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S. ALFORD & J. J. R. SMYTHE.

AMALGAMATING MACHINE.

APPLICATION FILED FEB. 14, 1903.

NO MODEL.

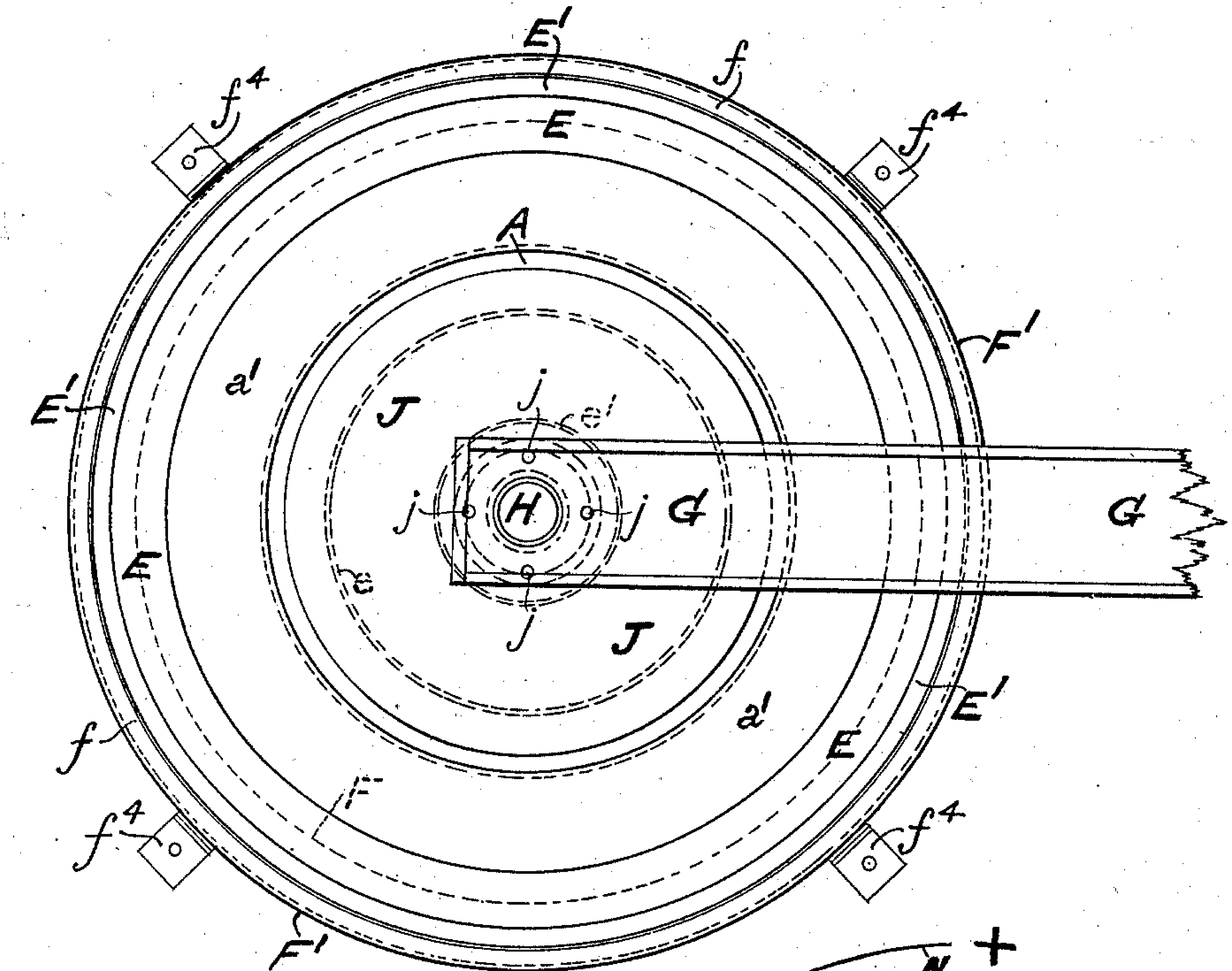

Fig. 2.

