

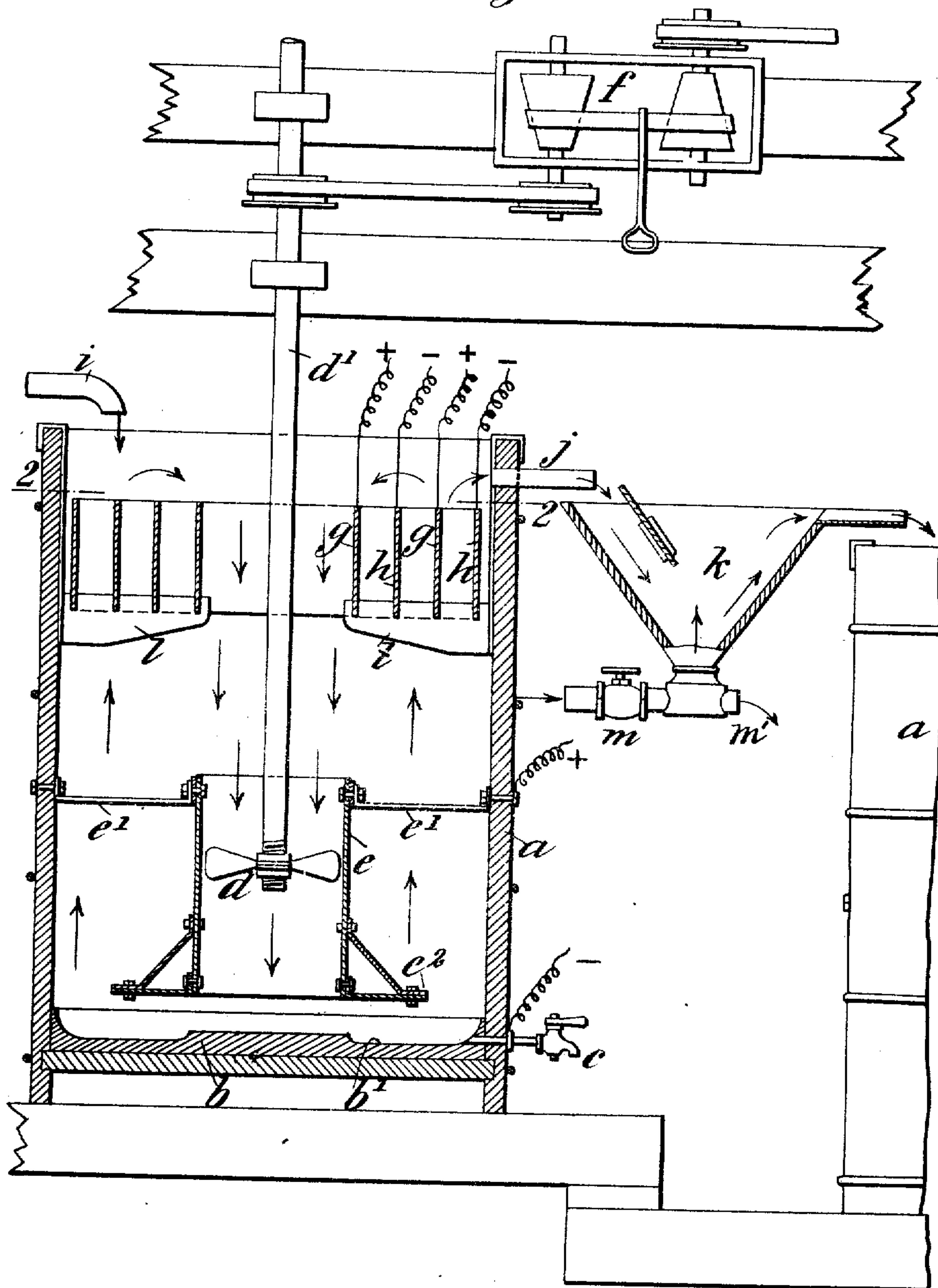
T. E. BEAUMONT.
 APPARATUS FOR THE EXTRACTION OF GOLD FROM CRUSHED ORES.
 APPLICATION FILED MAR. 29, 1906.

905,048.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 1.

Fig. 1.



