No. 635,119. Patented Oct. 17, 1899.

A. BARGIGLI.

APPARATUS FOR THE AMALGAMATION OF GOLD OR OTHER ORES.

(Application filed Apr. 5, 1899.)

(No Model.) 3 Sheets—Sheet 1.

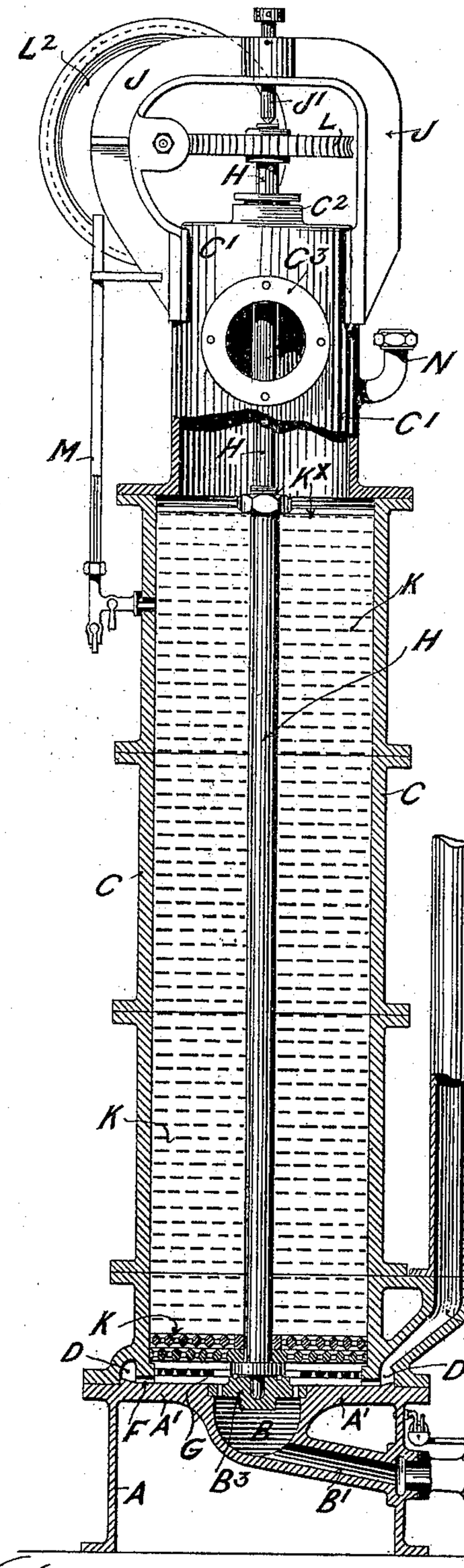

FIG: 1.

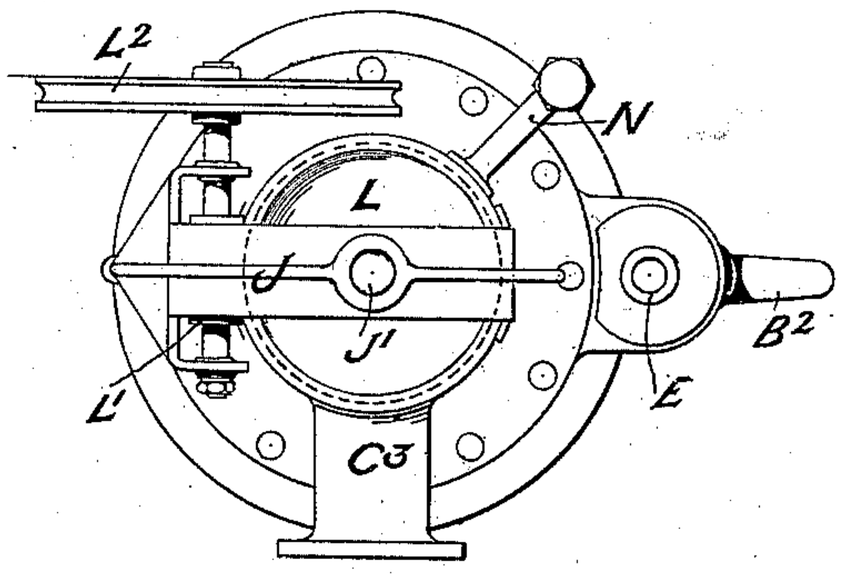

FIG: 2.

