F. D. MELHUISH.

ORE CONCENTRATOR.

APPLICATION FILED FEB. 3, 1909.

944,567.

Patented Dec. 28, 1909.

4 SHEETS—SHEET 1.

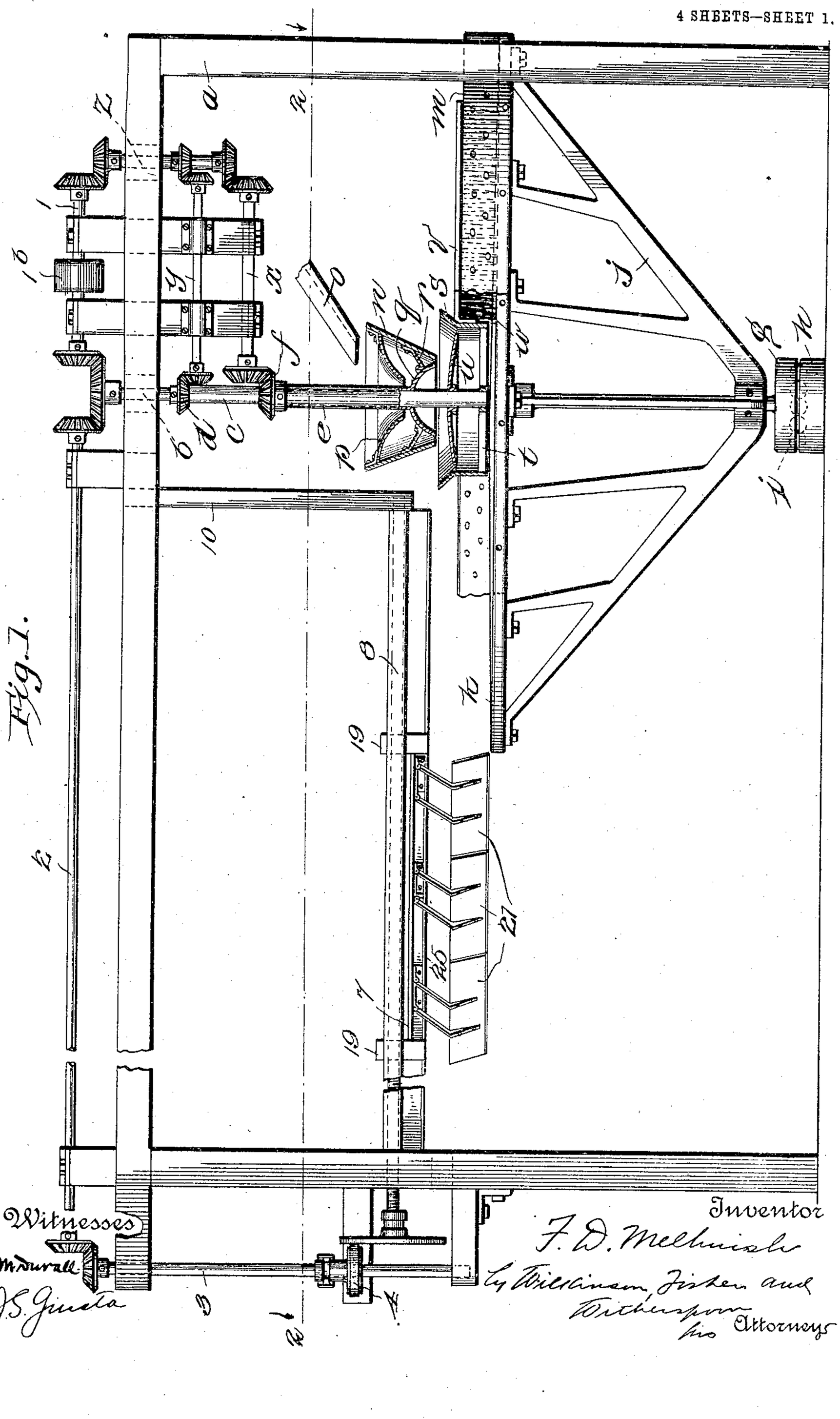

Fig. 1.