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 Warren U. Swartz

Inventor:
 Thomas E. Beaumont
 by Nelson & Byrnes
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2 SHEETS—SHEET 2.

Fig. 2

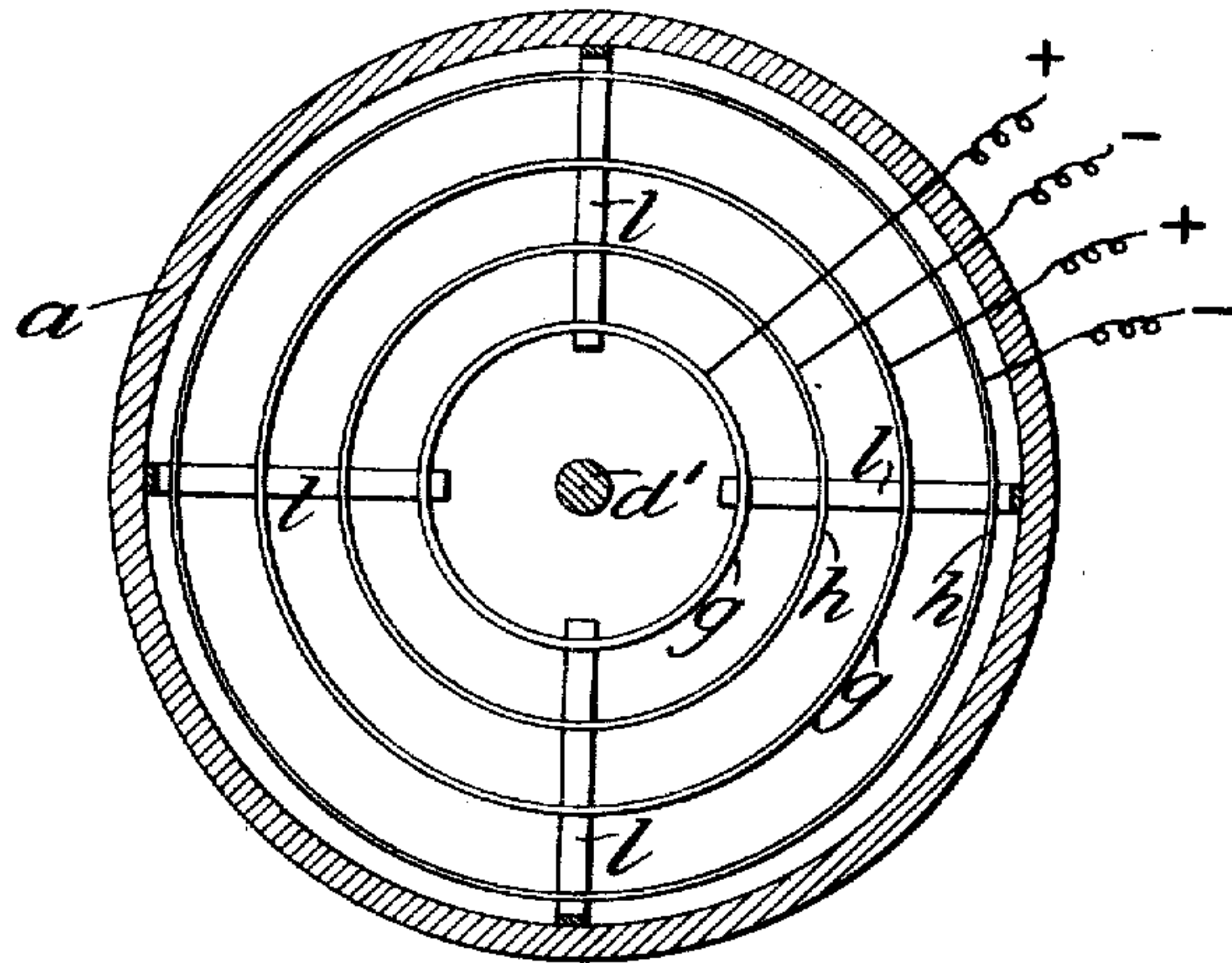
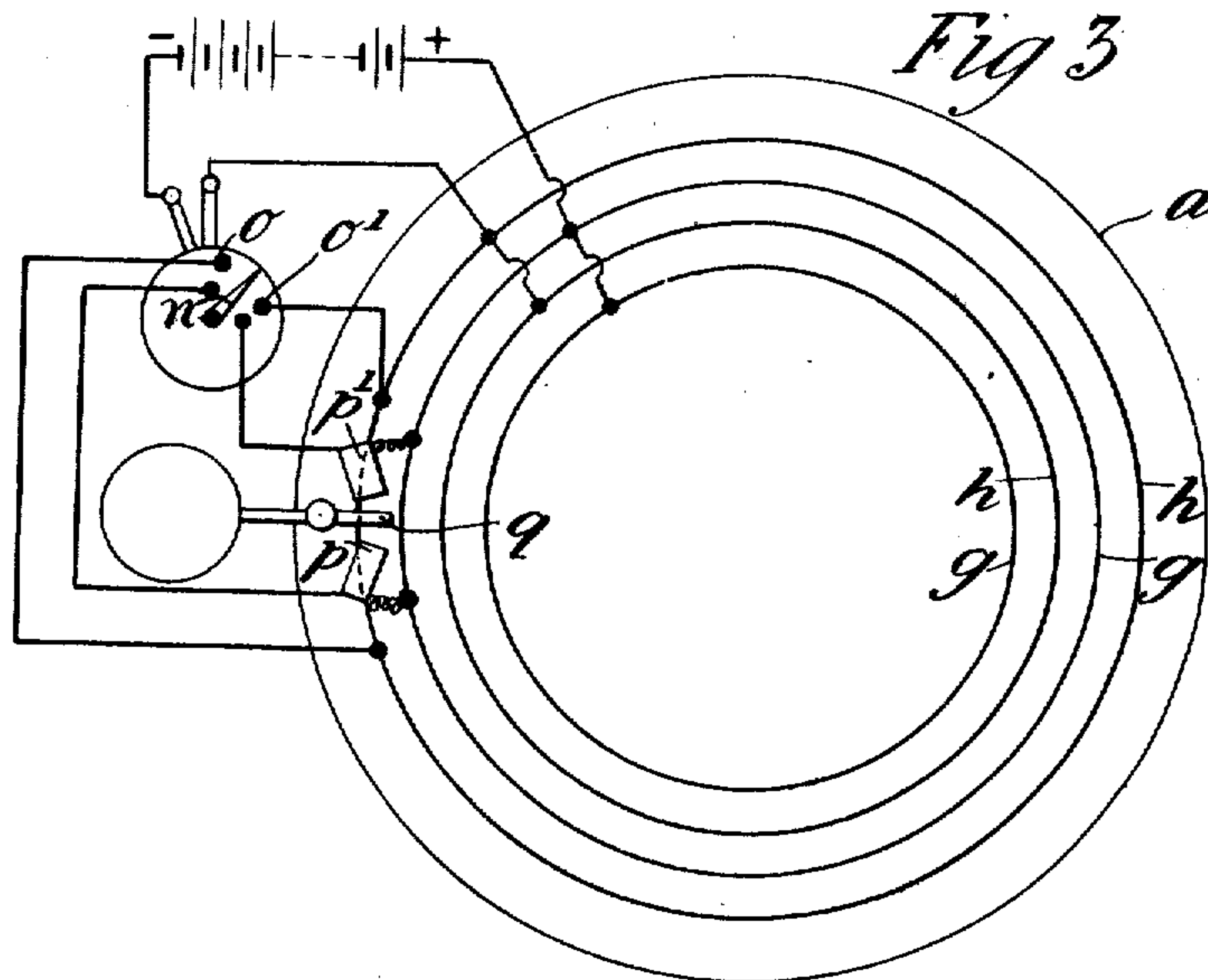


