

964,261.

F. G. JANNEY.
ORE CLASSIFIER.
APPLICATION FILED MAR. 14, 1910.

Patented July 12, 1910

2 SHEETS—SHEET 1.

FIG. 1.

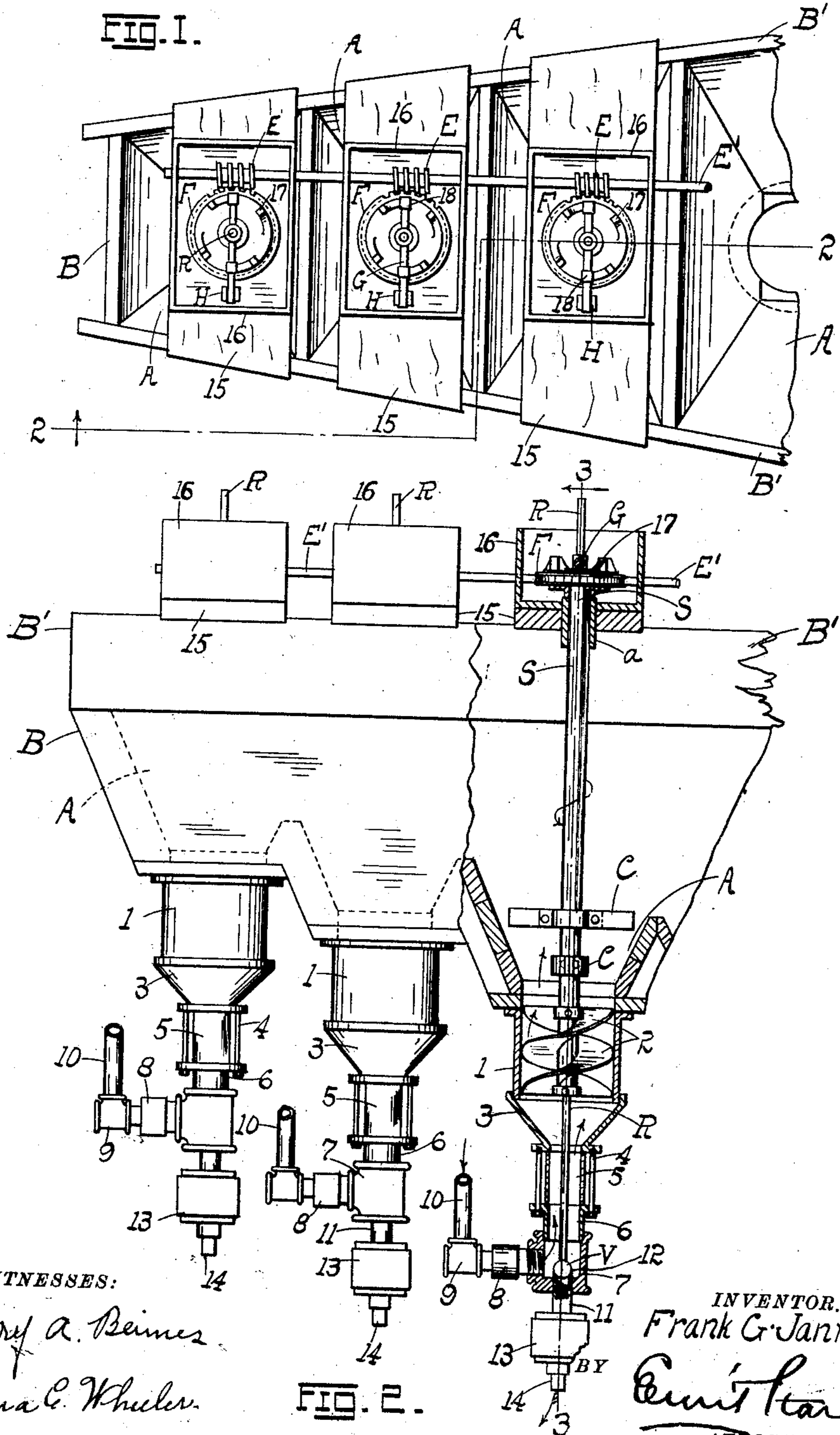


FIG. 2.