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3 Sheets—Sheet 2.

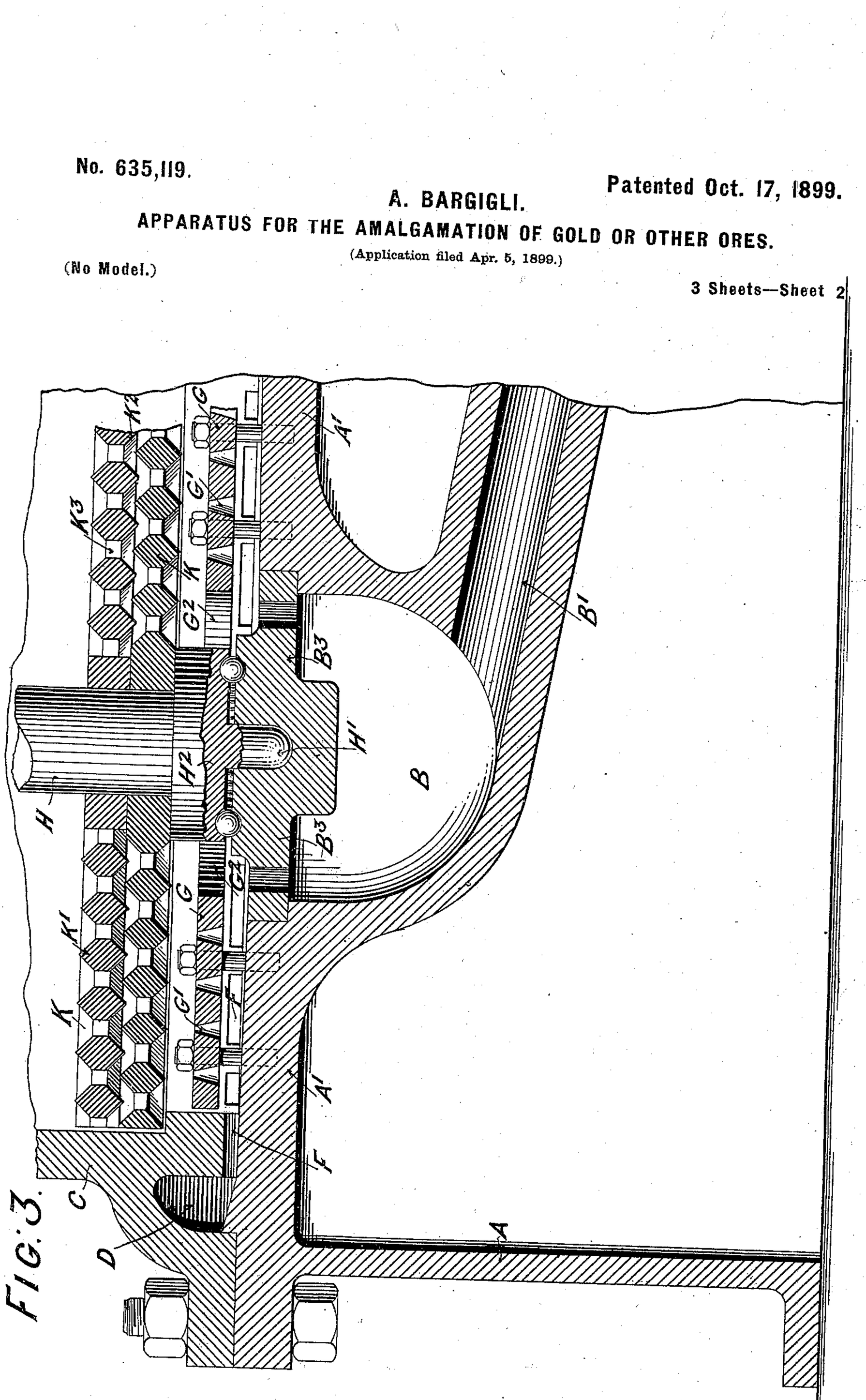

FIG. 3.

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(No Model.) 3 Sheets—Sheet 3.

FIG: 6.