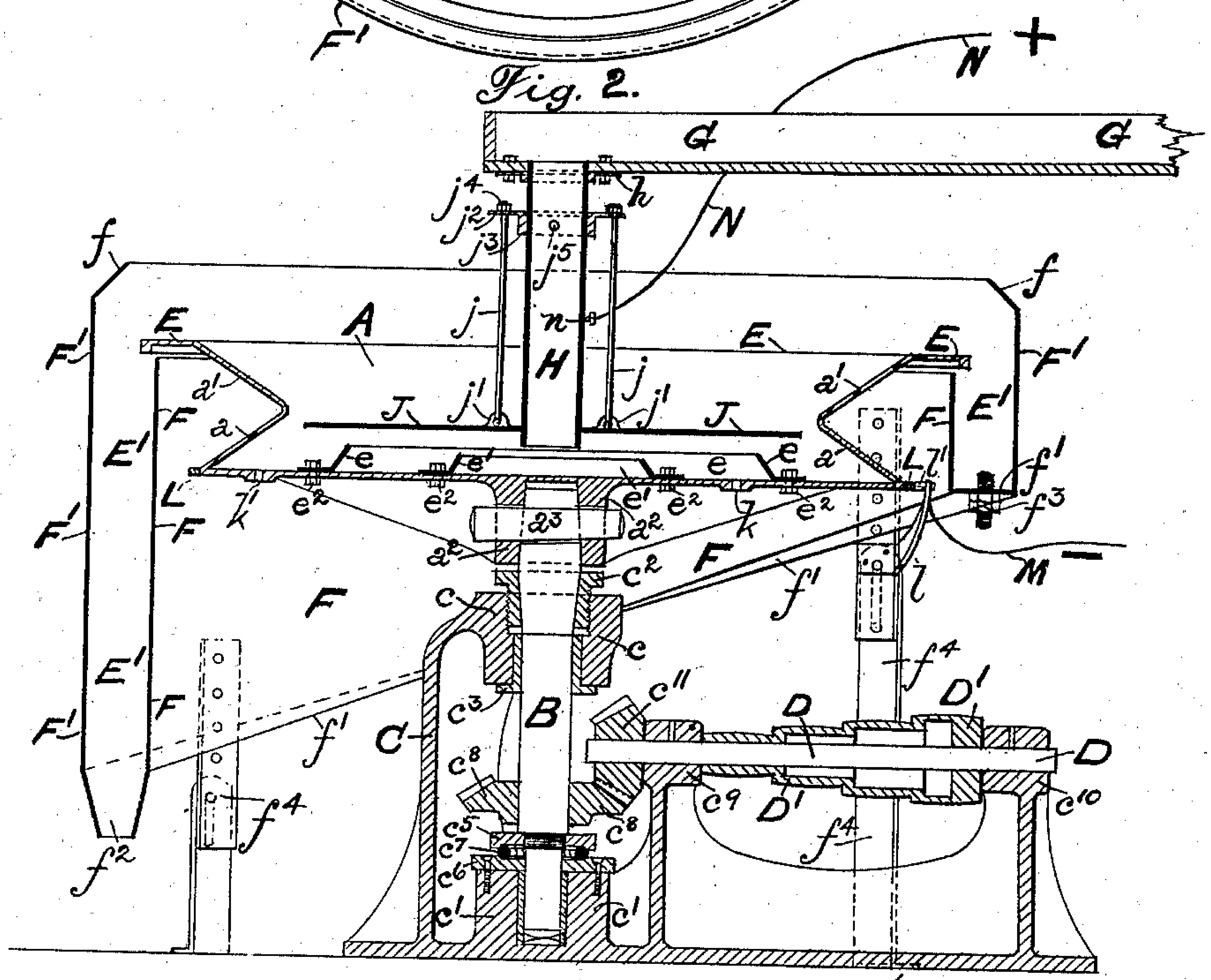

Fig. 1.

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No. 748,456. Patented December 29, 1903.

UNITED STATES PATENT OFFICE.

SAMUEL ALFORD AND JOHN JAMES ROBERT SMYTHE, OF JOHANNESBURG, TRANSVAAL, ASSIGNORS OF ONE-THIRD TO CHARLES LLEWELLYN ANDERSON, OF JOHANNESBURG, TRANSVAAL.

AMALGAMATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 748,456, dated December 29, 1903.

Application filed February 14, 1903. Serial No. 143,404. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL ALFORD and JOHN JAMES ROBERT SMYTHE, subjects of the King of England, residing at Johannesburg, Transvaal, have invented a certain new and useful Improvement in Amalgamating-Machines, (for which we have applied for Letters Patent in the Transvaal, No. 625, filed November 27, 1902,) of which the following is a specification.

This invention relates to amalgamating-machines employed in the treatment of auriferous or other metalliferous ores for the separation or extraction of the precious metal.

The object with which the invention is designed is to produce a machine of increased efficiency or one in which a higher or more complete extraction of the precious metal from the pulp or sand will be obtained, and that with the loss of a minimum quantity of mercury.

