(No Model.)

P. DANCKWARDT.

APPARATUS FOR AND PROCESS OF EXTRACTING GOLD OR SILVER FROM ORES.

No. 526,099. Patented Sept. 18, 1894.

FIG. 2.

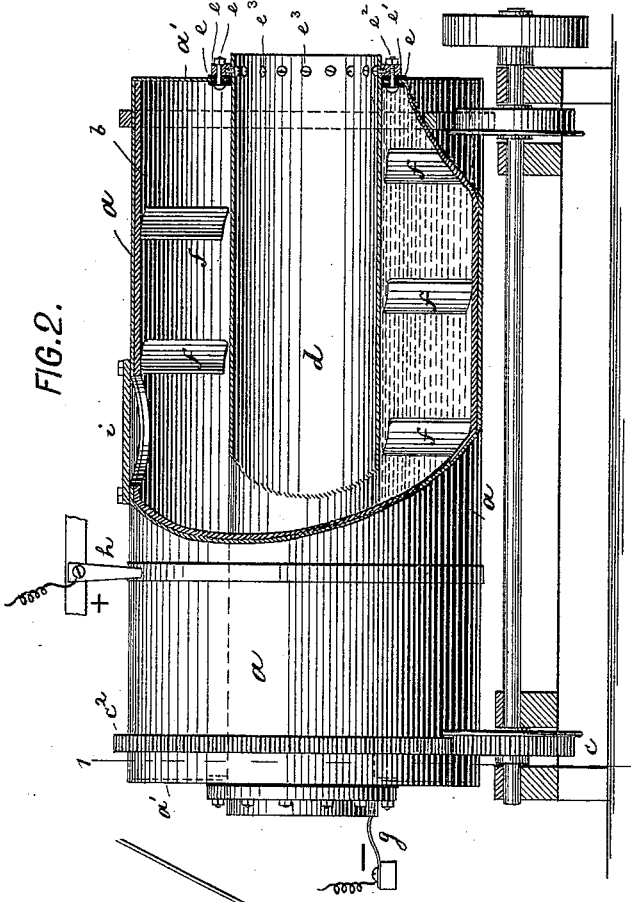


FIG. 3.

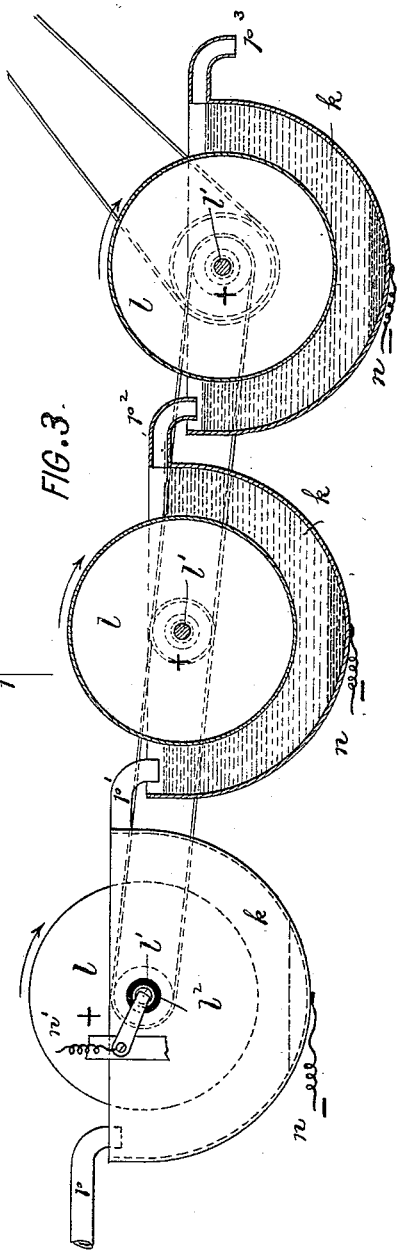
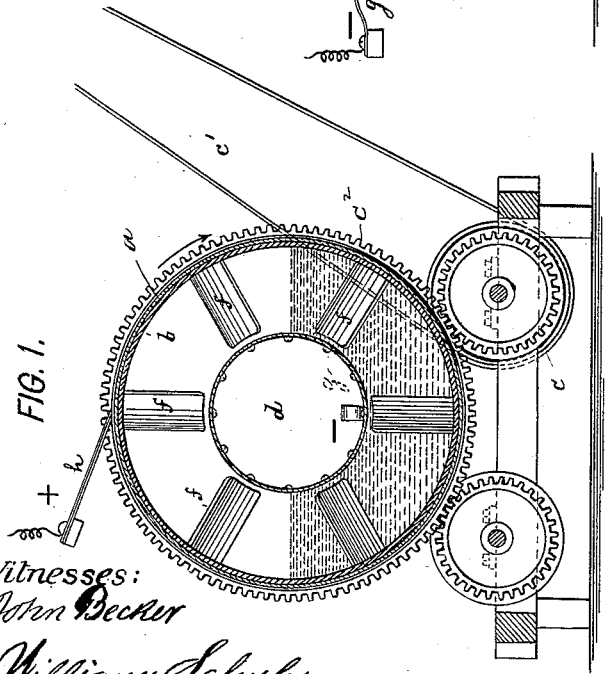


FIG. 1.



Witnesses:
John Becker
William Schulz

Inventors:
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by his attorneys
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UNITED STATES PATENT OFFICE.

PAUL DANCKWARDT, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO CHARLES DOEHRING, OF SAME PLACE.