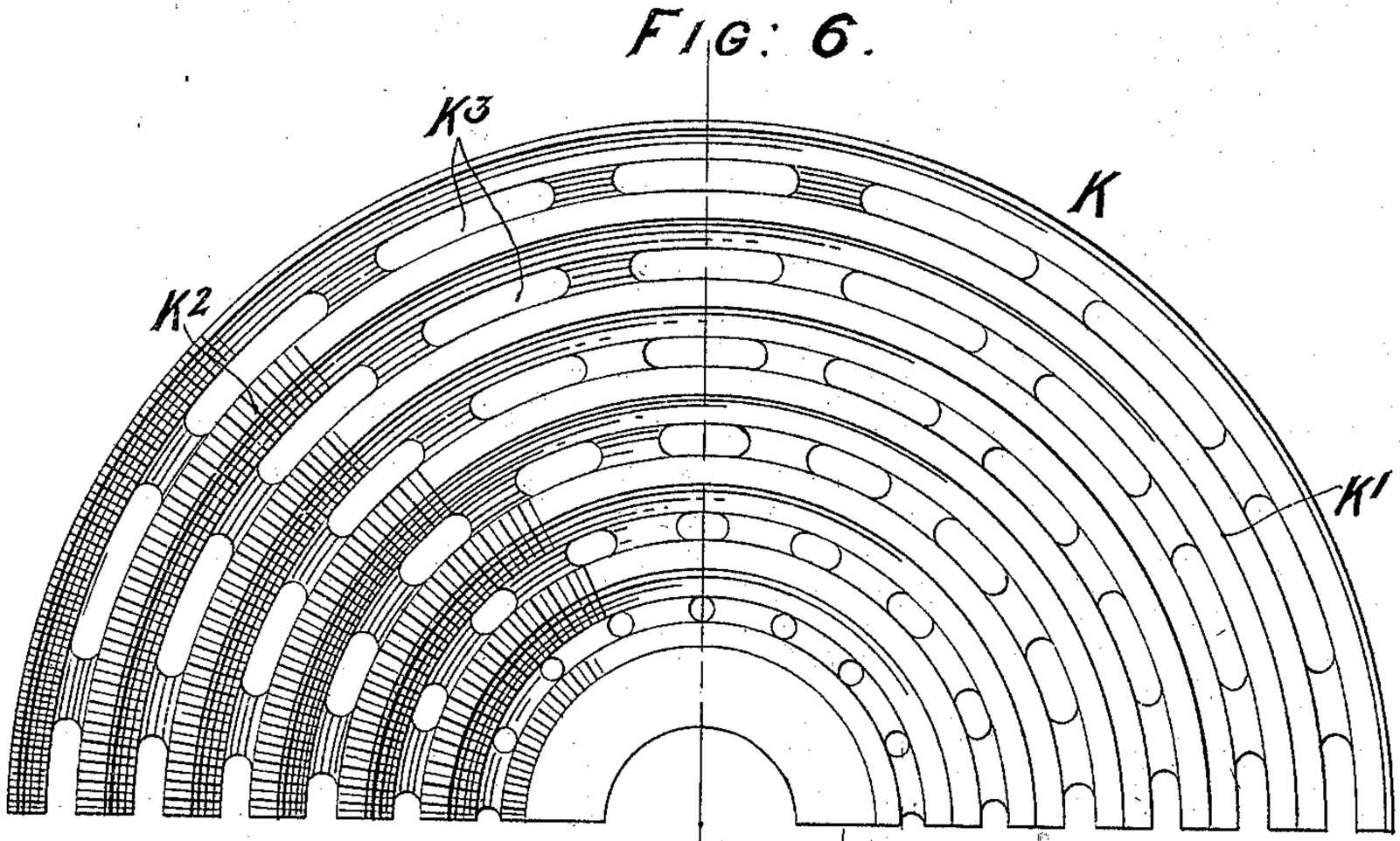
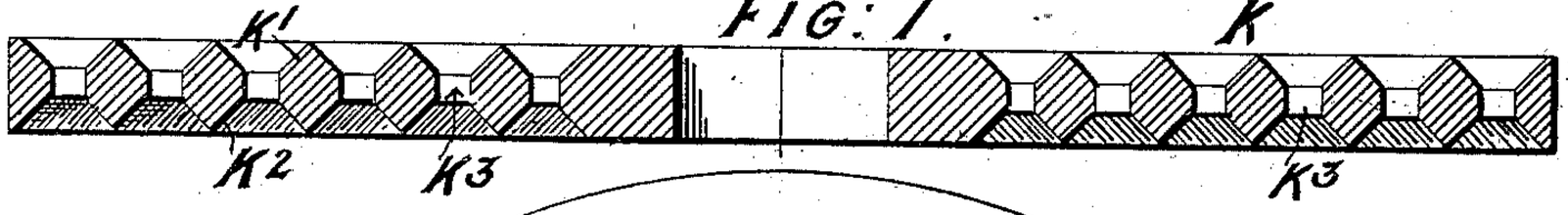


FIG: 7.