With the improved machine we can deal effectively, rapidly, and cheaply with large quantities of pulp, thereby rendering it possible to treat low-grade ores profitably. In our machine the pulp is not passed through the mercury, as in many of the existing machines, (which action has the effect of breaking up the mercury and results in it being carried away in the pulp and lost;) but by centrifugal action the pulp is brought into contact with the surface only, and in its passage through the machine it passes over or is exposed to a much larger surface of mercury in comparison with the amalgamating-machines now in use.

The invention consists, essentially, of a machine comprising a rotating vessel provided internally with pockets or traps adapted to retain within the vessel a quantity or body of mercury, into which rotating vessel the pulp is introduced and caused to pass or flow over the surface of the mercury and out of the vessel by the centrifugal action set up therein.

In order that the invention may be fully understood, we append a sheet of drawings, in which we illustrate an amalgamating-machine embodying our invention and which we have marked with letters of reference corresponding to the following description thereof.

Figure 1 shows a sectional elevation of the machine, and Fig. 2 a plan of same.

In the construction of the machine we employ a circular rotating pan or vessel A for the mercury. In the construction shown in the drawings this pan consists of two truncated or frusto cones, the base of the lower frustum a forming the bottom of the vessel and the base of the upper frustum a' the open top of the vessel. In other words, the vessel may be described as a circular one having its sides inclined inward and upward from the bottom to the center and then outward and upward to the top.

The base of the vessel A on the under side is formed with a socket or boss a^2, provided with a central taper hole adapted to receive the upper extremity of the vertically-disposed driving-shaft B. The extremity of the shaft B projecting into the socket a^2 is made taper to correspond to the socket. Through the socket a^2 is formed a keyway and through that portion of the shaft B fitted therein is provided a coincident key way or hole. a^3 is a key passing through the coincident keyways in the socket and shaft for detachably fixing the vessel or pan A on the extremity of the shaft B.

The vertically-arranged driving-shaft B is supported in a pedestal C, which forms a bearing c for it at the top or in proximity to the base of the pan A and also a footstep-bearing c' for the lower extremity thereof. In the top bearing c is screwed a bush c^2, formed with an internal taper, and that portion of the shaft contained within the same is correspondingly tapered, so that by screwing up the bush the shaft may be centered and adjusted or any looseness or play in the bearing due to wear may be taken up.

c^3 is a liner or bush for the lower portion of the top bearing c, and a lubricator may be provided for introducing a lubricant into said bearing.

On the lower extremity of the shaft B, above the foot step-bearing c', is screwed or otherwise fixed a disk or collar c^5, and on the top of the bearing c' is fixed a plate or disk c^6.

The adjacent surfaces of the two plates or disks c^5 c^6 are recessed or grooved to form a race for the antifriction-balls c^7, which are interposed between them.

On the driving-shaft B, above the disk or collar c^5, is keyed or otherwise securely attached a bevel-wheel c^8.

In proximity to the pedestal C bearings c^9 c^{10} are provided, in which is journaled a horizontal shaft D. The supports for the bearings of the shaft D are preferably cast in one piece with the pedestal C and its base-plate, as shown in the accompanying drawings. On the shaft D, between the bearings c^9 c^{10}, is fixed a speed-cone D′ for driving the same. This allows the speed at which the vessel A is rotated to be readily varied as may be required when the machine is put into operation. The shaft D projects beyond the bearings c^9 and has fixed on the extremity thereof a bevel-wheel c^{11}, which gears with the bevel-wheel c^8, fixed on the vertical shaft B. By this means a rotary motion is transmitted from the horizontal shaft D to the vertical shaft B and through the latter to the amalgamating-pan A.

Any suitable alternative arrangement of gearing may be employed for imparting the requisite rotary motion to the pan A which will allow of the speed at which the pan is rotated to be varied according to the character of the pulp to be treated or the quantity it is desired to pass through the machine.

In the interior of the pan A and on the bottom thereof are fixed two concentric conical rings e e'. The rings are fixed to the bottom of the pan by means of the bolts e^2 passed through flanges formed round the rings at the base. The rings e e' are shallow as compared with the depth of the pan A, and the inner ring e' is shallower than the outer ring e. The two rings e e', as also the lower frustum a, form annular pockets or recesses round the base of the pan A on the inside, which operate as traps to retain the mercury within the pan when it is rotated at a high speed.

Round the top or upper edge of the amalgamating-pan A is formed a flat annular lip E, and encircling the pan are two concentrically-arranged cylinders F F′. The inner cylinder F is slightly less in diameter than the top of the pan A, so that it projects beneath the lip E, and the outer cylinder F′, which is larger in diameter than the top of the pan, projects above the level of the lip E and is turned inward at the top, as seen at f, so as to deflect the pulp as it flows over the lip E into the annular chamber E′, formed between the cylinders F F′, and prevent it from splashing over the upper edge of the outer cylinder F′.

