

No. 607,755.

W. S. LOCKHART.

Patented July 19, 1898.

HYDRAULIC SEPARATOR FOR TREATING MIXED MINERALS.

(Application filed July 7, 1897.)

(No Model.)

2 Sheets—Sheet 1.

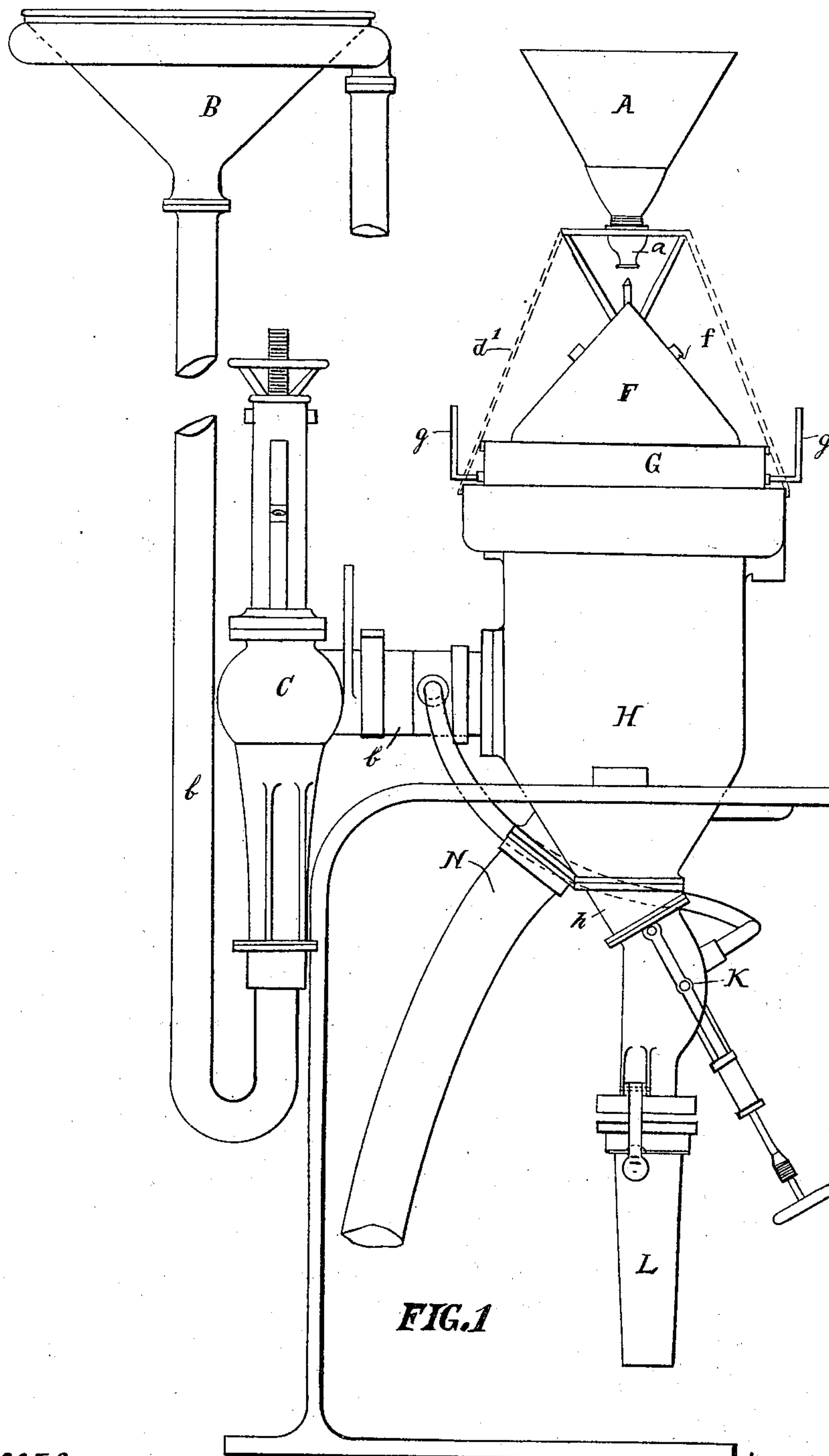


FIG. 1

WITNESSES

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INVENTOR

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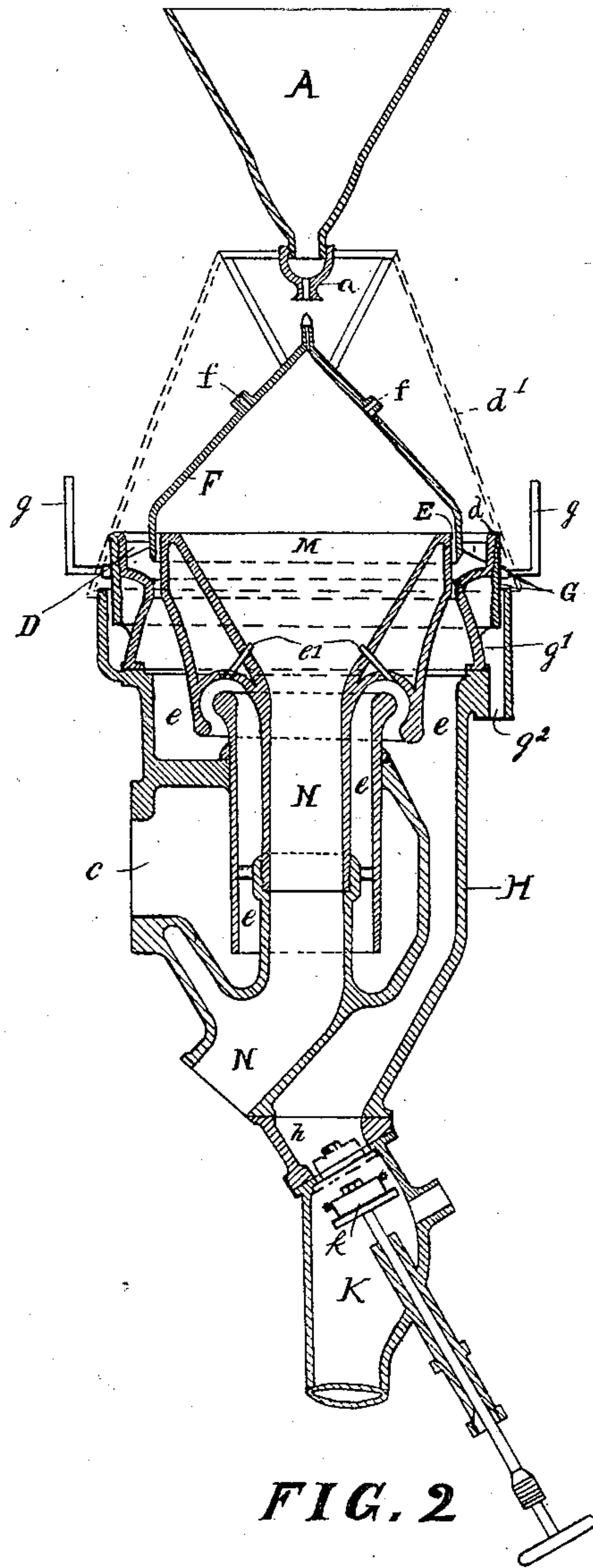


FIG. 2

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM STRONACH LOCKHART, OF LONDON, ENGLAND, ASSIGNOR TO THE
AUTOMATIC GEM AND GOLD SEPARATOR SYNDICATE, LIMITED, OF
SAME PLACE.

HYDRAULIC SEPARATOR FOR TREATING MIXED MINERALS.

SPECIFICATION forming part of Letters Patent No. 607,755, dated July 19, 1898.

Application filed July 7, 1897. Serial No. 643,747. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM STRONACH LOCKHART, residing at London, England, have invented an Improvement in Hydraulic
5 Separators for Treating Mixed Minerals, of which the following is a specification.

My invention relates to hydraulic upward-current separators for effecting the separation of metals, gems, or other minerals from their
10 gangue, slimes, sand, or materials with which they are mixed; and it consists of constructional improvement in such a device whereby the passage containing the separating-stream of water is constituted the last-con-
15 fined issuing-exit of such stream and whereby the velocity of such stream is better controlled by a finely-adjustable adjacent head or weir adapted so as to be absolutely constant when set in any specific position.

20 In order that my invention may be the better understood, I now proceed to describe the same in relation to the drawings annexed hereto and to the letters marked thereon.

Figure 1 represents an outside view of my
25 upward-current separator and mode of supplying it with the minerals and water. Fig. 2 is a vertical section through the said separator.

The slime, gravel, ore, or gangue of a uniform fineness, containing the gold, metal, gems, or other mineral that it is desired to separate therefrom, is fed, preferably by mechanical means, into the hopper, and thence falls by the nozzle *a* onto the cone-piece *F*.
30 The supply of water to the separator is provided from a supply-tank or stand-pipe *B*, maintained at a constant level by a ball-tap or a constantly-running overflow. This first constant supply-head of water from the tank
40 or stand-pipe *B* may be made available for several separators, the supply to each separator being controlled by an intermediate finely-adjustable valve *C*, which regulates the flow into each separator, so as to maintain a definite and uniform head of water at
45 *D* in the separator conveniently adjoining the annular issue-nozzle of the separator *E*, in which the actual separation of the gold, metals, gems, or other desired minerals from

the slime, gangue, or substances with which 50 they are mixed takes place.

