No. 622,408. Patented Apr. 4, 1899.

F. B. ASPINALL & E. C. EKSTROMER.

MEANS FOR EXTRACTING PRECIOUS METALS FROM THEIR ORES.

(Application filed Oct. 10, 1898.)

(No Model.) 3 Sheets—Sheet 1.

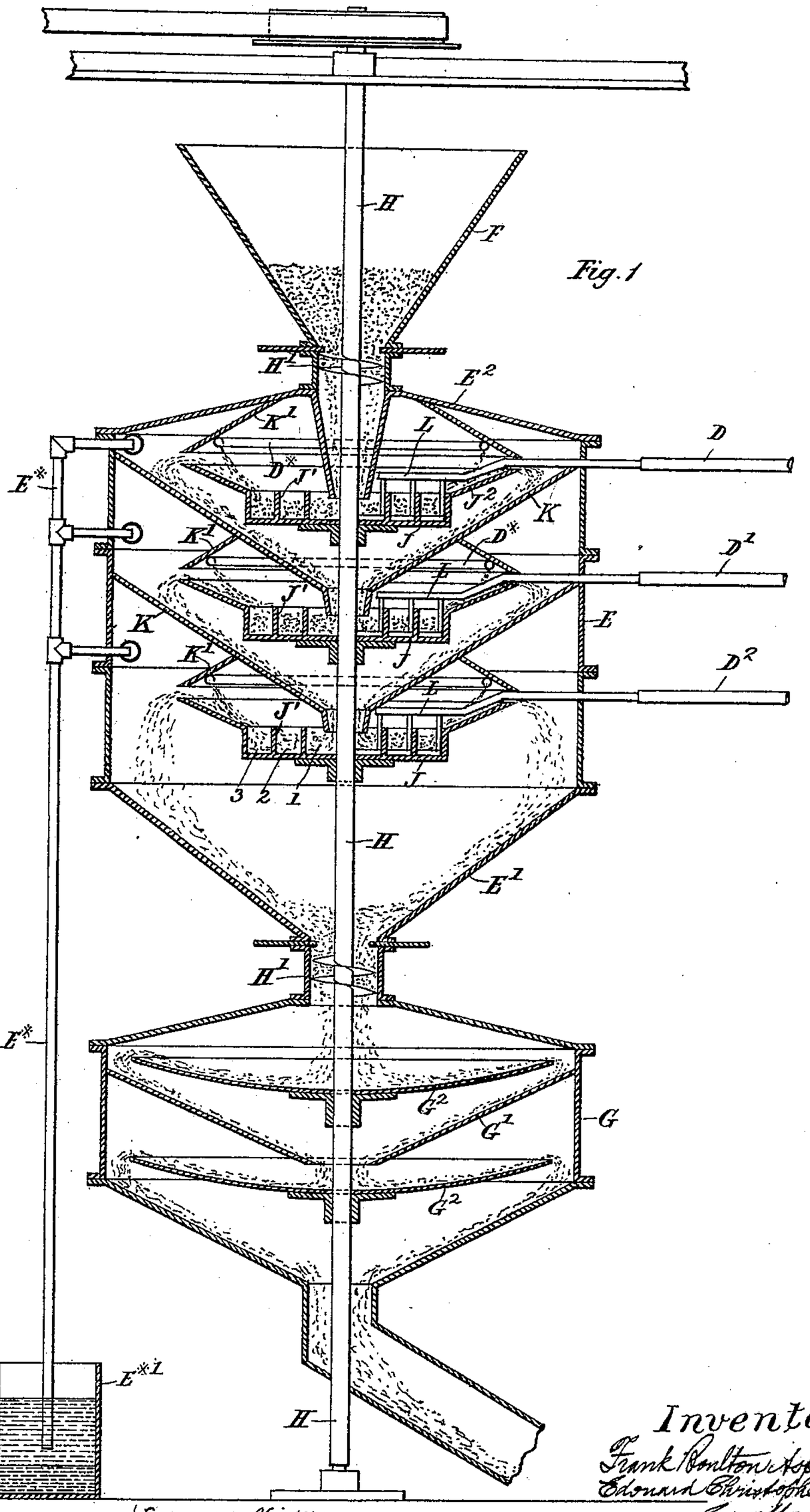

Fig. 1

Witnesses: Edward Viser. George Barry Jr.