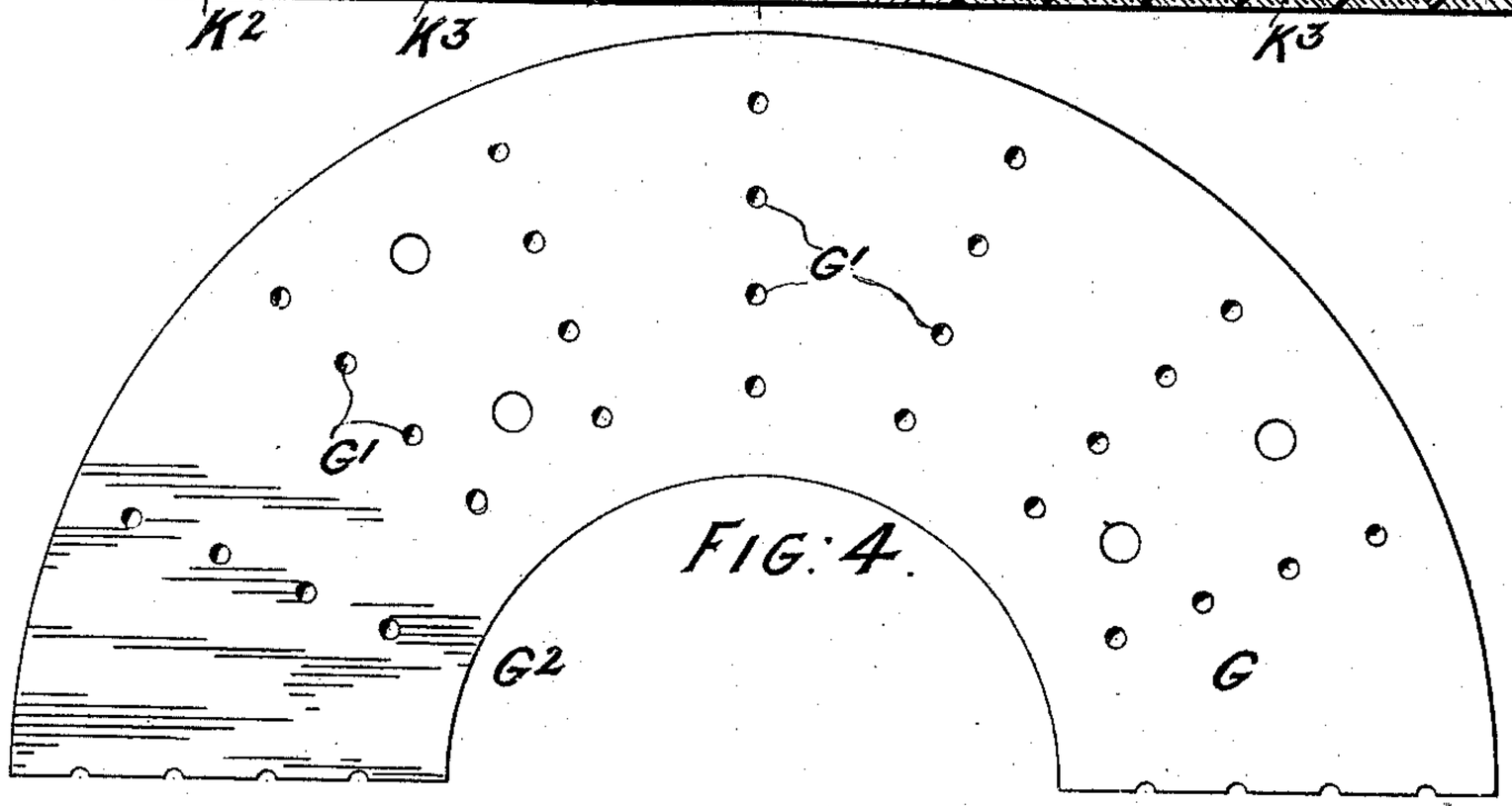


FIG: 4.

