(No Model.) 3 Sheets—Sheet 1.

E. WARNE.

CONCENTRATOR AND SEPARATOR FOR ORES, &c.

No. 268,325. Patented Nov. 28, 1882.

Fig. 1,

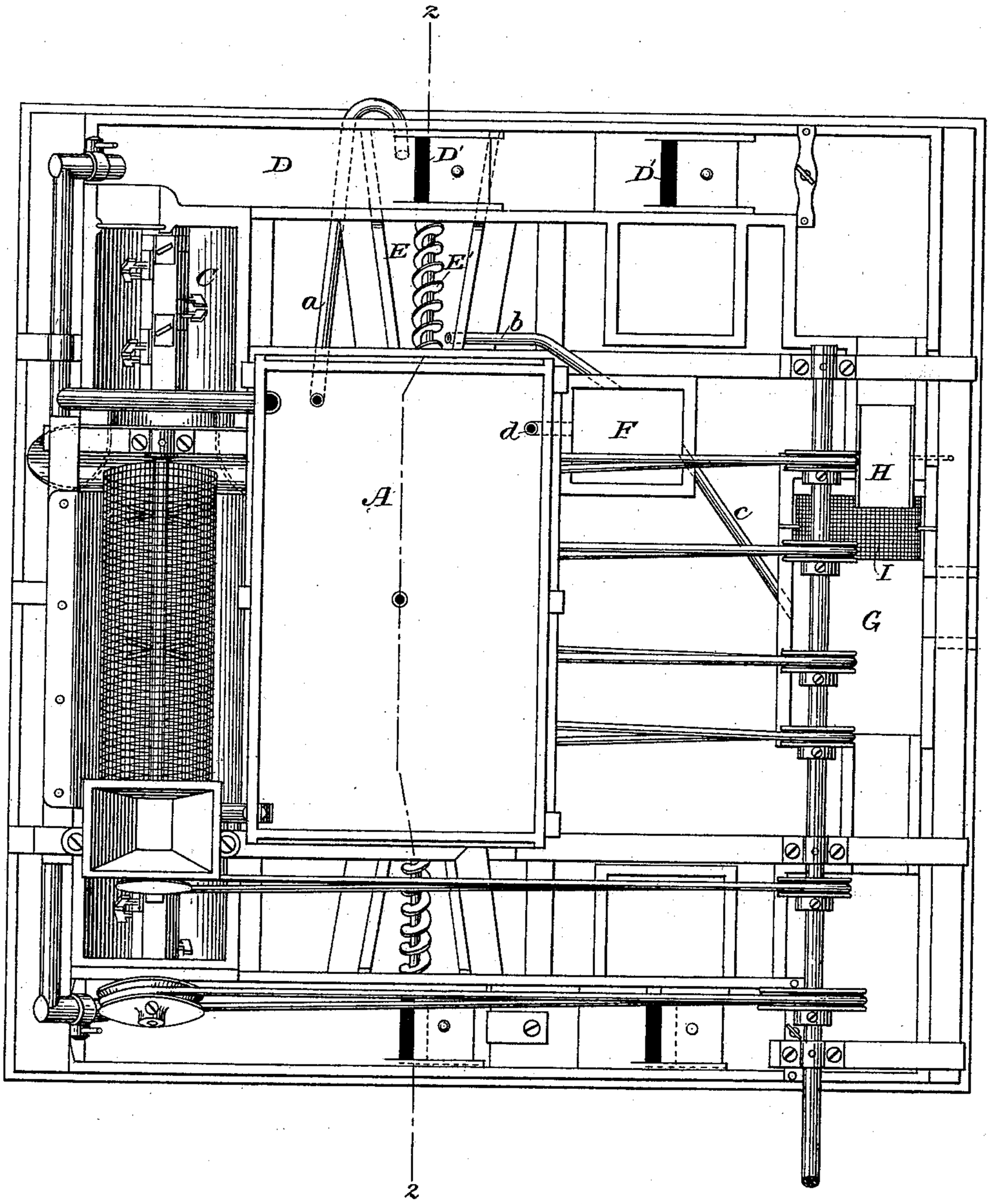

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Fig. 2,

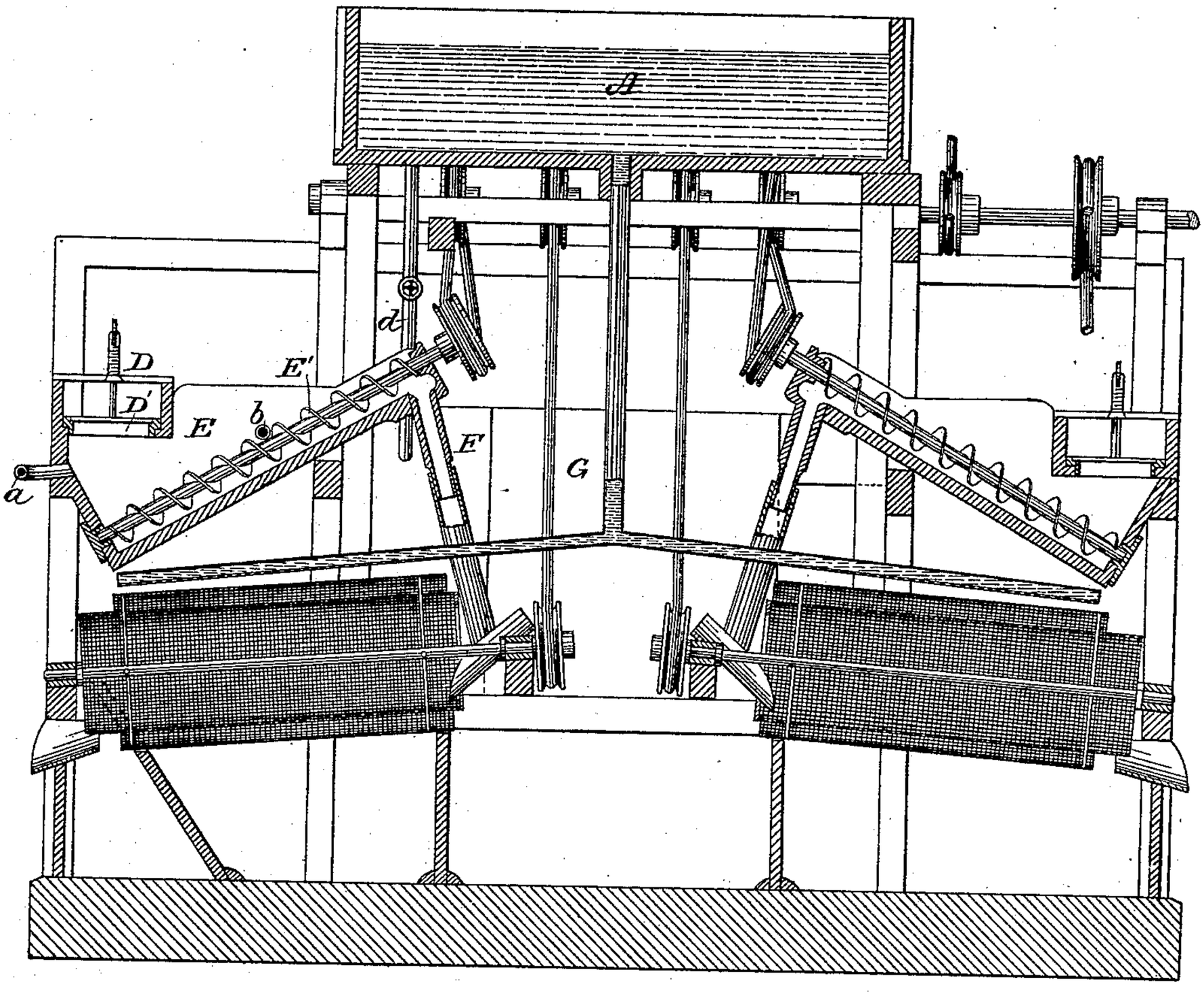