Fig 3



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UNITED STATES PATENT OFFICE.

THOMAS EDGAR BEAUMONT, OF LONDON, ENGLAND.

APPARATUS FOR THE EXTRACTION OF GOLD FROM CRUSHED ORES.

No. 905,048.

Specification of Letters Patent.

Patented Nov. 24, 1908.

Application filed March 29, 1906. Serial No. 308,669.

To all whom it may concern:

Be it known that I, THOMAS EDGAR BEAUMONT, a subject of the King of Great Britain, residing at 9 Prince of Wales road, Battersea, in the county of London, England, engineer, have invented certain new and useful Improvements in Apparatus for the Extraction of Gold from Crushed Ores, of which the following is a specification.

10 This invention relates to an apparatus for the extraction of gold from crushed ores which is continuous and rapid in its operation, which can be applied to any gold ore which is crushed fine enough, and which
15 can with such crushing recover practically all the gold in free milling ores and a very large proportion of gold that is not free.

The invention consists in an apparatus
20 by which amalgamation and electro-deposition are carried on simultaneously in the same vessel, in which the ore pulp is caused to circulate continuously in a downward stream which is deflected over the surface
25 of the amalgamator, returning in an upward stream which passes between pairs of metal plates preferably of copper and iron. The mercury of the amalgamator and the copper plates are made cathodes
30 of electric circuits by connection with a suitable source of electricity.

The invention will be described with reference to the accompanying drawings in which

35 Figure 1 is a longitudinal section of an apparatus adapted to carry out the improved process; Fig. 2 is a section on line 2—2 of Fig. 1; Fig. 3 illustrates diagrammatically an automatic device controlling the supply
40 of cyanid solution to the vessel.

The amalgamation and precipitation is conducted in ordinary wooden tub *a*, of which there may be two or more in each battery, in the base of which is fitted an
45 iron casting *b* having a trough *b'* to contain the mercury and a tap *c* to draw off the amalgam.

Centrally over the base of the tub is an agitator or propeller *d* which rotates within
50 an open cylinder *e* supported over the central part of the amalgamator. The propeller *d* is driven by suitable means at a speed which can be varied as desired by the interposition of the speed cones *f* between the
55 propeller shaft *d'* and the driving shaft, and the rotation of the propeller is con-

trolled to produce such a downward current through the cylinder *e* and resulting upward current outside the cylinder that the latter stream will be insufficient to raise
60 anything heavier than the largest gangue particles of the crushed ore, so that the heavy gold remains in the bottom of the tub and only the rock and fine gold raised to the surface. The cylinder *e*, which is sup-
65 ported by arms *e'* bolted to the sides of the tub, is provided at its lower end with a flange *e''* which deflects the flow of the gold containing pulp over the surface of the mercury in the trough *b'*.
70

In the upper part of the tub *a* but immersed in the ore pulp and liquid which the tub contains is a series of concentric open cylinders or rings *g h* alternately of copper and iron connected respectively with the
75 — and + poles of a suitable source of electric current which are insulatingly supported on brackets *l* between which plates the crushed ore in its continuous circulation passes, and by which the very fine and
80 dissolved gold is collected, partly by contact with the amalgamated surface of the copper plates and partly by electro-deposition thereon.

In practice the cylinder *e*, and the iron
85 plates *h* are connected with the + terminal of a continuous current generator capable of delivering a suitable current at a potential of about 6 volts, the tray *b* and amalgamated copper plates *g* being connected with
90 its — terminal. The liquid contained in the tub *a* preferably consists of a 0.1 per cent. solution of potassium cyanid and being by its continuous circulation repeatedly brought
95 under oxidation by the atmosphere, its power of dissolving or cleaning gold is thereby maintained at a high degree of efficiency by virtue of the absorbed oxygen. The cyanid solution is introduced into the first tub
100 from a vessel containing a saturated or strong solution and is added in such quantities as may be required to maintain the standard strength of solution in the tub, which as already stated is preferably a 0.1
105 per cent. solution but may be either somewhat stronger or weaker. A convenient method of maintaining the required strength of solution is by maintaining the electrical resistance between the anodes and cathodes constant, the total resistance of the electro-
110 deposition circuit having been previously adjusted to give the proper current density

when the electrolyte is of the standard strength. Thus it is merely necessary to observe the ammeter in the circuit and to open the cyanid supply cock when the current falls in strength until the ammeter again indicates the proper value. The supply cock may also be operated automatically by any suitable electrical device controlled by the movement of the circuit ammeter or voltmeter, such for example as is illustrated in Fig. 3, in which contact of the metal index n of an ammeter n' included in the electrolyzing circuit with one or other pair of the two pairs of contact studs o o' establishes one or other of two electric circuits which include electromagnets p p' respectively. These magnets are respectively arranged when energized to open and close the supply cock either by direct attraction of a lever q of magnetic material connected thereto or through any suitable linkage connecting their armatures with the cock. A spring acting on the lever may be substituted for one of the electromagnets.