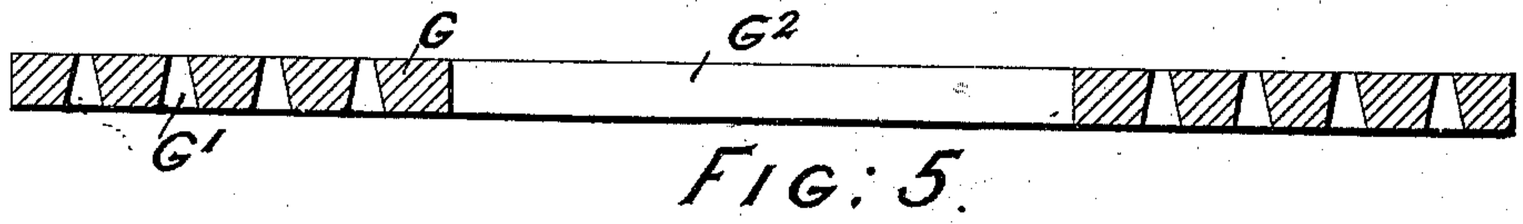


FIG: 5.

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UNITED STATES PATENT OFFICE.

ANATOLE BARGIGLI, OF PARIS, FRANCE.

APPARATUS FOR THE AMALGAMATION OF GOLD OR OTHER ORES.

SPECIFICATION forming part of Letters Patent No. 635,119, dated October 17, 1899.

Application filed April 5, 1899. Serial No. 711,783. (No model.)

To all whom it may concern:

Be it known that I, ANATOLE BARGIGLI, engineer, of Paris, France, have invented an Improved Apparatus for the Amalgamation of Gold or other Ores; and I do hereby declare that the following is a full, clear, and exact description of the same.

The object of my invention is to provide an improved apparatus for the amalgamation of gold and other ores by causing the water charged with the crushed mineral and earthy matters, hereinafter termed "pulp," to be passed upward through a body of mercury in divided streams and at the same time to cause the "pulp" to be acted upon during its said upward passage by the serrated under surfaces of a series of superposed revolving plates, each plate being perforated so that the particles after being so acted upon and triturated against the mercury by the lowest triturating-plate passes upward through the perforations in the latter plate to be again acted upon by the under surface of the next triturating-plate, and so on until the uppermost plate is reached, while the gold which becomes amalgamated is free to descend to the base of the apparatus, from whence it is withdrawn by a pipe or conduit controlled by a tap, while the residue passes off at the top of the apparatus.

My invention will be readily understood by the following description, having reference to the accompanying drawings, whereon—

Figure 1 is a vertical section of my new or improved amalgamating apparatus, Fig. 2 being a plan view of the same. Fig. 3 is a vertical section similar to Fig. 1, but showing the lower part of the apparatus only and drawn to a larger scale than the previous figures. Fig. 4 is a half-plan view of a fixed pierced plate, hereinafter described as the "distributing-plate;" and Fig. 5 is a vertical section of same. Fig. 6 is a half-plan view of one of several revolving plates employed in the apparatus and hereinafter described as the "triturating-plates," the left-hand part of the view, Fig. 6, showing the under side of the plate and the right-hand part showing the upper side of the said plate. Fig. 7 is a vertical section of the same plate.

By employing this apparatus the gold is brought into intimate contact with the mercury and becomes dissolved by the latter.

Referring to Figs. 1 and 3, the case A of the apparatus conveniently consists of a hollow frame or cylindrical casing, the upper horizontal surface A′ forming a bed-plate. Centrally in the bed-plate A′ there is formed a cavity B, preferably hemispherical, and from the lower part of same there extends a downwardly-inclined passage or pipe B′, terminating on the exterior of the base-casing A in a tap B^2, by which the delivery of amalgam can be controlled from the said cavity, within which it collects, as hereinafter described. The cavity B is closed at its upper part by a cover-plate B^3, perforated with holes, through which the amalgam passes to the said cavity.

The body C of the apparatus is cylindrical, stands vertically upon the bed-plate A′ of the base-casing A, and is conveniently formed of several cylindrical rings connected one to the other until the structure is of the required height.

At the base of the cylindrical body C, adjacent to the bed-plate A′, there is formed within an enlargement of the wall of the lower cylinder an annular channel D, from which there extends externally a tubular passage D′, connected to a pipe E, serving as the supply-pipe, by which the water charged with the mineral to be amalgamated is delivered under pressure to the annular channel D. From the said annular channel D there extends a considerable number of relatively small radial passages F in the base of the lower cylinder of the body C, such passages F opening into the interior of the apparatus at the base thereof above the base-plate A′.