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Fig. 3,

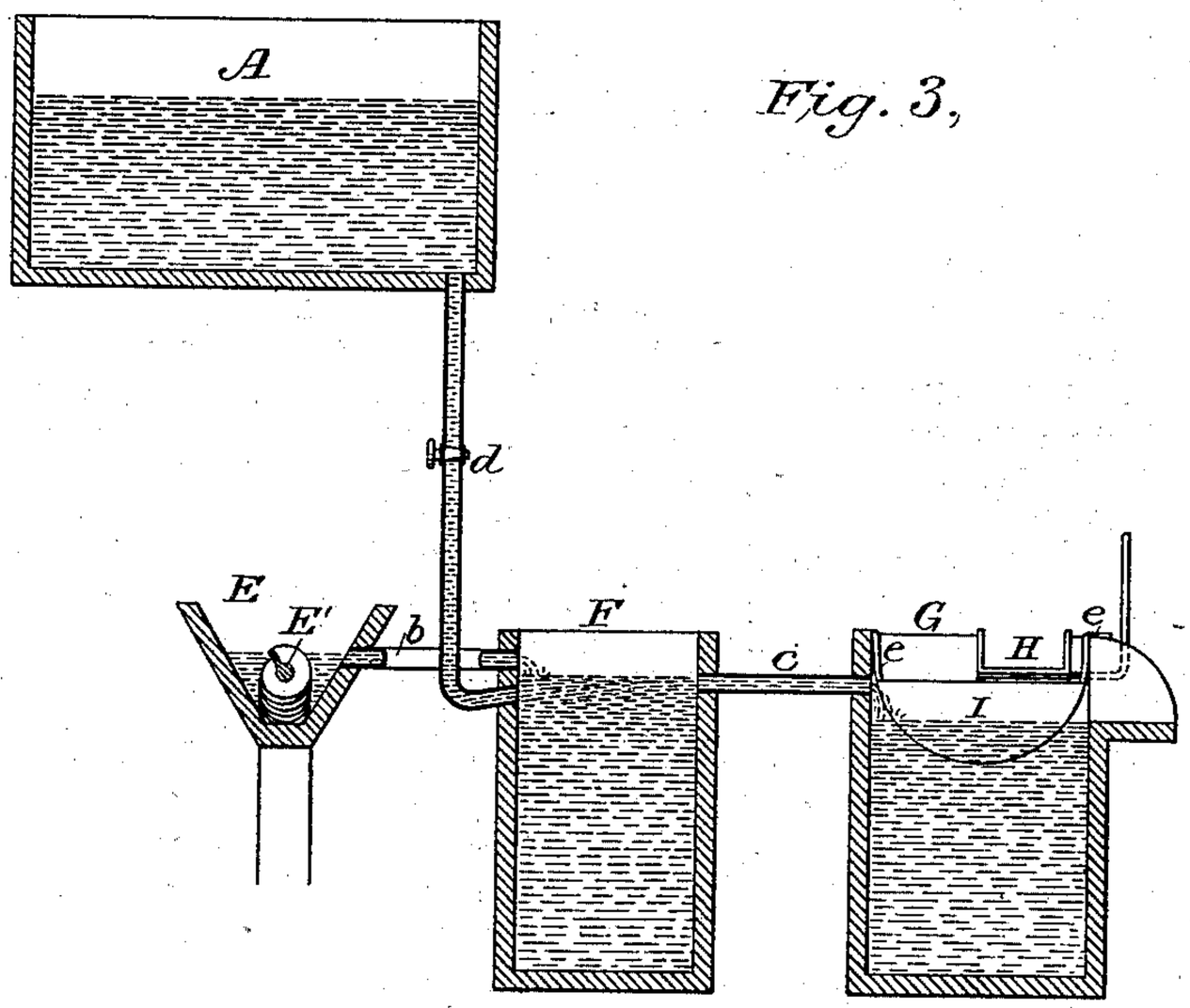
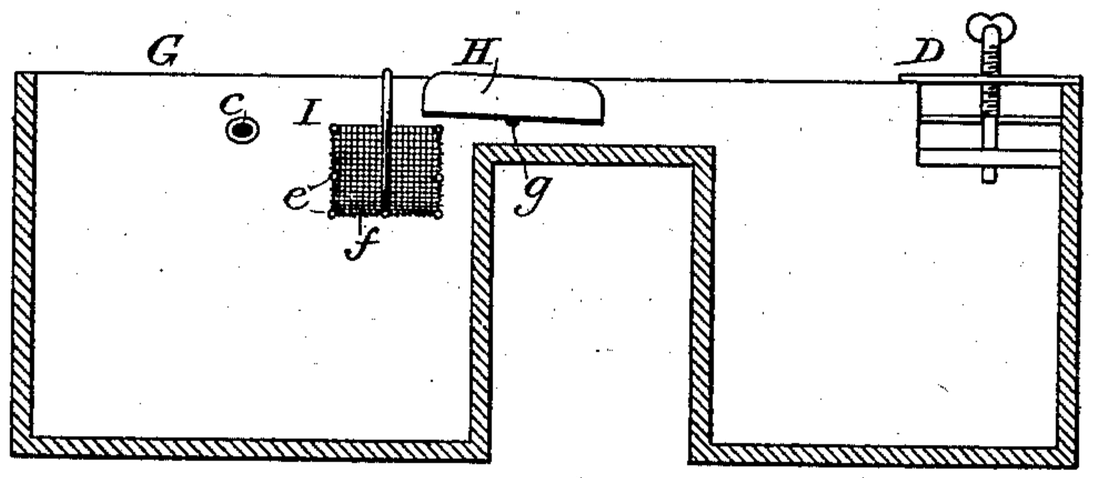