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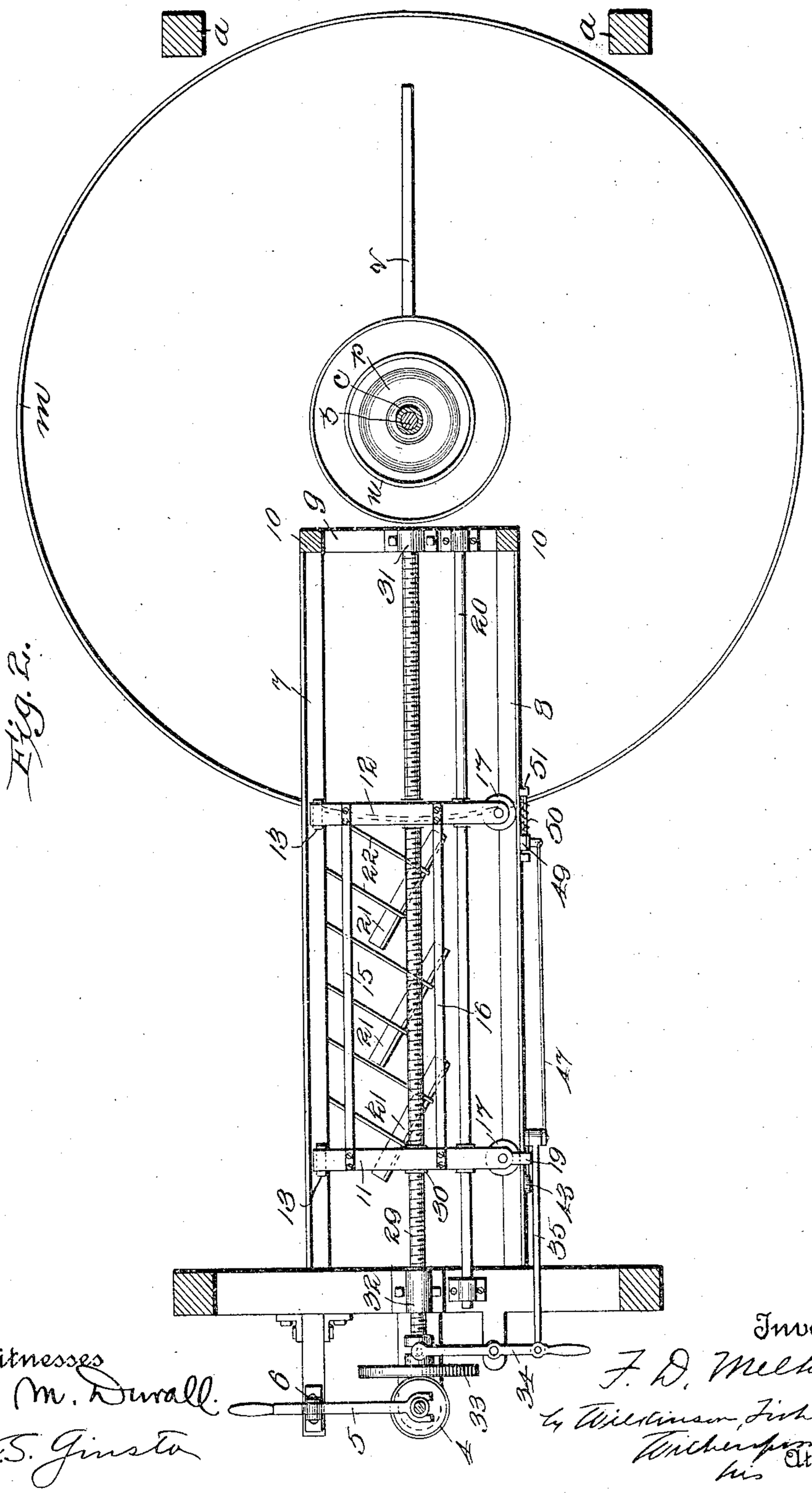
4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

W. M. Durall.

J. S. Ginsta

Inventor

F. D. Melhuish

by Wilkinson, Fisher and Richardson

his Attorneys

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4 SHEETS—SHEET 3.

Fig. 3.