The crushed ore pulp is delivered to the tub a by the pipe i and the overflow containing the gangue and some fine gold is discharged by the pipe j into the device commonly known as a spitzkasten consisting of a trough or hopper shaped vessel k open at its lower end to the pressure of a stream of water or cyanid solution in the pipe m by which an upward flow of liquid is maintained in the vessel k as indicated by arrows, which is sufficient to sustain the lighter particles of gangue and the fine gold which are discharged over the lip of the vessel k into a second recovering tub as shown in Fig. 1, which deals with the mixed gangue and gold in the manner already described, while the heavier gangue particles are carried by the stream of pressure fluid and discharged at the end m' of the pipe.

Similarly the discharge from the second tub may be treated in a third similar vessel and so on until the whole of the gold has been recovered, although usually it will be found that with most ores practically the whole of the gold will be recovered by treatment in two tubs only.

I claim—

1. An apparatus for the extraction of gold from crushed ores comprising in combination a vessel for the reception of the ore pulp, an amalgamator forming part of an electric circuit and placed in the base of said vessel, an electro-deposition apparatus for the deposit of gold in the upper part of said vessel, and means contained within the said vessel to circulate the ore pulp and subject it repeatedly to the successive action of the amalgamator and the electro-deposition apparatus; substantially as described.

2. In apparatus of the character herein described a vessel for the reception of the ore

pulp, a metal tray in the base of the said vessel having a trough containing mercury, a vertical open cylinder suspended centrally over the said tray and having a deflecting flange projecting over said trough, and a propeller within the said cylinder rotating to produce a downward flow of ore pulp within the cylinder, substantially as described.

3. In apparatus of the character herein described, a vessel for the reception of the ore pulp, an amalgamator forming part of an electric circuit, and placed in the base of the said vessel, a series of annular anode and cathode plates in the upper part of the said vessel, and means within the said vessel for inducing a central downward flow and outer upward flow of the ore pulp with respect to the said anode and cathode plates, whereby the said amalgamator and electro-deposit apparatus may be effectively used in the one and the same vessel; substantially as described.

4. An apparatus for extraction of gold from crushed ores, comprising a vessel containing ore pulp and an electrolyte, an amalgamator forming part of an electric circuit and placed in the base of said vessel, an electro-deposition apparatus in the upper part of said vessel, means for circulating the ore pulp and electrolyte within the said vessel, and means dependent on the density of the electrolyte to regulate automatically the supply of fresh electrolyte; substantially as described.

5. An apparatus for the extraction of gold from crushed ores, comprising a vessel containing ore pulp and an electrolyte, an amalgamator forming part of an electric circuit and placed in the base of said vessel, an electro-deposition apparatus in the upper part of said vessel, means for circulating the ore pulp and electrolyte within the said vessel, and means for maintaining automatically the strength of the electrolyte in said vessel and automatically supplying fresh electrolyte thereto, comprising an electric relay connected with the electrolyzing circuit, a pair of electric circuits controlled by said relay, an electro-magnet in each of said pair of circuits, an electrolyte supply tap, and a lever actuating said tap and controlled by said electro-magnet; substantially as described.

6. An apparatus of the class described comprising a vessel for the reception of ore pulp, an amalgamator forming part of an electric circuit, in said vessel, an electro-deposition apparatus for the deposit of metal, also in said vessel, means for subjecting the ore pulp repeatedly to the successive action of the amalgamator and the electro-deposition apparatus.

7. An apparatus of the class described comprising a vessel for the reception of ore pulp,

an amalgamator forming part of an electric circuit, in said vessel, an electro-deposition apparatus for the deposit of metal, also in said vessel, and means for causing the sub-
5 jection of the pulp to the successive action of the amalgamator and the electro-deposition apparatus.

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

THOMAS EDGAR BEAUMONT.

Witnesses:

EDWARD GARDNER,

WALTER J. SKERTEN.