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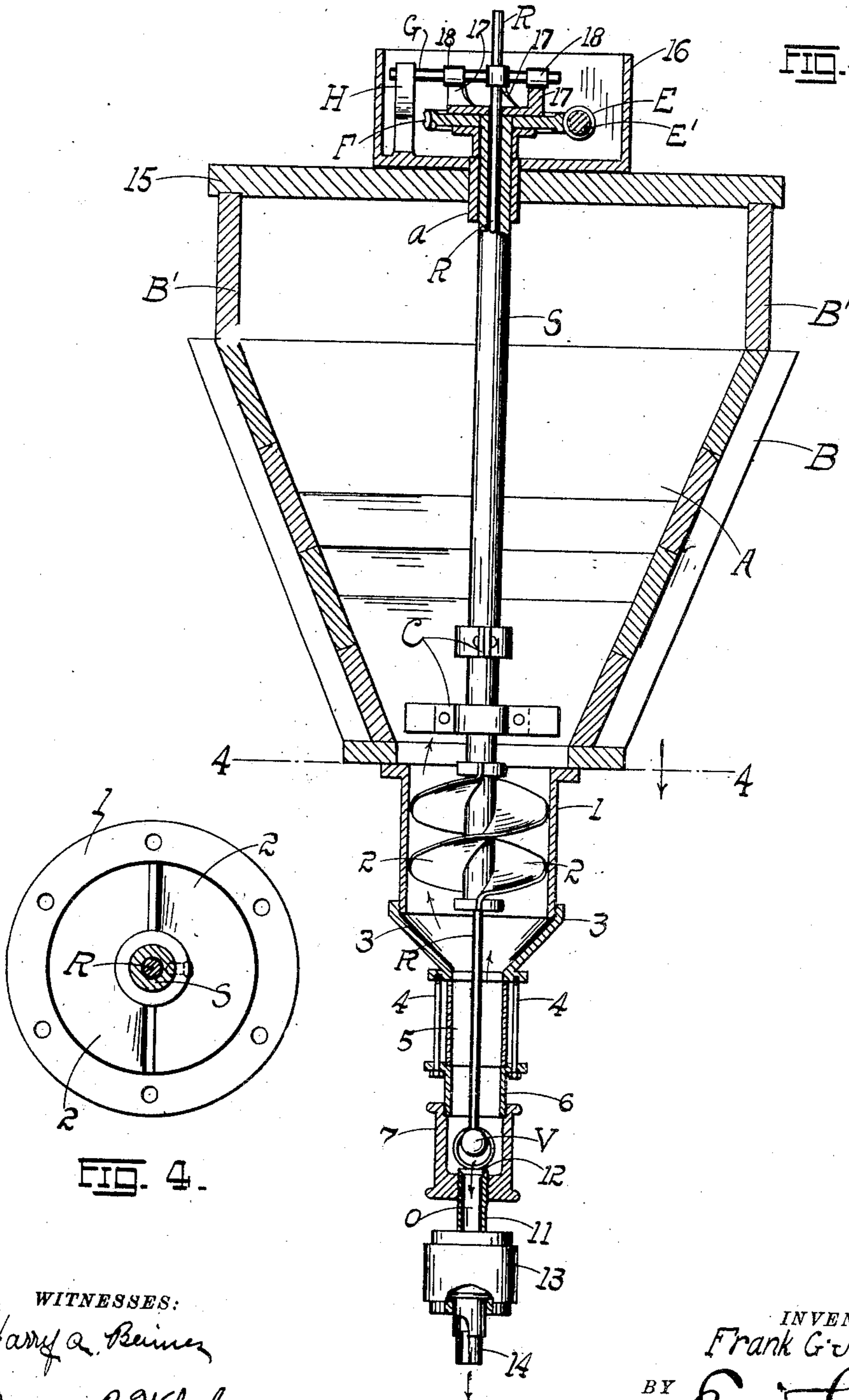
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ORE-CLASSIFIER.

964,261.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANK G. JANNEY, citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Ore-Classifiers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in ore-classifiers; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a plan of a series of ore-classifiers, showing my invention applied thereto; Fig. 2 is a combined vertical longitudinal elevation, and section on the line 2—2 of Fig. 1; Fig. 3 is an enlarged vertical cross-section on the line 3—3 of Fig. 2, taken through one of the series of classifiers; and Fig. 4 is a horizontal cross-section on the line 4—4 of Fig. 3, taken across the final sizing chamber.

The present invention is an improvement on the ore-classifier covered by my U. S. Patent numbered 928,455, dated July 20, 1909; and while contemplating the several objects, and possessing the various advantages of the patented construction, it possesses the additional advantages (1) of breaking up all currents which destroy the desired effect of a uniform and homogeneous rising column, (2) of keeping the particles of ore separate and according each particle the individual benefit of such rising column, and (3) of enabling the rising column to effectively carry off the lighter particles from one hopper to the next hopper of the series.