The concentric cylinders F F′ are shaped so as to cause the pulp when it enters the annular chamber E′ to flow to a convenient point for discharge. This is effected by inclining the bottom f' of the chamber E′ to a spout or outlet f^2, fitted in the bottom f' at the lowest point. The spout f^2 may discharge into a launder or trough, along which the pulp will flow to any desired point.

In the bottom f' of the chamber E′ is fitted a union f^3 for a water-supply connection to wash the pulp out of the chamber, if necessary. The union is fitted in the bottom f' at the highest point.

The cylinders F F′ are carried by the four adjustable legs or supports f^4.

The pulp or sand to be treated is led or introduced into the machine along an inclined overhead launder G, which terminates above the pan. In the end of the launder G, immediately over the center of the pan A, is fixed a cylindrical feed pipe or chute H, down which the pulp falls onto the center of the pan. The pipe H is fixed in the bottom of the launder by means of the flange h formed on or attached to the top of the pipe. In order to effect an equal distribution of the pulp in the interior of the pan A, the center of the pipe H is in alinement with the center of the shaft B or the axis of the pan A.

In the interior of the pan A and above the concentric conical rings e e' is a horizontally-disposed adjustable deflecting plate or disk J. This disk is hung or suspended from the feed-pipe H by means of the four rods j. The rods at their lower ends are attached to lugs j', formed on the top of the disk J, and at their upper ends pass through a flange j^2, formed on a collar j^3, and have nuts j^4 screwed on their extremities above said flange. The collar j^3 is adjustably fixed on the pipe H by means of a set-screw or the like passed through a hole j^5 in the collar.

The deflecting-disk J acts to prevent the pulp when it falls into the pan A from splashing upward and compels it as it passes through the pan to spread or pass over the surface of the mercury in the several pockets or traps. The disk J can be arranged so that it assumes a position just below the center of the pan or the smallest diameter thereof, as shown in the drawings, or it may be raised or lowered from that position, as may be found necessary or desirable in the working of the machine to effect the spreading or distribution of the pulp in the pan, while not impeding its egress therefrom.

In the bottom of the pan A holes k k' are provided and fitted with plugs. These holes serve to draw off the mercury from the pan, the hole k for the pocket formed by the outer concentric ring e and the hole k' for the pocket formed by the frustum a or the lower portion of the pan A.

For the purpose of passing an electric current through the pan and its contents a copper or other suitable metal ring or band L is shrunk or otherwise fixed round the bottom edge of the pan A. A bracket l is adjustably bolted to one of the legs f^4 of the cylinders F F′. The bracket l, which is shaped to project within a short distance of the metal band

L, carries a brush l', connected with the electrical wire M, thus forming an electrical connection with the rotating metal pan A. The other electrical wire, N, is attached to the metal feed-pipe H at the point n or in other convenient position, thereby constituting the pipe the anode for the passage of the electric current through the mercury contained within the pan A.

The particular shape of the amalgamating-pan and the precise arrangement, construction, or number of the pockets or traps above described, and shown in the drawings, are not absolutely essential for the accomplishment of the objects we have in view—viz., the retention of the mercury within the pan, while allowing it to be rotated rapidly, and to present a large area or surface of the mercury to the pulp as it flows through the pan by the centrifugal action set up within the same when it is rotated. We find that the peculiar shape of the vessel and the construction and arrangement of the rings shown and described give good results in practice; but we illustrate them by way of example only.

In working the machine a suitable quantity of mercury is first placed in the pan A, and motion is then imparted to shaft B, which in turn rotates the pan. Should too much mercury have been placed in the pan for the speed at which it is intended to run, it will be thrown out of the vessel over the lip E and may be caught at the spout f^2. The pulp or sand is now led along the launder G and falls from thence down the pipe H onto the bottom of the pan, and the electrical current is then switched on. The deflecting-disk J operates to prevent the pulp splashing upward out of the pan, secures an even and equal distribution of the incoming pulp, and compels it to flow or pass over the surface of the mercury contained within the recesses formed by the concentric conical rings e e' and lower frustum a. The mercury fills or partially fills the recesses formed in the interior of the rings e e' and the recess formed by the inwardly-inclined sides of the lower portion a of the pan, so that as the pulp passes over the surface of the mercury and is thrown to the periphery of the pan by the centrifugal action the metallic particles are amalgamated, and the remainder of the pulp passes up the surface or wall presented by the mercury, over the edge formed at the center of the pan above the disk J, and up the outwardly-inclined sides of the upper part a' of the pan and over the lip E into the chamber E′ between the cylinders F F′, whence it passes out through the spout f^2.

