(No Model.) 2 Sheets—Sheet 1.

W. S. LOCKHART & E. W. STREETER.

HYDRAULIC MINERAL SEPARATING APPARATUS.

No. 489,538. Patented Jan. 10, 1893.

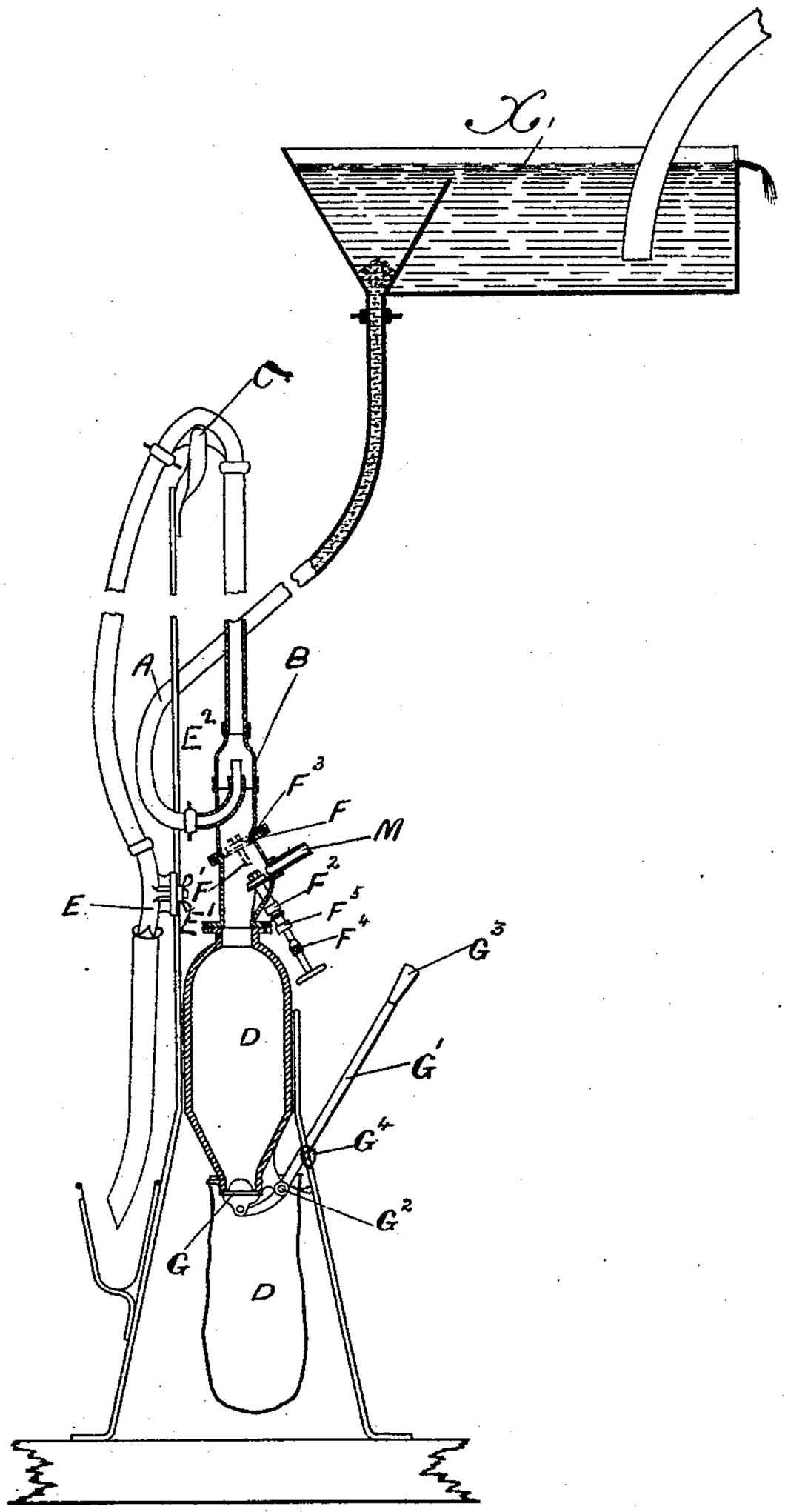

FIG. 1.

Attest
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(No Model.) 2 Sheets—Sheet 2.

