the pipe *d* and passes thence through the various branch pipes *c* upwardly through the matte and diaphragm and into contact with the cathodes, on which the metal is deposited, and overflows through the pipe *l* back into the pipe *d*. Whatever apparatus is used at *m* it will be electrically insulated and adapted to this operation.

An anode of the character described is very

economically made, and because of its granular or powdered condition and its large surface the metal is more thoroughly extracted and on account of its permeability maintains the electrolyte at a constant saturation.

The processes which may be carried out by means of the present invention are the subject of my case of even date herewith entitled "Method of recovering metals by electrolysis, filed July 30, 1900, Serial No. 25,293.

What I claim is—

1. An electrolytic bath, having an anode extending over its bottom and consisting of suitable electrical conductors and a body of disintegrated material containing the metal or metals to be extracted, a superposed layer of granular electrically-neutral permeable material in immediate contact with the disintegrated material, and suitable cathodes, substantially as described.

2. An electrolytic bath having an anode extending over its bottom and consisting of suitable electrical conductors and a body of disintegrated material containing the metal or metals to be extracted, a superposed layer of sand in immediate contact with the disintegrated material, and suitable cathodes, substantially as described.

3. An electrolytic bath, having an anode extending over its bottom and consisting of suitable electrical conductors and a body of disintegrated material containing the metal or metals to be extracted, and a superposed layer of granular electrically-neutral permeable material in immediate contact with the disintegrated material, combined with cathodes and an electrolyte and means to circulate the electrolyte through the anode and the superposed layer of electrically-neutral material and in contact with the cathodes, substantially as described.

4. An electrolytic bath, having an anode extending over its bottom and consisting of suitable electrical conductors and a body of disintegrated material containing the metal or metals to be extracted, and a superposed layer of granular electrically-neutral permeable material in immediate contact with the disintegrated material, combined with a series of cathodes suspended above the electrically-neutral substance, substantially as described.

In testimony whereof I have hereunto set my hand this 27th day of July, A. D. 1900.

HANS A. FRASCH.

Witnesses:

WM. H. FINCKEL,

C. A. NEALE.