Fig. 4,



WITNESSES

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UNITED STATES PATENT OFFICE.

ELIJAH WARNE, OF EASTON, PENNSYLVANIA.

CONCENTRATOR AND SEPARATOR FOR ORES, &c.

SPECIFICATION forming part of Letters Patent No. 268,325, dated November 28, 1882.

Application filed December 29, 1881. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH WARNE, of Easton, Northampton county, Pennsylvania, have invented certain new and useful Improvements in Concentrators and Separators for Ores and other Materials, of which the following is a specification.

My invention is directed to concentrating ores and other materials by what is known as the "wet process," and is an improvement upon that kind of machinery for this purpose which is described in my Letters Patent No. 258,332, dated May 23, 1882. In said patented machinery the material to be acted on is carried by water through a sluice provided at intervals with bottom-openings, through which the material falls by gravity into standing water contained in receptacles beneath, and from these several receptacles the material, as it settles, is carried off by conveyers to screens, where it is separated according to size. It is however desirable and even necessary in working certain classes of materials to provide means whereby certain portions of the material entering the receptacle, which settle more slowly than the main body or mass, shall be carried off separately from the latter on top the receptacle. To this end I combine with the receptacle a water pipe or inlet, located near the surface of the standing body of water and so placed as to introduce into the same a stream or jet of water which shall induce a cross-current of regulable force. By this current the lighter portions of the material held in suspension are directed, as they descend from the sluice, toward an overflow-opening in the receptacle, whence they pass off into a separate box, in which they may settle. The overflow-opening is preferably located at a point near where the conveyer emerges from the water, so that the material carried along by the conveyer may be exposed to the current, which will tend to wash it of light particles, which when thus separated pass to the overflow along with the other particles held in suspension. In order to carry the separation still further, I combine with the box into which the overflow discharges one or more water-admitting nozzles or pipes, which enter below the water-line and inject water with regulable force into the box in an upward direction. The heavier portion of the material held in suspension in the water gradually settles to the bottom of the box, notwithstanding the upward currents induced by the above arrangement; but a certain portion of the material which is light enough to be affected thereby is upheld long enough to be carried to an overflow, whence it is discharged into another box or receiver, in which it can settle. Finally, there is a considerable percentage of the material acted on oftentimes of much value, which is so light that it is floated by the sluice-water to such an extent that it will not settle through the openings in the sluice. This material I catch by means of an open-ended trough-like device, located at the tail of the sluice and adjustable up and down, so as to be immersed any desired depth below the surface of the sluice-water. By this means I can skim the sluice-water, and, by conducting off the skimming to a fine sieve or filter of cloth or other suitable substance which will let water through, I can save all the solid material contained therein.

In the accompanying drawings is shown so much of an ore concentrating and separating machine as needed to explain my invention.

Figure 1 is a plan of an apparatus of the kind described in my Letters Patent hereinbefore referred to and embodying my present improvements. Fig. 2 is a section of the same on line 2 2, Fig. 1. Figs. 3 and 4 are diagrammatic sectional elevations of those portions of the apparatus to which my improvements more particularly relate.