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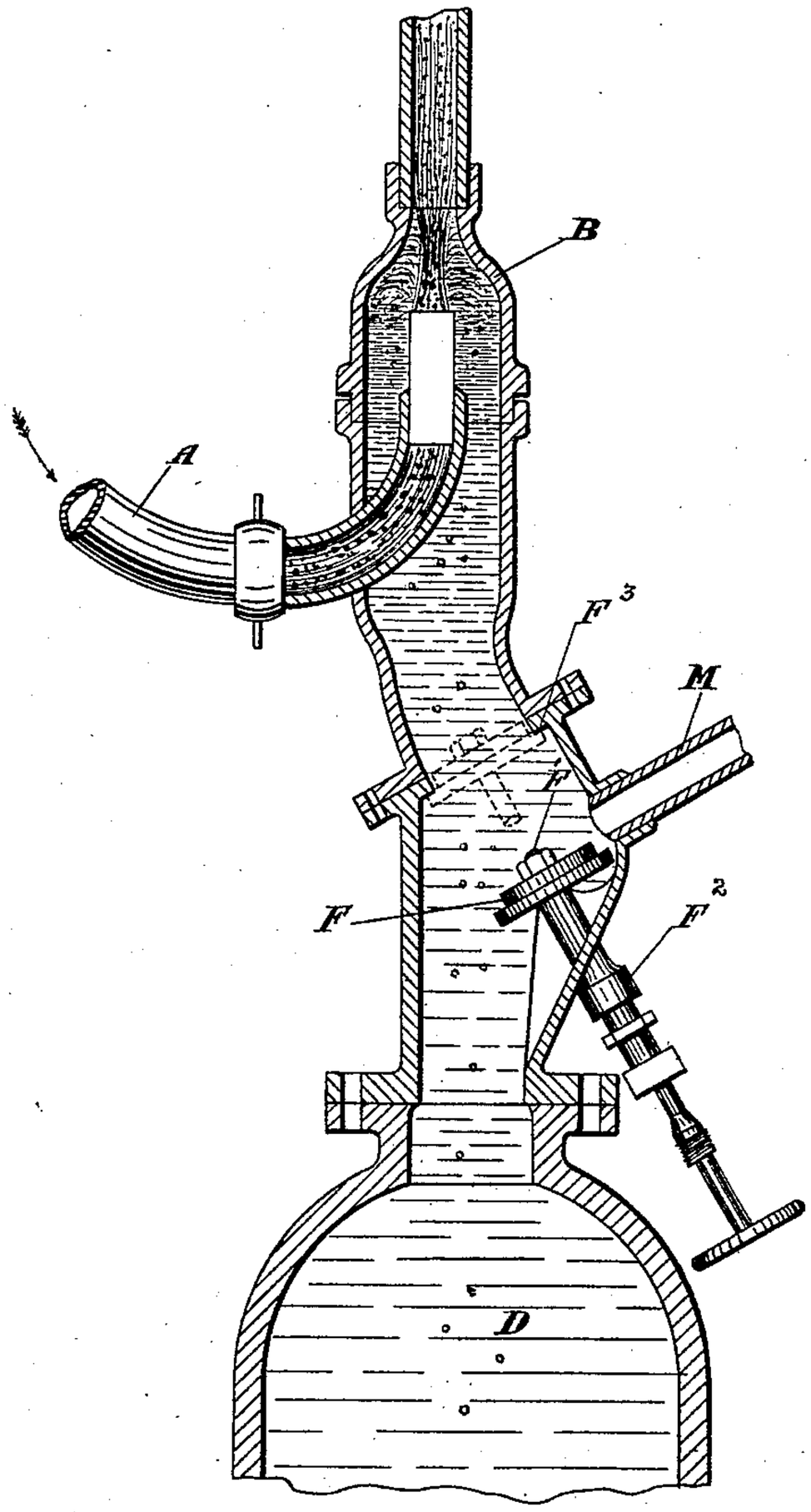

FIG. 2.

Attest
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UNITED STATES PATENT OFFICE.

WILLIAM STRONACH LOCKHART AND EDWIN W. STREETER, OF LONDON, ENGLAND; SAID STREETER ASSIGNOR TO SAID LOCKHART.

HYDRAULIC MINERAL-SEPARATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 489,538, dated January 10, 1893.

Application filed April 18, 1892. Serial No. 429,642. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM STRONACH LOCKHART and EDWIN WILLIAM STREETER, subjects of the Queen of Great Britain and Ireland, both residing at London, England, have invented an Improved Hydraulic Mineral-Separating Apparatus, of which the following is a specification.

Our invention relates to an improved apparatus for separating precious stones, metals, or other minerals from their gangue or other impurities with which they are mixed, by an ascending stream of water or other liquid which takes up and feeds the mixed minerals into a standing vertical pipe with siphon regulated discharge controlling the speed of the flow of liquid, the lighter particles of the mixed minerals being carried upward and onward into the siphon discharge, while those of greater specific gravity, fall by their own weight through the stream into a receptacle or receptacles adapted to receive them, and to permit removal without stopping the continuous action of the apparatus.

The materials to be treated are by preference first separated into approximately uniform sizes by suitable screening, jigging, or pulsating apparatus, as may be considered expedient to the various sizes; then passed into the ascending current to be further separated according to their various densities; but the ascending current may also be used for separating materials of varying density and size into particles of approximately uniform weight, in which case the preliminary operation of sizing would be unnecessary but should follow for the purpose of separating the particles of similar size from those of greater or less bulk.

In order that our invention may be the better understood we now proceed to describe the same in relation to the drawings hereunto annexed reference being had to the letters marked thereon.