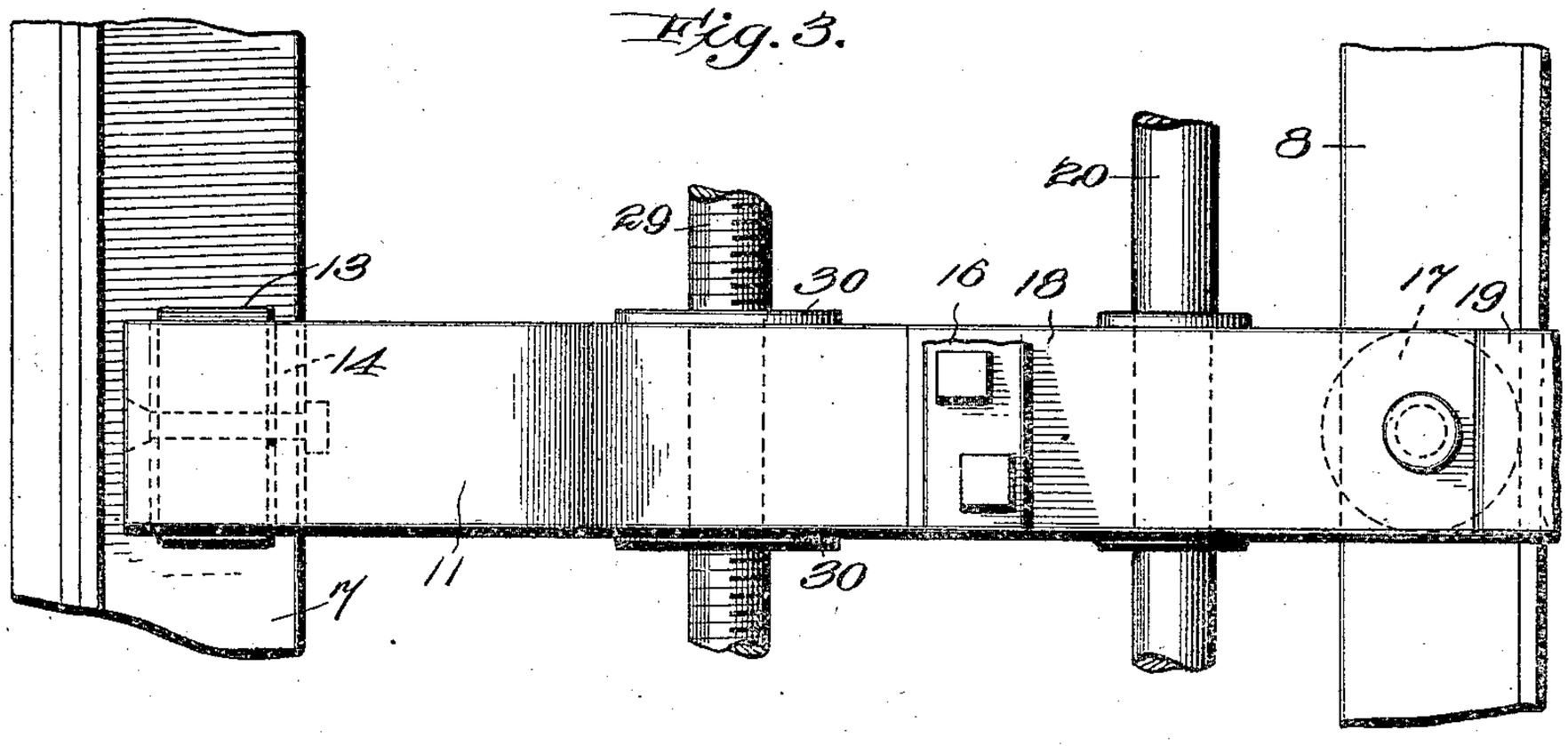