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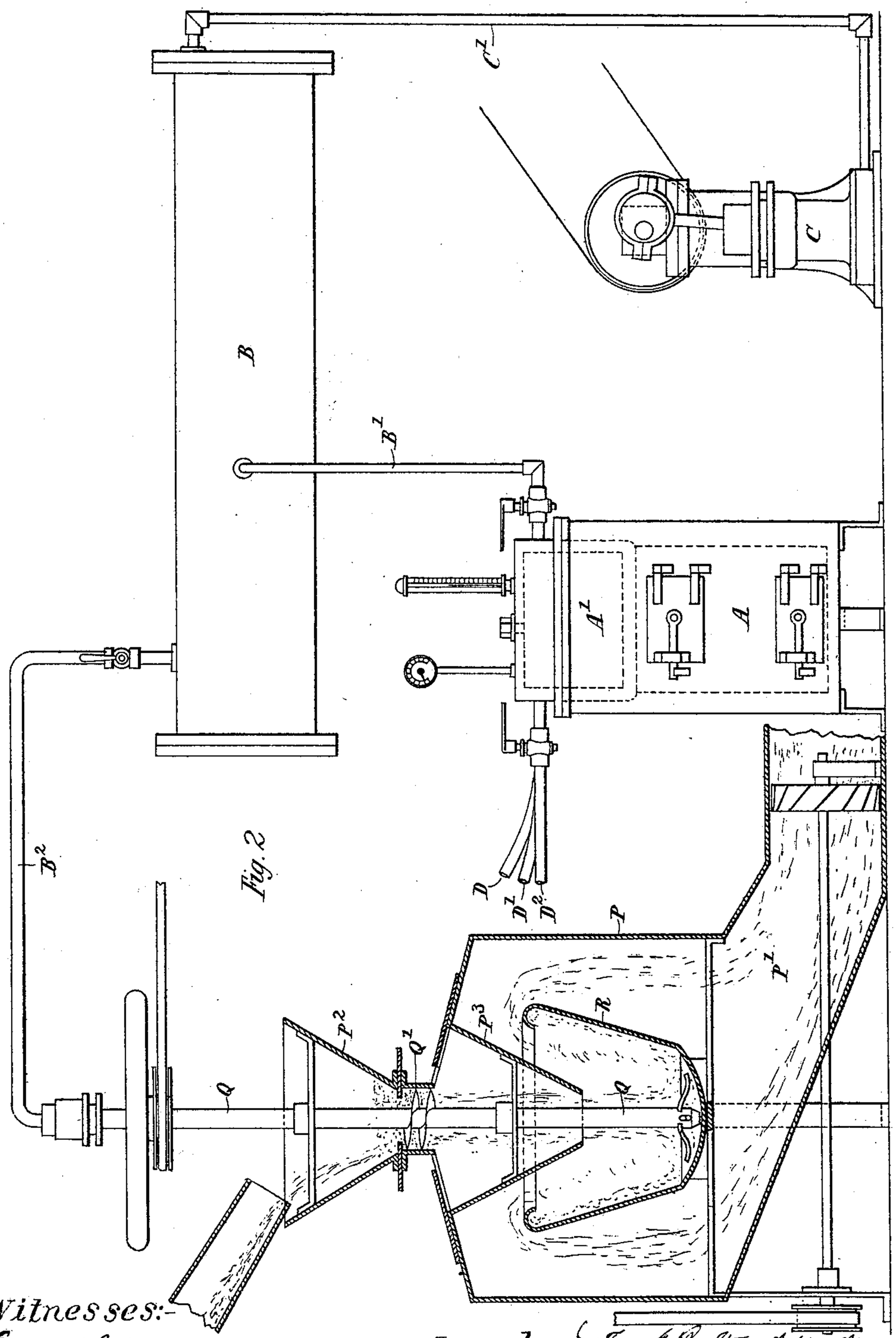

Fig. 2

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3 Sheets—Sheet 3.