At a short distance above the base-plate and above the exit ends of the radial passages F in the interior of the apparatus there is fixed a horizontal plate G, which I term the "distributing-plate." This plate G is vertically perforated with a series of holes G′, (best seen at Figs. 4 and 5,) the total area of the said holes G′ being one and a half to twice the area of the delivery-pipe E, while centrally of the plate G there is a larger circular aperture G^2, hereinafter mentioned, and the pulp delivered under pressure by the supply-pipe E enters in divided streams through the

radial passages F from the annular channel D and percolates upward through the perforations of the fixed distributing-plate.

Upon the top of the vertical cylindrical body C of the apparatus there is a cylindrical cap C′ of smaller diameter than the body C, centrally upon the closed top of which there is a stuffing-box C^2, and I provide a central vertical shaft H, which extends from the base-plate A′ up through the interior of the body C and projects through the stuffing-box C^2, before mentioned.

The top cylindrical cap C′, forming the cover of the apparatus, is or may be of smaller diameter than the body and allows the water and residue which have already passed through the apparatus to rise to a certain height above the level of the mercury to allow the particles of mercury to deposit, which would have to be extracted before this water and the residue are discharged by the opening C^3 in the side of the cap.

The lower end H′ of the shaft H aforesaid enters a bearing in the cover-plate B^3 of the central cavity B of the case, above which there is a collar H^2 on the shaft. Between the cover-plate B^3 and the collar H^2, I provide a ring of antifriction bearing-balls.

Upon the top of the cylindrical cap C′ of the body there is a fixed yoke J, carrying a center pin J′, which bears upon the upper end of the shaft H and maintains the position of the shaft vertically.

Fixed upon the shaft H and within the body of the apparatus I provide a series of superposed triturating-plates K, such series of superposed plates K forming a perforate cylindrical body fitting the body of the casing C. These plates K extend from near the distributing-plate G to near the lower part of the cylindrical cap C′ aforesaid. Two only of such plates K are shown in section at Fig. 1, similar plates being superposed one upon another, as indicated by the dotted lines. The triturating-plates K are of a circular disk formation and form an important feature of the device, the detailed construction of same being clearly shown at Figs. 6 and 7. Each plate K is formed with upper and lower concentric projecting ribs K′ K^2, the faces of the lower ribs K^2 being serrated radially, as indicated by the inverted quarter-plan at Fig. 6, while between the ribs there are a number of perforations K^3 through the plates K of somewhat sector or segmental formation for allowing the pulp to percolate through same. The total area of these perforations K^3 in each plate varies between fifteen to twenty times that of the supply-pipe E.

The vertical shaft H, carrying the triturating-plates K, is revolved by gearing—such, for example, as by a worm-wheel L, fixed on the upper end of the shaft H, operated by a worm L′, Fig. 2, carried in bearings on the cross-head J and driven by any convenient means, such as a pulley L^2.

The body C of the apparatus is filled with mercury to the level of the upper triturating-plate at $K^\times$, and a gage-glass M is provided, by which the level of the mercury can be observed. Also the cylindrical cap C′ is fitted with a pipe N, by which mercury can be inserted.

The frictional resistance to be overcome in rotating the triturating-shaft H is but small, as the shaft H and triturating-plates K, being constructed of material of less density than mercury, become floated in the latter and do not therefore exert pressure on the lower bearing.