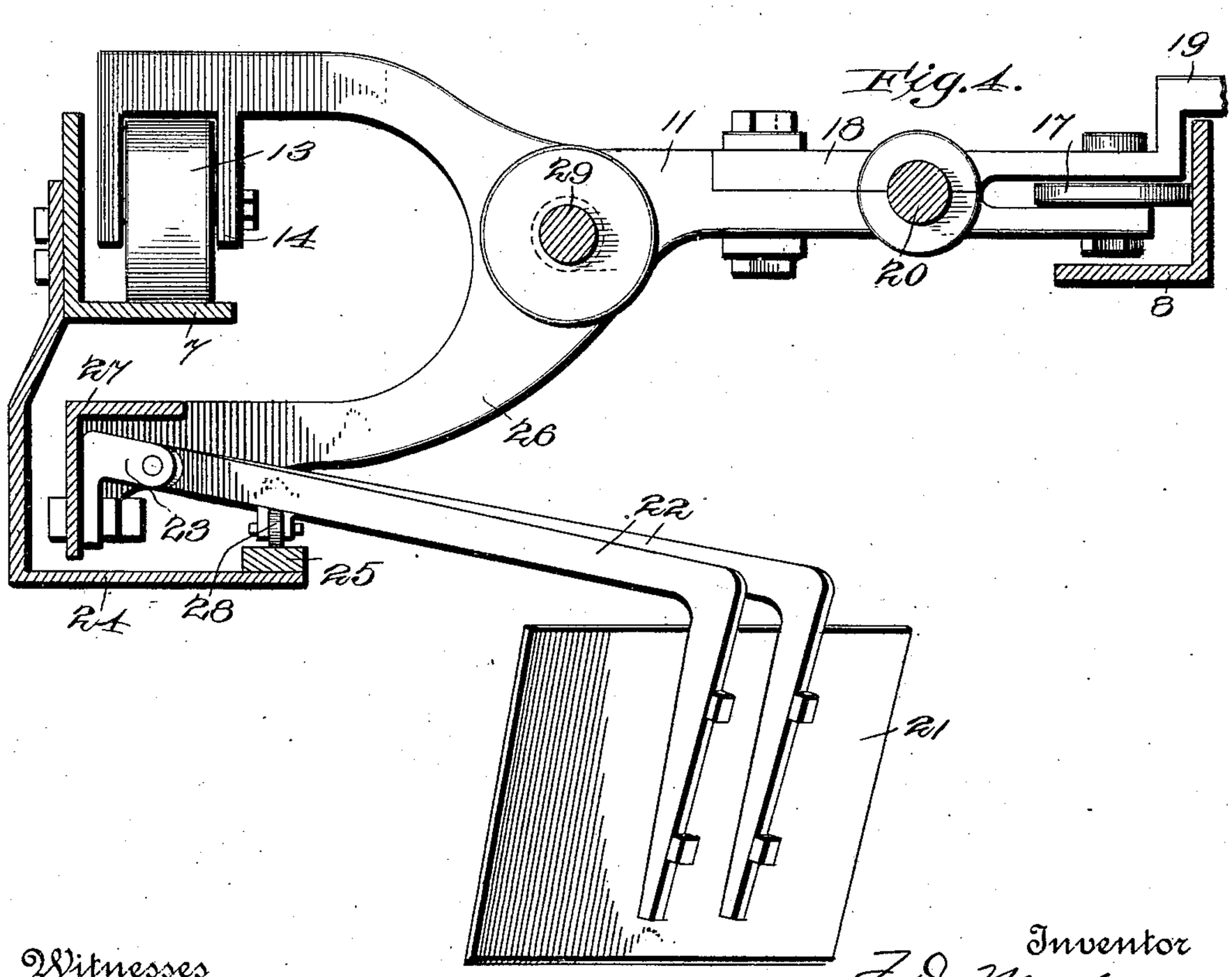