What we claim as our invention, and desire to protect by Letters Patent, is—

1. An amalgamating-machine, comprising a revoluble pan, and a ring of less height and diameter than the rim of the pan, secured to and inclining upwardly and inwardly from the bottom of the pan, as set forth.

2. An amalgamating-machine, comprising a revoluble pan, and a plurality of concentric rings of less height and diameter than the rim of the pan, secured to and inclining upwardly and inwardly from the bottom of the pan, as set forth.

3. An amalgamating-machine, comprising a revoluble pan, and a plurality of concentric rings of less diameter than the rim of the pan, secured to the bottom of the pan, the outer ring being of less height than the rim of the pan and the inner ring being of less height than the outer ring, as set forth.

4. An amalgamating-machine, comprising a revoluble pan having a rim which inclines first inward and upward from the bottom and thence outward and upward to the top, and one or more rings of less height and diameter than that of the rim, secured to and inclining upwardly and inwardly from the bottom of the pan, as set forth.

5. An amalgamating-machine, comprising a revoluble pan, and a ring of less height and diameter than the rim of the pan, secured to and inclining upwardly and inwardly from the bottom of the pan, means for delivering pulp to the pan, and a deflecting-plate within the pan and extending over the ring on the bottom of the pan, as set forth.

6. An amalgamating-machine, comprising a revoluble pan having a substantially flat bottom, and a plurality of concentric rings of less height and diameter than the rim of the pan, secured to the bottom of the pan, means for delivering pulp to the pan, and a deflecting-plate within the pan and extending over the rings on the bottom of the pan, as set forth.

7. An amalgamating-machine, comprising a revoluble pan, and a plurality of concentric rings of less diameter than the rim of the pan, secured to the bottom of the pan, the outer ring being of less height than the rim of the pan and the inner ring being of less height than the outer ring, means for delivering pulp to the pan, and a deflecting-plate within the pan and extending over the rings on the bottom of the pan, as set forth.

8. An amalgamating-machine, comprising a revoluble pan having a rim which inclines first inward and upward from the bottom and thence outward and upward to the top, and one or more rings of less height and diameter than that of the rim, secured to and inclining upwardly and inwardly from the bottom of the pan, means for delivering pulp to the pan, and a deflecting-plate within the pan and extending over the rings on the bottom of the pan, as set forth.

9. An amalgamating-machine, comprising a revoluble pan, and a ring of less height and diameter than the rim of the pan, secured to and inclining upwardly and inwardly from the bottom of the pan, means for delivering pulp to the pan, and means for passing a current of electricity through the pulp to the pan, as set forth.

10. In an amalgamating-machine, in com-

bination, the pan A comprising the lower and upper frustums a a', the two concentric rings e e^2 of less height than the rim of the pan and secured to and inclining upwardly and inwardly from the bottom of the pan, the lip E formed round the top of the pan, and the cylinders F F′ forming between them the chambers E′ for receiving the pulp as it leaves the pan, as set forth.

11. In an amalgamating-machine, the combination of the pan A, the concentric upwardly and inwardly inclined rings of less height than the rim of the pan, the feed-pipe H arranged to discharge over the center of the pan, the disk J for spreading or distributing the pulp as it enters the pan, and means for adjusting the height of the disk J in relation to the bottom of the pan, said means comprising the adjustable collar j^3 on the feed-pipe and the rods j attached at one extremity to the disk and at the other extremity to the collar, as set forth.

12. In combination, the pan A, the concentric upwardly and inwardly inclined rings e e' of less height than the rim of the pan, the lip E round the top of the pan, the two concentric cylinders forming the chamber E′ to receive the pulp as it leaves the pan, the adjustable disk J, the launder G and pipe H discharging over the center of the pan beneath the disk, the metal band L round the base of the pan A, the stationary bracket l, the brush l' connected with the electric wire M and bearing against the band L for making an electrical connection with the rotating pin, and the electric wire N connected with the pipe H for passing a current of electricity through the pan and its contents, as set forth.

In witness whereof we have hereunto set our hands, at Johannesburg, Transvaal, this 13th day of December, 1902, in the presence of two subscribing witnesses.

SAMUEL ALFORD.
JOHN JAMES ROBERT SMYTHE.

Witnesses:
CHAS. OVENDALE,
J. F. SCRIMGEOUR.