APPARATUS FOR AND PROCESS OF EXTRACTING GOLD OR SILVER FROM ORES.

SPECIFICATION forming part of Letters Patent No. 526,099, dated September 18, 1894.

Application filed April 2, 1894. Serial No. 505,999. (No model.)

To all whom it may concern:

Be it known that I, PAUL DANCKWARDT, of New York city, New York, have invented an Improved Apparatus for and Process of Extracting Gold or Silver from Ores, of which the following is a specification.

This invention relates to an improved apparatus and process for extracting gold and silver from ores by electrolysis.

It consists essentially in treating the ores in a finely pulverized state with a solution of cyanide of potassium and ammonium sulfide, or another alkali sulfide, and subjecting it simultaneously to the action of an electric current and an amalgamated cathode.

In the accompanying drawings, Figure 1 is a cross section of my improved apparatus, on line 1, 1, Fig 2. Fig. 2 is a longitudinal section, partly in elevation, of the same, and Fig. 3 a cross section, partly in elevation, of a supplemental apparatus.

The letter *a*, represents an iron cylinder provided with a lead lining *b*, and revolved by a belt *c'*, and toothed wheel *c*, that engages a toothed wheel c^2, embracing the cylinder. The heads *a'*, of the cylinder *a*, are made of annular shape and receive within their central opening, a second drum or cylinder *d*, composed of amalgamated sheet copper. This cylinder closes the openings within the heads *a'*, and is insulated from such heads. The insulation is effected preferably by a rubber packing *e*, that embraces the inner edge of heads *a'*, and to which a metal ring *e'*, is connected by bolts e^2. To this ring in turn the cylinder *d*, is secured by screws e^3.

To the inner periphery of cylinder *a*, there are secured a number of inclined radial blades *f*, that reach to within a short distance of cylinder *d*, and serve to shovel the ore in thin streams slowly over the surface of the inner cylinder. The electricity is conveyed to the apparatus by the contact springs *g*, *h*, connected respectively to the cylinders *d*, *a*, and of which the cylinder *a*, constitutes the anode, and the cylinder *d*, the cathode.

In use the pulverized ore is introduced into the apparatus through door *i*, together with a solution of cyanide of potassium and ammonium sulfide, or another alkali sulfide. The proportions should be for one ton of ore, about ten pounds cyanide of potassium and two to three pounds of ammonium sulfide. The door is then closed, the drum is rotated and a constant current of electricity under low tension is turned on. This current will cause the gold and silver to be separated at the anode and to be deposited upon the amalgamated cathode. The alkali sulfide will reduce the consumption of cyanide of potassium to a minimum, because it will prevent the formation of soluble combinations between any of the raw metal combinations and part of the cyanide of potassium. Moreover the alkali sulfide will favor the solution of certain silver combinations, because the electric current will cause a partial oxidation of the sulfide, into hyposulfite, which will thus be able to exert its dissolving power upon the silver combinations.

After the apparatus has rotated for several hours, all or nearly all of the gold and silver is deposited upon the inner cylinder *d*, in the form of amalgam. If this precipitation has been perfect, the apparatus is arrested, the inner cylinder is removed and the amalgam is scraped off. This amalgam is heated in a retort to obtain a gold and silver alloy, and the filtered solution goes to a storage tank to be used over again. If however the precipitation upon the inner cylinder should not have been perfect, I prefer to employ the auxiliary apparatus illustrated in Fig. 3. This apparatus is a modification of the one illustrated in Figs. 1 and 2, and consists of a series of semi-cylindrical tanks *k*, arranged one below the other. Each tank contains a revoluble cylinder *l*, hung on shaft *l'*, which is insulated from tank *k*, by rubber washer l^2. The distance between cylinder and tank should be about four centimeters, the drawings showing such distance enlarged for the sake of clearness.

The tanks *k*, are amalgamated upon their inner side and contain a little mercury besides the solution to be treated. Each tank *k*, is connected with the negative pole of an electric generator by coil *n*, while the cylinder *l*, is connected to the positive pole by coil *n'*, and constitutes the anode. The filtered solution taken from the main apparatus is introduced into the uppermost tank *k*, by

pipe p. All the cylinders l, are rotated and a constant current of electricity under low tension is turned on. As soon as the uppermost tank has become filled, the solution will enter the second tank by pipe p', and thence through pipe p^2, the third tank, to finally leave the apparatus through pipe p^3, free from gold and silver. The latter is deposited in the form of amalgam upon the bottom of the tanks.

I employ the auxiliary apparatus generally for precipitating any cyanide solutions that contain gold and silver, and especially for precipitating solutions of gold and silver and cyanide of potassium.

What I claim is—

1. The process of extracting gold and silver from ores which consists in subjecting the same simultaneously to the action of cyanide of potassium, an alkali sulfide and to electrolysis, substantially as specified.

2. The combination of an outer revolving drum with an inner insulated amalgamated drum, blades secured to the outer drum, and electric connections secured to the outer and inner drum, substantially as specified.

3. The combination of a series of communicating tanks with revolving insulated drums hung within such tanks, and with electric connections secured to the tanks and drums, substantially as specified.

4. The combination of a main apparatus consisting of a revolving outer drum having blades, an insulated inner drum and electric connections, with an auxiliary apparatus consisting of a series of communicating tanks, rotating insulated drums and electric connections, substantially as specified.

In testimony whereof I have signed this specification this 28th day of March, 1894.

PAUL DANCKWARDT.

Witnesses:

F. v. BRIESEN,

WILLIAM SCHULZ.