Fig. 4.



Witnesses

W. M. Durall.

J. S. Gleeson

Inventor

F. D. Melhuish

by Wilkinson, Fisher & Witherspoon

his Attorneys

944,567.

F. D. MELHUISH.

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4 SHEETS—SHEET 4.

Fig. 5.

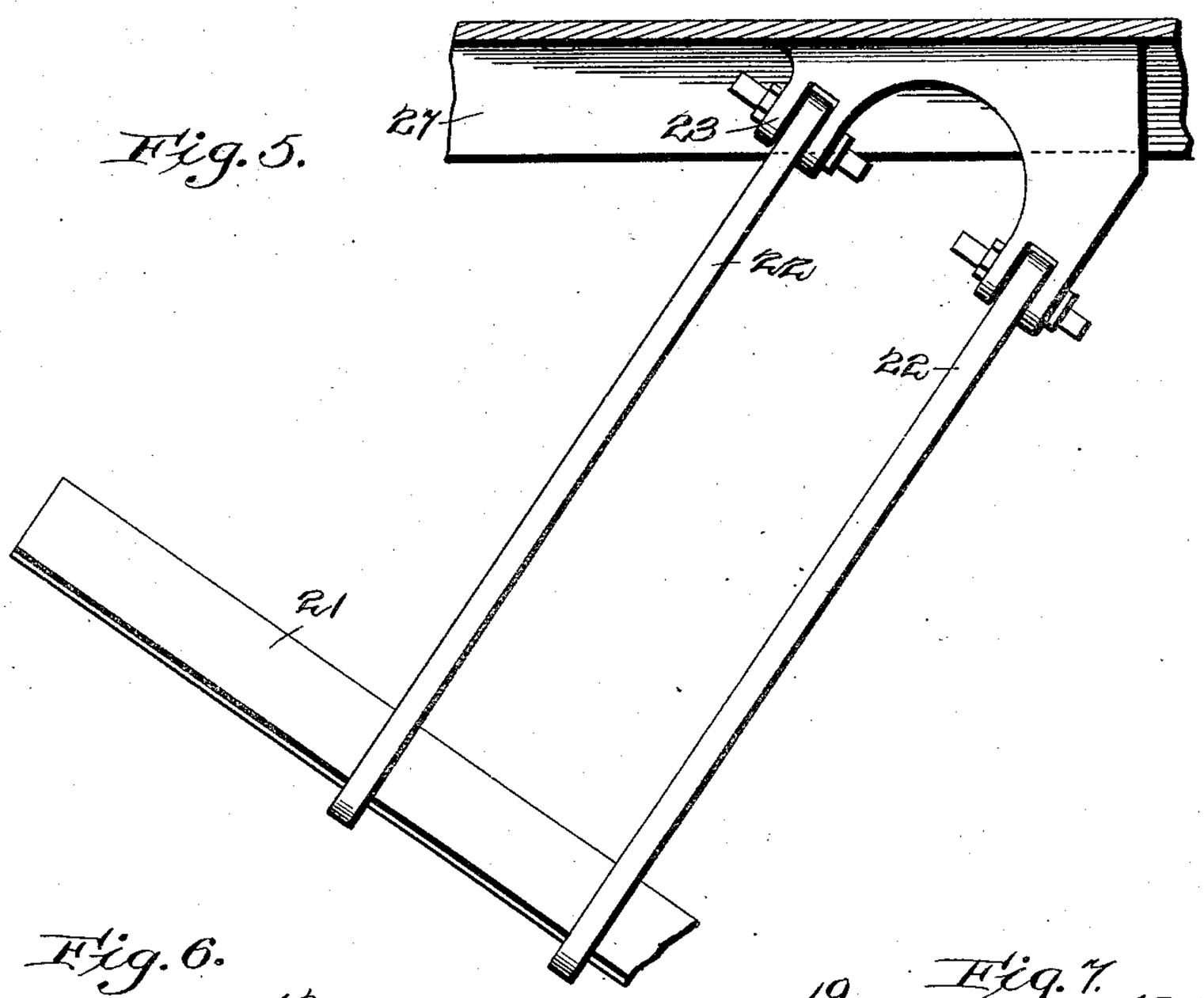


Fig. 6.