Fig. 4.

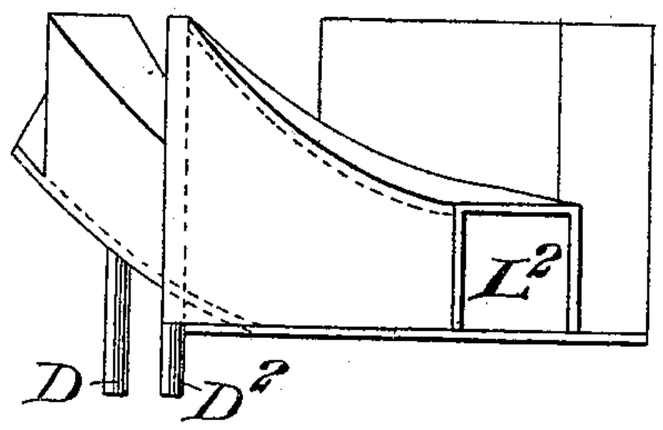


Fig. 3.

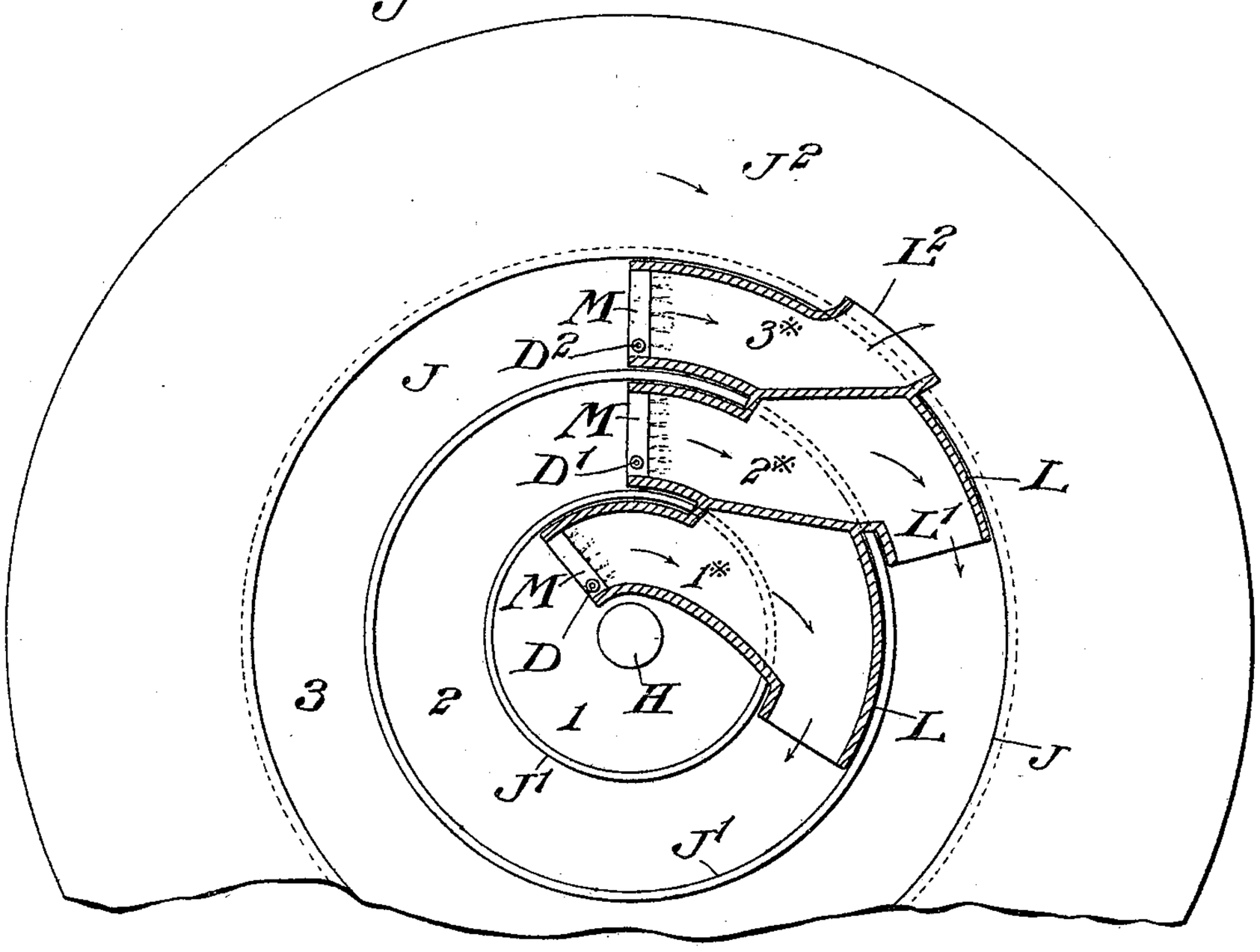
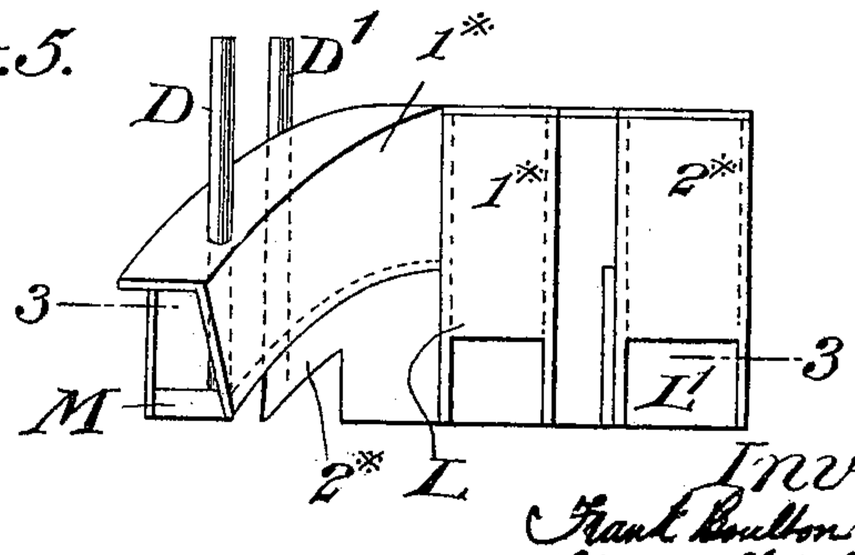


Fig. 5.



Witnesses:-
George Barry Jr.
Edward Vieser

Inventors.
Frank Boulton Aspinall
Edmund Christopher Ekstromer
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UNITED STATES PATENT OFFICE.

FRANK BOULTON ASPINALL, OF LEE, AND EDOUARD CHRISTOPHER EKSTROMER, OF SNARESBROOK, ENGLAND.

MEANS FOR EXTRACTING PRECIOUS METALS FROM THEIR ORES.

SPECIFICATION forming part of Letters Patent No. 622,408, dated April 4, 1899.

Application filed October 10, 1898. Serial No. 693,178. (No model.)

To all whom it may concern:

Be it known that we, FRANK BOULTON ASPINALL, a subject of the Queen of Great Britain, and a resident of Dacre Park, Lee, in the county of Kent, and EDOUARD CHRISTOPHER EKSTROMER, a citizen of the United States of America, and a resident of Wellesley road, Snaresbrook, in the county of Essex, England, have invented an Improvement in Means for Extracting Precious Metals from Their Ores, of which the following is a specification.

This invention relates to the extraction of precious metals from their ores by amalgamation, which is effected by subjecting the ores in a finely-pulverized state and in the form of a cloud to the action of the fumes of mercury; and for this purpose the improvement consists in the apparatus hereinafter described and claimed.