For proper classification one of the objects sought is to secure an equal upward velocity for each rising molecule of water throughout the entire cross-section of such column so that the necessity of breaking up disturbing currents which destroy this molecular equality of flow becomes imperative. In the present improvement this is accomplished by interposing between the hoppers or "Spitzkasten" and the terminal retarding discharge chamber or equalizer, a final sizing or sorting chamber in which the hydraulic water has imparted thereto a double spiral rotary motion, thereby giving rise to a double spiral sorting or sizing column which not only breaks up the undesirable

currents referred to, but keeps the individual particles of ore separated from one another.

The advantages of the present improvement will be fully apparent from a detailed description of the invention, which is as follows:—Referring to the drawings, in which Figs. 1 and 2 show a conventional series of ore-classifier hoppers or "Spitzkasten" well known in the art, the classifier consists of a long tapering box or trough B, which is divided into a series of successive compartments, hoppers or pulp containers A progressively increasing in depth and capacity toward the wide end of the box or that end at which the slime-water is discharged and toward which the pulp is directed by the general flow of the water from one compartment to the next compartment of the series. Of course, any one compartment constitutes a classifier in itself, so that a detailed description of one will answer for all.

Mounted centrally within the compartment or container A is a hollow rotatable shaft S to which are affixed a series of paddles or stirrer arms C progressively increasing in length with the inclination of the walls of the compartment. The shaft extends downward into and through a bottom cylindrical, final sizing or sorting chamber 1, wherein the shaft is provided with a (preferably) double screw or spiral conveyer 2, 2, the chamber being preferably provided with a bottom conical discharge mouth or extension 3 as shown. The shaft S however, terminates in the horizontal plane of the lower end of the cylindrical portion or sizing chamber proper. Secured to the lower flanged end of the discharge mouth 3 by means of tie-rods 4 is a glass cylinder 5 through which the condition of the classification may always be observed, a nipple 6 connecting said observation cylinder with a tee 7 which by means of a union 8 has its horizontal leg connected to a second tee 9 from which leads the line pipe 10 to any suitable source of hydraulic water-supply (not shown). From the bottom of the vertical member of the tee 7 depends a tube 11, the upper end of which within the tee forms a valve seat 12, the tube discharging into a bottom equalizer or retarding chamber 13 provided with a discharge nozzle or bushing 14, the same as in my patent aforesaid.

The shaft S is propelled by a worm-pinion

E (on the drive-shaft E') engaging the worm-gear F secured to the upper end of the shaft, and may be rotated from any source of power (not shown) at any desired speed. The upper end of the shaft S is supported in a bearing *a* on a plank or plate 15 mounted across the top of the container and supported on the side extensions B' of the box B, the gearing being protected by boxes or housings 16 through the vertical walls of which the shaft E' freely passes, and by which it is in a measure supported. Of course, any available mechanical manner of supporting the shafts S and E' may be resorted to, no special method being indispensable. Loosely operating in the hollow stirrer shaft S is a rod or stem R, the lower end of which is provided with a valve V which controls the discharge port or passage *o* of the adjustable tube 11, the valve being adapted to rest on the seat 12. To the upper projecting end of the valve-stem R is secured an arm G, one end of which projects beyond the periphery of the worm-gear F and is guided between the fork members or bracket-arms H (in the housing 16) which are of sufficient height to allow the arm G the necessary vertical movement in the reciprocations to which it is subjected in operating the valve V.

Disposed along the top face of the worm-gear F are a series of cams or tappets 17 which in the rotation of the worm-gear impinge in pairs against the arm G (the latter being provided with suitable rings 18 which the tappets directly engage) and thereby lift the stem R and its valve V. After the cams have passed off the arm G, the rod R with its valve V drops by gravity to its lowest position in which the valve V rests on the seat 12, thereby closing the passage *o* in the tube 11. In my patent aforesaid the member corresponding to the tube or plug 11 is adjustable for effecting a full or partial closing of the port *o* by an adjustment of the plug to or from the valve V, and the same arrangement may be availed of here if desired. The discharge of the classified material thus becomes intermittent instead of continuous. In the particulars just described the present classifier is not unlike the patented construction referred to, and possesses the same advantages. In fact, it is practically the same invention with the added improvements which give rise to the several advantages specifically enumerated above in the general statement of the invention. These improvements reside in the final sizing chamber; in the spiral agitator and conveyer mounted therein; in the specific location of such sizing chamber; in the equal angular velocities of rotation imparted to the conveyer and stirrer arms of the container; in the extension of the stirrer shaft S to which the spiral blades of the

conveyer are attached; and in the several details more specifically pointed out in the claims. In particulars not specifically detailed herein the present machine does not differ from the patented one. For example, the bottom retarding chamber or equalizer 13 serves the same purpose herein as in my patent aforesaid, namely to maintain a slight upward current for holding fine particles of slime in suspension during the discharge of the classified material. Features shown but not alluded to are old in the art, and hence need not be described herein.