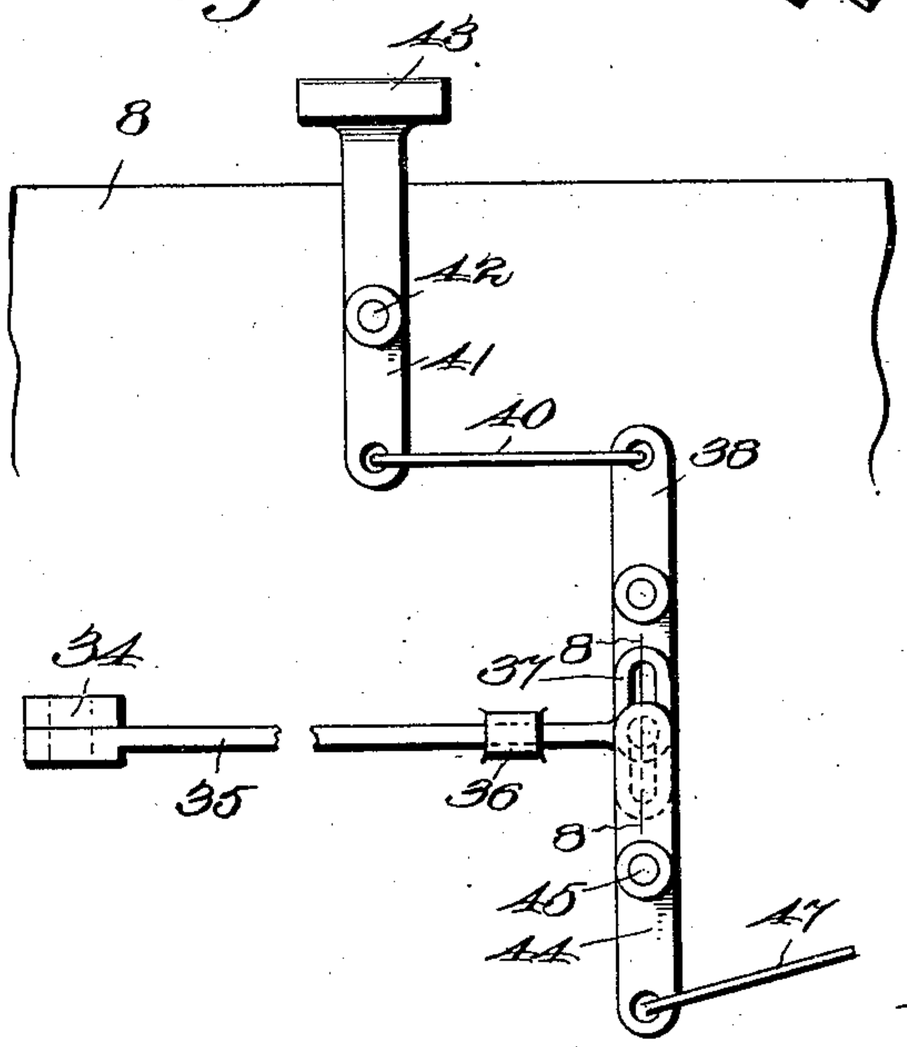


Fig. 7.

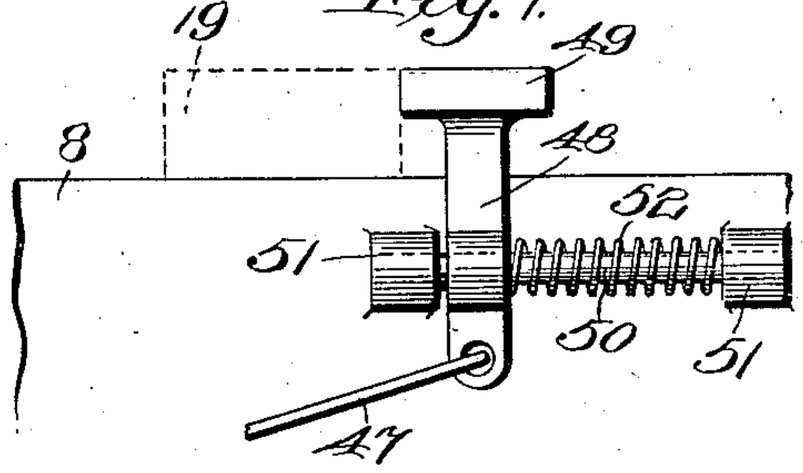
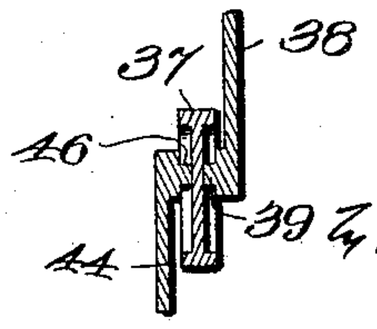


Fig. 8.



Witnesses
W. M. Durall
J. S. Ginsta

Inventor
F. D. Melhuish
by Wickersham Fisher and Wickersham
his Attorneys

UNITED STATES PATENT OFFICE.

FRANK D. MELHUISH, OF ATLANTA, GEORGIA.

ORE-CONCENTRATOR.

944,567. Specification of Letters Patent. **Patented Dec. 28, 1909.**

Application filed February 3, 1909. Serial No. 475,848.

To all whom it may concern:

Be it known that I, FRANK D. MELHUISH, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to ore concentrators, and the object thereof is to produce a simple apparatus for handling all kinds of crushed ores and capable of handling in a shorter time and concentrating a greater amount of ore in a given time than any other machine known to me, thereby reducing the cost of the operation.

With this object in view, my invention consists in the construction and combinations of parts as hereinafter described and claimed.