Figures 1 and 2 together represent an elevation, partly in section, of the apparatus. Fig. 3 represents, on an enlarged scale, a horizontal section, in the line 3 3 of Fig. 5, of a device which is termed a "plow" and a plan of a pan in which it works. Fig. 4 is an elevation of one side of this plow, and Fig. 5 is a similar view of the other side of the plow.

A, Fig. 2, is a furnace for heating the mercury to obtain the fumes above mentioned and which is contained in the vessel A′ (shown by dotted lines.)

B is a compressed-air reservoir, into which air is driven by a force-pump or equivalent contrivance C through the pipe C′. From the reservoir B the air is passed by the pipe B′ to the mercury-chamber A′ and by a pipe B^2 to a separator, which will be presently described. From the chamber A the mercury-laden air passes by pipes D D′ D^2 to an amalgamator E, which will now be described. These pipes are provided with cocks, so that one or more of the pipes may be temporarily cut off, if required. This apparatus consists of a cylindrical casing E with a hopper-shaped bottom E′ and having a cover E^2, carrying a feeding-hopper F, all made of iron, which does not become "wetted" by the mercury. This apparatus is so formed that the inlet and outlet will become sealed by the powdered ore, so that the fumes will not escape. Below the amalgamator E is another vessel G, which is termed a "concentrator," which will also be composed of iron and may be capable of being sealed, as before explained, and from this vessel the material passes by a spout to the separator before mentioned.

Passing vertically and centrally through the amalgamator E, the hopper F, and concentrator G is a spindle H, which is supported and driven in any convenient manner. The spindle H carries two screws H′, which serve to regulate the flow of material from the hoppers F and E′. Upon the spindle is mounted a series of trays J, and each tray is provided with partitions J′, preferably vertical and concentric, so as to form a central space 1 with two annular concentric passages or troughs 2 3 around it. The edge of the tray is provided with an upwardly-extending conical lip or flange J^2. These trays J are contained in compartments formed in the casing by inverted conical partitions K, and to the under side of these partitions K and of the cover E^2 are secured conical deflectors K′ of the same diameter as the lips or flanges J^2 of the trays J and arranged so that there will be a small space between the edges of the flanges and the deflectors.

Below each deflector is a perforated annular pipe D* in connection with one of the pipes D, D′, or D^2, by means of which the mercury-laden air is thrown on the lip or flange J^2 of the tray J beneath for a purpose to be presently explained.

Dipping into the troughs of each tray is a peculiarly-shaped appliance, which is designated a "plow" L and is shown at Figs. 3, 4, and 5. In Fig. 1 the position of this plow L is indicated, though the plow is not shown from want of space; but in Fig. 3 the plow is shown, drawn on an enlarged scale, as applied to the tray J, the cover of the plow being removed to show more readily the internal construction of the appliance. This plow,

then, consists of a casting L, having three inclined passages 1* 2* 3*, one for the central space 1 and one for each trough 2 3. These passages are open at their upper and lower ends. The inclined bottom of each passage commences low down within—say at the bottom—the space or trough and then rises so as to pass over the top of the partitions J'. At this point, in the case of passages 1* 2*, there is a well or spout L' projecting downward into the troughs 2 or 3, as the case may be, and in the case of passage 3* an opening L^2 is made in the side wall delivering onto the lip or flange J^2 of the tray J. The walls of the passages and the wells or spouts L' are curved to the radius of the partitions J', and the partitions as they revolve pass partly between and partly under the passages, as will be seen from the drawings.

In the mouth of each passage is a nozzle M, which is in connection with one of the pipes D D' D^2, so that jets of the mercury-laden air are injected into the mouth of the passages.