Figure 1 is a partial sectional view through a portion of the apparatus. Fig. 2 is a sectional view through a portion of the apparatus.

We employ a stream of liquid, supplied at a suitable head from a convenient source as the elevated tank X, Fig. 1 into which the metals precious stones or other minerals with their crushed mineral gangue or matrices, such as quartz &c., have been fed. The downward flowing stream carrying the said mixed minerals or other materials is introduced by the pipe A into a vertical or approximately vertical column or standpipe B, of any suitable section, either from above or below, but so that the suspended material is subjected to the upward flow of an ascending current, preferably of water the liquid with the lighter mineral substances passing over the summit C of the said vertical column or stand-pipe, and the heavier materials, such as metals or precious stones, failing to travel the full height of the vertical column or stand pipe fall down into a suitable receptacle or receptacles D for their collection. The vertical column or stand-pipe may be conveniently made of glass or other material, so arranged with sight-holes or windows for observation of the behavior of the materials within it. The velocity of the upward current may be simply regulated by turning over the standpipe B as a siphon, and by adjusting the end E of the said outer siphon pipe at any required height by means of the clamp nut E′ which will hold the pipe E at any required height along the vertical standard E^2.

In order to eliminate the irregularities of action produced by various sizes of the crushed or pulverized minerals being treated together, we may first treat the pulverized matrix and stones by jigging or revolving trays or drums, provided with screens of various meshes so as to divide the material as far as possible into uniform sizes, for further treatment in any individual stand-pipe. With materials of similar volume the limit of upward travel in the aforesaid ascending current or stream will be decided by their respective specific gravities alone, and it is obvious that mixed stones or minerals may be conveniently treated in this manner.

It is obvious that where several successive and distinct separations of minerals are desired, a succession of alternate descending and ascending currents, at various heights, may be employed, and the separation of the

denser minerals will take place in the successive receptacles at the foot of each successive ascending current.

The collecting receptacle or pockets are arranged so that by means of a suitable valve or cock F above the receptacle, and a valve G or controllable orifice or door, the collected minerals may be withdrawn from time to time without interfering with the continuous action of the apparatus. The valve G is carried on the lower end of the lever G′ pivoted at G^2 and provided with a handle G^3 by which the valve may be adjusted and held by a lock G^4. The valve F is carried on a spindle F′ passing through the stuffing box F^2. The valve finds a seat at F^3 and when adjusted to this position the material which falls from the vertically ascending current will be caught and held while the collected material in the receptacle D is being removed by opening the valve, after which the valve G is closed and the valve F is opened.

The various sizes of pulverized mineral matter and precious stones assorted from the sieves or riddles may be treated in a succession of graduated columns, or in different separating apparatus, and the apparatus may be employed for the separation of particles of like size according to their different densities, or of particles of varying size and density according to their actual weight, in which latter case preliminary screening would not be necessary, but should follow. It will be noticed that the current of water containing the material is projected upward in the form of a jet, the inner end of the pipe A being turned upward within the stand pipe and thus the material to be separated is not merely floated but is thrown upward and passes through the upper part of the stand pipe to be discharged, or falls therefrom into the receptacle D, according as the particles are light or heavy.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed what we claim is:—

1. In combination the stand pipe, the collecting receptacle, and the inlet pipe for the liquid and material extending to the stand pipe and connecting therewith to form an upward jet, substantially as described.

2. In combination the stand pipe, the collecting receptacle at the lower part thereof, the inlet pipe A for the liquid with the material, said pipe connecting with the stand pipe to form an upward jet, and the siphon connecting with the upper end of the stand pipe and adjustably supported, substantially as described.

3. In combination the stand pipe, the collecting receptacle, the inlet pipe A forming a jet extending up through the stand pipe and means for regulating the resistance to the said jet, substantially as described.

4. In combination the stand pipe, the inlet pipe A having its end within the stand pipe and projecting upwardly, and the receptacle at the lower part of the stand pipe, substantially as described.

5. In combination the stand pipe, the inlet pipe connecting therewith to form an upward jet, the receptable at the lower end of the stand pipe, below the end of the pipe A, the valve F between the pipe A and the receptacle, and the valve at the lower end of the receptacle, substantially as described.

6. In an apparatus for the hydraulic separation of crushed minerals, an adjustable discharge siphon pipe adapted for regulation by a clamp and stand-post, to any desired height to control the velocity of the ascending current.

7. In an apparatus for the hydraulic separation of crushed minerals, the combination with a vertical stand pipe, of a receptacle at the base of the stand pipe, and a shut off valve at the neck of the receptacle, and a locked and controllable orifice or door, by which the collected minerals may be removed without stopping the continuous action of the apparatus.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM STRONACH LOCKHART.
EDWIN W. STREETER.

Witnesses to the signature of William Stronach Lockhart:

RICHARD A. HOFFMANN,
CHARLES H. CARTER.

Witnesses to the signature of Edwin William Streeter:

ROBERT BILLINGHURST,
FRED. CHEESWRIGHT.