In the accompanying drawings—Figure 1 is a side view of my invention, parts being omitted and parts broken away, and parts being shown in section. Fig. 2 is a cross section on the line 2—2 of Fig. 1, looking downward. Fig. 3 is a top plan view of the carriage for carrying the scrapers. Fig. 4 is an end view of the same, the carriage guides and operating rods being shown in section. Fig. 5 is a top plan view showing one method of attaching the scraper to the carriage. Figs. 6 and 7 are partial side views showing details of the stock device, and Fig. 8 is a cross section on the line 8—8 of Fig. 6.

a represents the framework carrying the various parts of the machine. In this frame is mounted the rotatable shaft *b*, which is vertically disposed and drives the concentrating table. On the shaft *b* is mounted a sleeve *c*, carrying a beveled gear wheel *d*, and on the sleeve *c* is mounted a larger sleeve *e*, carrying a beveled gear wheel *f*. The lower end of the shaft *b* is enlarged, as shown at *g*, and is supported on a bearing *h*, anti-friction balls *i* being placed between the parts *g* and *h*.

To the shaft *b* is firmly fixed a frame *j*, made substantially conical and having various branches thereon, as shown, and on this frame is mounted the ore concentrating table *k*, which is slightly inclined from the center outward. A removable circular screen *m* is provided, adapted to fit on the outer edge of the table, which screen is removed when the scrapers hereinafter described are put in operation.

n represents a hopper secured to the lower end of the sleeve *e*, and *o* represents a spout for delivering the ore mixed with water into said hopper. This hopper is provided with a downwardly and inwardly-extending flange *p*, having an opening at its center, and below this flange is a curved dome *q*, attached by braces *r* to the interior of the hopper *n*. A circular space is left between the outer edge of said dome and the lower edge of said hopper.

The sleeves *c* and *e* are so mounted on the shaft *b* as to be independently rotatable thereon, and on the sleeve *c*, which is longer than the sleeve *e*, is mounted a receptacle open at the top and bottom, and having an annular flaring lip *s* at the top, and arms *t* which connect the lower edge of the receptacle to the sleeve *c*. Within this receptacle, and attached to the sleeve *c*, is a dome *u*, which stops short of the inner wall of the receptacle, leaving a circular opening therebetween.

By the construction described, I have found that a perfectly regular and even flow of material to be concentrated may be obtained.

To the outside of the lower receptacle is attached an arm *v*, carrying a brush *w*, which slowly revolves over the surface of the table in a direction opposite to the movement thereof, and assists in the concentrating action.

The sleeve *e* is driven by a shaft *x*, and the sleeve *c* is driven by a shaft *y*, both of these shafts being driven by a shaft *z*, which in turn is driven by the driving shaft 1, provided with a driving pulley 1^b. All these shafts and sleeves are provided with beveled gear wheels meshing with each other, as shown in Fig. 1. The shaft *b* also drives a shaft 2 by means of beveled gear wheels, which shaft in turn drives the shaft 3 by means of beveled gear wheels, and this shaft 3 drives the scrapers at intervals by means hereinafter described. Slidably mounted on the shaft 3, but splined thereto is a friction wheel 4, and this wheel can be

raised or lowered at will by the operator by means of a lever 5, pivoted at 6 in an extension of the framework.

The raceway for the carriage carrying the scrapers is shown in top plan view in Fig. 2. It consists of two L-shaped rails 7 and 8, arranged parallel to each other, and firmly attached at one end to a portion of the framework, and having their inner ends connected by the cross-piece 9, which is supported by beams 10 from the upper part of the framework. On this raceway travels the carriage carrying the scrapers. As shown in Figs. 2 and 4, this carriage consists of two substantially horizontal portions 11 and 12. On one end of these horizontal portions are arranged vertical bearing wheels 13, rotatably mounted in extensions 14, projecting downwardly from the parts 11 and 12. The parts 11 and 12 are firmly connected together by parallel braces 15 and 16 bolted thereto.

Opposite the wheels 13 are arranged horizontal bearing wheels 17, bearing against the vertical part of the rail 8, while the wheels 13 bear against the horizontal part of the rail 7.

18 represents a separate piece firmly bolted to the top of the part 11, thus affording a space for the wheel 17, as shown in Fig. 4, and extending outwardly over the rail 8, as shown at 19 in Figs. 2 and 4, the construction being the same on the part 12.

20 represents a guide rod secured at one end to the part 9, and at the other end to the framework of the machine, and the parts 11 and 18 are extended and perforated so as to engage this guide rod, as shown in Fig. 4.

21 represents a trio of scrapers carried by said carriage, and arranged diagonally in relation thereto. These scrapers are arranged parallel to each other and their ends overlap, as shown in Fig. 2. These scrapers are so arranged that they travel from the outer rim of the table on the direct center line to the inner part of the table and at an angle of not less than 35° to said center line, thereby removing the concentrates in much less time than any other device known to me.