The action of this part of the apparatus is as follows: The ore, ground to a condition of dust or impalpable powder, is placed in the hopper F and is gradually fed by the screw H' into the central space 1 of the top tray J. The spindle H being driven at considerable speed, the tray is rotated therewith, and the material is thus forced up the passage 1* or is scooped up by the plow, which projects into the space. This, so to speak, raises a cloud of dust in the passage with which the mercury fumes issuing from the nozzle M come in contact. The dust and amalgam then fall by the well or chute L' into trough 2, where the same operation takes place in passage 2*. The dust and amalgam then fall into trough 3 and the same operation takes place in passage 3*. From this passage the dust and amalgam pass by the opening L^2 onto the lip or flange J^2 of the tray, up which they gradually creep by centrifugal action and fall over the edge. On the lip or flange the ground ore is subject to the action of jets of mercury fumes coming from the annular pipes D* above mentioned. The ore, with the amalgam, then slides down the conical partition K, which practically forms a hopper, into the central space 1 of the next tray J. The same series of operations as above described will then take place with respect to the second tray J, and this may be continued any number of times, according to the nature of the ore to be treated and the number of trays provided. From the last tray J the whole mass falls into the hopper E', by which it is conducted to the concentrator G. It is allowed to enter in regulated quantities by the screw H'.

E* is an outlet-pipe in connection with each compartment of the amalgamator E, by which the air under compression may escape from the casing. As, however, mercury fumes may pass away with the air, the pipe E* dips into an interceptor E*' containing water, in which the fumes are condensed and retained. The inlets to the branches of E* will be covered with gauze to prevent the dust passing away with the air and fumes.

The concentrator consists of a cylindrical casing G, with a conical partition G', (practically forming hoppers,) and the compartments formed by this partition inclose dishes G^2, mounted on the shaft H and rotating with it at considerable speed.

The mercury, which will have become condensed in the shape of small globules before it passes to the concentrator, will, as with the ore it creeps outward by centrifugal action and is, so to speak, rolled over and over, form blobs or large globules of amalgam, and thus becomes, as it were, concentrated. This action may be continued for such number of times as may be thought desirable, and the concentrated ore then passes to the separator P, Fig. 2. This separator consists of a cylindrical casing P, having a trunk P' at its lower end leading to the open air or elsewhere, as may be desired. On the cover of the casing is secured a hopper P^2, which receives the ore and amalgam from the concentrator G, and inside the cover is an inverted conical deflector P^3. Running vertically and centrally through the apparatus is a hollow spindle Q, which receives air from the reservoir B and is rotated in any convenient manner.

The feed from the hopper P^2 is regulated by a screw Q' on the spindle Q or in any other convenient manner.

Below the deflector P^3 is a pan R, having an overhanging rim or flange, as shown, and this pan is supported and arranged in any convenient manner, so that it may be readily removed when required. The spindle Q descends nearly to the bottom of this pan, and at the end is provided with hollow arms, which serve to distribute compressed air in the pan and also to stir up the contents. The concentrated ore is allowed to fall into this pan, and by the action of the blast the dust is blown away and drops down outside the pan into the trunk, from which a screw conveys it away.

The overhanging lip or flange prevents the amalgam from passing away with the dust.

From time to time the amalgam is removed from the pan and is treated in any convenient manner to recover the precious metals.

It will be understood that the apparatus described is capable of more or less modification in many respects in the shape of mechanical equivalents for carrying out the process, an essential feature of which is to separate the particles of the ore to raise a cloud of dust, with which the fumes of mercury are

brought into contact, and we therefore do not intend to confine ourselves to the exact details shown.

We claim—

An apparatus for extracting precious metals from their ores comprising a tray divided by partitions into annular troughs, a closed vessel within which said tray rotates, a plow containing a series of inclined passages leading from one to another of said troughs over their dividing-partitions, a nozzle in the mouth of each of said passages, means for supplying pulverized ore to said tray and means for supplying mercury fumes through said nozzles into said passages, all in combination substantially as herein described.

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EDOUARD CHRISTOPHER EKSTROMER.

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FRED C. HARRIS.

Witnesses to the signature of Edouard Christopher Ekstromer:

WALTER J. SKERTEN,
GEO. J. B. FRANKLIN.