The gold, gems, metals, or minerals, with their associated gangue, gravel, or slime, after passing down the outside of the cone *F*, enter the separation-annulus *E* by the external channel *d*, where is maintained a constant head of water from the supply-pipes
55 *b b*, the inlet *c*, and annular and serpentine passages *e e*. These passages are made of larger area than the annulus *E* and of serpentine form to insure water without eddies, and the highest parts of such serpentine channels are ventilated by the pipes *e'* into the interior chamber of the separator, which is maintained in constant communication
60 with the atmosphere by ventilation-tubes *f*, passing through the cone-piece *F*.

According to the flow of water permitted from the main head in tank or stand-pipe *B* through the valve *C* the specific height or
70 head of water *D* in the annulus *d* is determined to maintain a required flow through the separation-annulus *E*.

Where little water enters with the mineral to be treated from the hopper *A* and where a very small fluctuation of the head of water
75 *D* is not of consequence, the outer lip of the annulus *d* may be continued upward, as shown in dotted lines *d'*, up to the hopper-nozzle *a*; but where there is much water entering with
80 the slime or gangue and where it is necessary to maintain the head of water *D* very exact the outer lip of the annular weir *d* or part of it is made adjustable by an outer screwed ring *G*, provided with handles *g g*, by which
85 the outer lip may be accurately adjusted at will, or by one or more weights or notches therein similarly adjustable as to height to determine an overflow at any desired point
90 should the head *D* tend to rise by access of water through any means. The overflow from the outer weir is collected in any convenient manner, such as by the annular trough *g* or by one or more issue-pipes to waste *g'*.

The heavier gold, gems, or minerals when
95 they have entered the separation-annulus *E* are not supported by the upward-flowing stream of water, but fall through such stream

into the outer part H of the lower casing and thence through the collecting-nozzle *h* and the valve-chamber K to the locked receptacle L, which may be of glass or provided with sight-holes to show the accumulation of the gold, gems, or minerals.

The valve-chamber K, provided with a push and screw-down valve *k*, is furnished so that the valve *k* may be closed when desired and the locked receptacle L removed for collection of the gems, gold, or minerals. On the other hand, the lighter slime, gangue, or materials mixed with the gold, gems, or minerals are carried up by the force of the current of water in the separation-annulus E and flow, with the water, over the lip of the inner annular weir into the internal waste-collecting chamber M and are carried away to waste by the exit-nozzle and pipe N N.

In order to obtain perfect and accurate separation of gold, gems, or other minerals from their slime, gangue, or other substances with which they are mixed, I find it important that the separation-annulus E shall be the most constricted part of the system of various pipes, valves, or channels through which the water enters the separator and that such separation-annulus shall be the last exit of the water from such system of confining-channels and that the head of water determining the velocity of the water in such separation-annulus shall be capable of very fine adjustment as to height and shall be adapted to be maintained absolutely constant in level when determined for the treatment of substances such as slimes and float-gold. These essential points for successful operation are embraced in the apparatus I have just described.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination in a hydraulic gravity-separator, an annular chamber, receiving the material to be separated, and in communication with the water-supply of separation; a vertically-adjustable ring connected to the outer edge of said annular chamber adapted to adjust height of local head of still water in said annular chamber to control speed of adjacent separation-current, an annular chamber beneath the upper receiving-chamber admitting gravity-separated particles through a contracted annular neck, a contracted annular overflow-orifice forming a vertical extension of said contracted neck, and an annular circuitous water-supply pas-

sage leading to the said lower chamber, substantially as described.

2. In combination, the cone for receiving at its point and spreading by its coned surface the material to be separated; the annular receiving-chamber at the base of the cone, adapted to discharge outwardly any excess of water with material, having a lateral communication with a narrow adjacent annular and vertical water-exit passage between its inner wall and the edge of the said cone, a chamber to receive the separated material beneath the said contracted annular passage between the cone and inner wall of upper chamber and an annular circuitous water-supply passage to said lower chamber, substantially as described.

3. In combination, the cone for receiving and distributing the material to be separated, the annular chamber beneath having a narrow exit-channel between its inner wall and the edge of said cone and forming a dead-water space between the cone and its outer wall, a vertically-adjustable sleeve forming an adjustable edge for said outer wall, a lower chamber having a narrow channel communicating with the upper chamber, and a circuitous water-supply leading to said lower chamber, substantially as described.

4. A self-contained hydraulic gravity-separator consisting of, in combination, a hopper for mixed wet material to be separated with central discharge, a cone-spreader with apex upward supporting said hopper or skeleton supports; an annular receiving-trough at base of cone adapted to discharge outwardly free from apparatus excess water with material, to receive and maintain a constant head of water from other constant supply to interior of apparatus and to transmit into an adjacent upward current annulus the particles to be separated, a downward means of exit to locked receptacles from base of upward current of heavy gravity-separated particles, and a free unrestricted exit inwardly toward center of apparatus of the light waste particles and separating current of water, substantially as described.

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

WILLIAM STRONACH LOCKHART.

Witnesses:

CHARLES H. CARTER,
RICHARD A. HOFFMANN.