D is the sluice, provided at intervals in its bottom with openings D′, adjustable in size in the manner and for the purpose described in my aforesaid Letters Patent. Under each opening is a receptacle, E, which is filled with standing water to the level of the bottom of the sluice and is provided with a power-driven feed-screw or conveyer, E′. These parts in their arrangement and mode of operation resemble like parts of my patented machine and require no further description. I have deemed it necessary to show but one receptacle, E. The sluice I have shown is that sluice (lettered X in my said Letters Patent) which is located at the lower end of the tilted or inclined mix-

ing or separating trough C of the patented machine, so as to receive the liquid portion of the contents of the trough.

From the tank A, which supplies water under head or pressure to the various parts of the machine, extends a pipe, *a*, which opens into the receptacle E below the water-line therein and on that side of the opening D′ opposite to that on which the discharge end of the conveyer E′ is situated. The pipe should be provided with a suitable cock or valve to regulate the force of the stream of water discharged from it; and its position is such that the water issuing from it crosses the path of the material descending through the opening D′ and creates a cross-current, which carries along with it the lighter portions of the material and also washes against the conveyer E′ at the point where the latter emerges from the water. Adjoining the conveyer at the point is the overflow-pipe *b*, through which the surplus water, together with the light substances thus separated by it from the main or heavier mass, is discharged into a box, F. This box is provided with an overflow-pipe, *c*, leading into a receiver, G; and it is also combined with one or more valve or cock controlled pipes *d*, which lead from the tank A and open into the box F below the water-line, the nozzle of the pipe being turned upward, so as to direct the stream of water issuing from it upwardly into the body of overflow-water already in the box. The effect of this arrangement is to create upward currents of regulable force, which will hold in suspension and near the surface lighter portions of the solid matter contained in the overflow-water long enough to permit these portions to be carried over through pipe *c* into the receiver G. It is usually sufficient to employ but one box, such as F. By means of it, in conjunction with the receptacles G and E, the separating process can be carried on to a sufficient extent for ordinary purposes. It is, however, manifest that by using a series of such boxes the separation process might be carried out to any extent desired.

In order to catch such solid matter as is floated by the sluice-water and will not descend through the openings D′, I place at the tail of the sluice an adjustable device, H, which I term a "skimmer." This is a thin flat-plate the width of the sluiceway, with upright sides fitting snugly between the sides of the sluice. It is intended to be about parallel with the surface of the sluice-water and to be just a little immersed therein, so as to carry off the surface stratum of water and solid matter that may be contained therein. The main body of sluice-water passes off through a separate passage into a tank or receiver—as, for instance, G. The portion carried off by the skimmer H may finally enter the same receptacle, but before doing so it falls into a filter or fine sieve—such, for instance, as shown at I—consisting of a metallic skeleton box-like frame, *e*, covered by or lined with a filtering-cloth, *f*. The water discharged from the skimmer filters through the cloth, but the solid matter is retained in the filter, and can be gathered and removed as desired. The skimmer H is made adjustable in this instance by hanging it on pivots *g*, on which it may be turned so as to immerse more or less, as desired, that edge which meets the sluice-water. Manifestly, however, it can be made adjustable in other ways.

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

1. The combination, with the sluice provided with openings, as described, the receptacle beneath the opening in the same, the conveyer in said receptacle, and the overflow-pipe located at the end of the receptacle farthest from the opening in the sluice, of the independent water-supply pipe entering the receptacle below the water-line therein on the side of the sluice opening opposite to that on which the discharge end of the conveyer is situated.

2. The box F, provided with conduits for leading into and from it the overflow-water containing the suspended solid matter, in combination with one or more valve or cock controlled water-supply pipes whose nozzles enter the box below the water-line and are placed so that water shall be discharged from them in an upward direction into the body of overflow-water contained in the box, substantially as and for the purposes hereinbefore set forth.

3. The combination of the sluice, the receptacle E, provided with a conveyer, the box F, the overflow-pipes *b c*, and the independent water-discharge pipe *d′*, under the arrangement and for joint operation, substantially as hereinbefore shown and set forth.

4. The combination, substantially as hereinbefore set forth, of the sluice, the adjustable skimmer, and the sieve or filter.

In testimony whereof I have hereunto set my hand this 5th day of December, 1881.

ELIJAH WARNE.

Witnesses:
E. A. DICK,
W. C. CROSS.