The operation of the amalgamator constructed as described is as follows: The body of the apparatus being charged with the required mercury by means of the pipe N, the pulp to be treated is admitted by the supply-pipe E under artificial pressure or pressure obtained by reason of the supply-pipe E extending upward to a tank (not shown) at a sufficient height. The mercury will then assume its proper level—that is, it will rise to or about the uppermost triturating-plate—and the level will be shown by the gage M. The vertical shaft H, carrying the triturating-plates K, is then set in motion. As soon as the pulp issues by the radial passages F it comes in contact with the under surface of the distributing-plate G. The pulp is then forced upward through the perforations of the distributing-plate G and is thereby divided into a number of vertical streams; but although the perforations G′ are of a total area greater than that of the supply-pipe E, yet these perforations may not allow the passage of all the pulp which constantly arrives, and the said pulp is therefore carried toward the central opening G^2—that is to say, the center of the apparatus—from there passing upward along with the numerous divided streams from one triturating-plate K to another by the apertures therein, sometimes ascending vertically, sometimes being drawn circularly by the plates and finished by arriving at the top of the apparatus, and after having left the precious metal behind the water and residue escape by the opening C^3 in the cylindrical cap C′ at the upper part of the apparatus. In practice the pulp would only have to be supplied from a reservoir placed at such a height that the pressure of the column of water just exceeds that of the column of mercury to establish through the mercury a natural flow almost without any bubbling. Whatever may be the method of supplying the pulp at a proper pressure, the action is the same—that is to say, the supply-pipe will deliver the pulp into the apparatus—the pulp consisting of four principal constituents—viz., water, the earthy part of mineral, precious metal in fine powder or in small grains, as well as a certain quantity of air. Now all these elements move in a liquid metal, the weight of which is about thirteen and one-half times that of water. As soon as all these materials go through the perforations of the distributing-

plate G into the apparatus they become separated, the air by reason of its very little density escapes immediately through the mercury toward the top of the apparatus, followed more slowly by the water and then by the earthy materials. The absolutely free gold being of a density very much greater than the mercury naturally remains at the bottom of the apparatus and amalgamates; but a great part of the gold although free is often attached in extremely-fine particles to the small grains of quartz, and their ascending movement being very slow these grains of quartz are caught by the serrations of the first triturating-plate K and are triturated against the mercury, which, although liquid, has always a certain amount of consistence. The particles escaping upward through the apertures K^3 of the first plate K are then acted upon by the second plate K, and so on. It will thus be easily understood that this trituration is repeated numerous times and each time by a length of surface of the plates K, and that by this continuous action all the gold incident in the particles becomes dissolved. The gold becomes amalgamated during the upward travel of the pulp and is deposited in small globules at all points of its travel upon the top of the revolving plates K, where, guided by the smooth inclined concentric ribs and being sheltered from the currents, however weak they may be, the circular movement of the plates causes these little globules to move slowly until they meet with one of the holes K^3, by which they fall on the plate immediately below, and so on to the bottom of the cavity B. During the operation of the apparatus the gage M allows of its regular movement being controlled, and any drawing away of the mercury may be observed.

I claim as my invention—

1. In apparatus for amalgamating gold and other ores, the combination with a vertical cylindrical casing containing mercury, passages to the interior of the base of the casing, and means for supplying the "pulp" to be treated to the passages at a greater pressure than that of the column of mercury, a cavity at the base of the casing to receive the amalgam, and an exit, above the level of the mercury, to take off the water and residue of the pulp; of a central vertically-arranged rotatable shaft, a series of superposed circular plates fixed on the shaft, each plate having upper and lower concentrically-ribbed surfaces, the ribs on the lower surfaces being serrated, and a series of segmental perforations through each plate for the passage of the "pulp" and amalgam—such series of superposed plates forming a perforate cylindrical body fitting the body of the casing, capable of rotation, and through which the pulp and amalgam percolate in a vertical direction therein, substantially as set forth.

2. In apparatus for amalgamating gold and other ores, the combination of a vertical cylindrical casing to contain mercury, an annular channel at the base thereof, a tubular passage and a pipe to conduct the "pulp" to be treated to the annular channel, a number of radial horizontal passages from the channel to conduct the "pulp" to the base of the interior of the casing, a perforated distributing-plate, having a central, circular aperture fixed horizontally a short distance above the base of the casing, a central spherical cavity in the base of the casing to collect the amalgam, an inclined pipe and tap to draw off the amalgam, a perforated cover-plate for the cavity and a bearing in the cover-plate, a cylindrical cap above the cylindrical casing, a central stuffing-box in the top of the cylindrical cap, a yoke provided with a central pin and carried by the cylindrical cap, a shaft passing through the stuffing-box supported at its base in the bearing in the cover-plate, and at the top by the center pin in the yoke, and mechanism to revolve the shaft, a number of superposed circular plates fixed on the shaft, each plate having upper and lower concentrically-ribbed surfaces, the ribs on the lower surfaces being serrated, and a series of segmental perforations through each plate for the passage of the "pulp" and amalgam, a space in the cylindrical cap, a pipe to conduct the water and residue away, a gage-glass on the casing to enable the level of the mercury to be observed, and a pipe for the insertion of the mercury, substantially as set forth.

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