The operation may be summarized as follows:—As the pulp flows from the narrow container A to the next succeeding one, the contents of each container are stirred by the stirrer arms C, the classified material being intermittently discharged by the raising of the valve V. Of course, the classification is accomplished by the rising column of water directed from the hydraulic line or pipe 10 into the container through the sizing chamber 1 into and through which the heavier ore particles are constantly falling against the rising current, the lighter particles being carried over into the next succeeding container. The rising column in the sizing chamber 1 is subjected to a spiral motion by the screw conveyer 2 rotating at the same angular velocity as the stirrer arms C, this action not only separating the ore particles so that each individual grain may have the benefit of the classifying action of the rising water, but breaking up any currents which would have a tendency to destroy the equal velocity of upward flow of the individual molecules of the water of such rising column. The classified material as it falls through the sizing chamber is directed by the conical discharge mouth 3 thereof into the observation cylinder 5 whence it precipitates into the vertical chamber or leg of the tee 7 where it is intermittently discharged past the reciprocating valve V through the tube 11, thence dropping into the retarder or equalizer 13 from which it escapes through the bushing 14. The same action takes place in each container or classifier of the series, each succeeding classifier treating the overflow from the one immediately preceding it, until the last hopper is reached whence the slimes pass off to the proper concentrating apparatus.

The classifier obviously may be used for treating other material than what may be best designated by the term "ore", and I wish to be understood as not restricting the use or application of the invention to "ore" merely.

Having described my invention, what I claim is:—

1. An ore-classifier comprising a suitable container provided with stirring means for

the pulp, means for directing thereinto a rising column of water, and a screw conveyer coupled to the stirring means for imparting to such column a spiral motion.

5 2. An ore-classifier comprising a suitable container provided with stirring means for the pulp, means for directing thereinto a rising column of water, and a double screw conveyer coupled to the stirring means for
10 imparting to such column a spiral motion.

3. An ore-classifier comprising a suitable container for the pulp, means for directing thereinto a rising column of water, means rotating about a fixed axis in the container for
15 stirring the contents thereof, and a screw conveyer coupled to the stirring means and interposed in the path of the rising column and subjected to rotation about the same axis with the stirring means.

20 4. An ore-classifier comprising a suitable container for the pulp, means for directing thereinto a rising column of water, means rotating about a fixed axis in the container for stirring the contents thereof, and a screw
25 conveyer coupled to the stirring means and interposed in the path of the rising column and rotating about the same axis with the stirring means and at the same angular velocity.

30 5. An ore-classifier comprising a suitable container, a final sizing chamber below the same, and in communication therewith, means for directing into the container through the sizing chamber a rising column
35 of water, there being a discharge port for the sizing chamber, a rotatable mechanical

agitator comprising a hollow shaft and stirrer arms located in the container, the shaft extending into the sizing chamber, a spiral conveyer or stirrer on the shaft in the
40 sizing chamber, and a valve for controlling the discharges from the sizing chamber through the discharge port.

6. In combination with a container for the pulp, stirring means for agitating the
45 contents of the container, a sizing chamber leading from the bottom of the container, a rotatable spiral conveyer or stirrer in said sizing chamber connected to the stirring means, and means for directing a rising
50 column of water through the sizing chamber into the container during the operation of the stirring means and spiral conveyer respectively.

7. A classifier comprising a pulp-con- 55
tainer provided with stirring means, a sizing chamber communicating with the container through the bottom thereof, means for directing through the sizing chamber and into
60 the container a rising water column, a double-screw rotating in the sizing chamber about a vertical axis for imparting a spiral rotary motion to the rising column, and a retarding chamber below the sizing chamber for dis-
65 charging the classified material.

In testimony whereof I affix my signature, in presence of two witnesses.

FRANK G. JANNEY.

Witnesses:

EDWARD BIGELOW,
A. W. WATSON.