Attached to the rail 7 is a downwardly-extending substantially L-shaped rail 24, carrying a bearing-piece 25.

26 represents arms curving down from the part 11 and made integral therewith, the construction on both ends of the carriage being the same, and 27 represents an angle iron connecting the arms 26.

The scrapers 21 are each supported on a pair of arms 22, pivotally mounted in brackets 23, secured to the angle iron 27. Each of these arms carries a small anti-friction wheel 28, resting upon the bearing part 25. By this construction, the scrapers 21 are limited in their downward movement, but will yield slightly to obstructions upon the table. This is the construction that I prefer, but, of course, the scrapers could be carried rigidly on the arms 26, or similarly arranged parts, if desired.

The carriage is moved back and forth in the following manner: 29 represents a screw rod, which engages with screw-threaded bearings, such as 30 in the parts 11 and 12. This rod is supported at one end in a bearing 31, mounted on the part 9, and near the other end in a bearing 32 on the framework. This rod, however, is arranged to revolve freely in said bearings, and does not advance, but simply revolves. A suitable device (not shown) such as a collar engaging a groove in the end of the rod 29 may be employed in the bearing 31. Splined to the rod 29, but arranged to slide freely thereon, is a friction disk 33, which is adapted to contact with the friction wheel 4 on the shaft 3 at times. This disk may be moved back and forth by the clutch lever 34 mounted on an extension in the framework.

It is necessary that the movement of the carriage should be automatically stopped just before it strikes the braces *m* in its movement in one direction, and before it strikes the framework in its movement in the opposite direction, and this automatic stop device is best shown in Figs. 2, 6, 7 and 8.

35 represents a link pivoted to the clutch lever 34, and guided by a bearing 36 on the framework. At the other end, this link is provided with an elongated disk 37 having a long groove on each side, as shown in Figs. 6 and 8.

38 represents a lever pivotally mounted on the frame of the machine, and provided with a pin 39 projecting into one of the grooves in the disk 37. To the upper end of this lever is attached a link 40, the other end of which is attached to the lever 41, pivoted at 42, on the rail 8, and having an enlarged head 43. 44 represents another lever, pivoted at 45 on the frame of the machine, and having a pin 46 engaging one of the grooves in the part 37.

47 represents a link attached to the lower end of the lever 44, and also attached at its other end to the lower end of a sliding bar 48 having an enlarged head 49. This bar is arranged to slide on a shaft 50 carried in bearings 51 on the rail 8, and normally held in the position shown in Fig. 7 by the spring 52.

The part 19 of the movable carriage is adapted to strike against the enlarged heads 43 and 49, above referred to, and when it does strike either one of these heads it will operate the clutch lever 34, moving the friction disk 33 out of contact with the friction wheel 4, thereby stopping the movement of the carriage.

As stated before, the friction wheel 4 is

slidably mounted upon the shaft 3. By means, therefore, of the lever 5, the speed of operation of the disk 33, and thereby of the screw-rod 29, may be varied, as desired, or may be reversed by moving said wheel 4 below or above the center of the disk 33.

The operation is as follows:—The lever 5 is first moved so as to disengage the wheel 4 from the disk 33, thus throwing the scraper carrying carriage out of operation. The ore to be concentrated, mixed with water, is fed in through the chute *o*, and is delivered in an even stream upon the concentrating table, the screen *m* having been previously placed around the edge of said table. The centrifugal force, aided by the brush *w*, causes a concentration of the ore, the lighter particles and water escaping through the holes in the screen *m*. When the operator judges that the concentration has been sufficiently effected, he removes the screen *m*, and throws the friction wheel 4 into contact with the friction disk 33, thus causing the scrapers to travel, at a definite rate of speed, from the position shown in Fig. 1 toward the center of the table, which is all the time revolving. This causes the concentrates to be quickly and evenly scraped from the table into a suitable receptacle (not shown). The carriage moves forward toward the center of the table until the part 19 strikes the part 49 when the motion is automatically stopped as the friction disk 33 is disengaged from the friction wheel 4. The operator then shifts the friction wheel 4 down beyond the center of the friction disk 33 and moves said disk back into contact with the friction wheel 4, whereupon the carriage travels back until the part 19 strikes the part 43, whereupon the backward motion is automatically stopped. The screen *m* is then put back around the table, and the operation repeated.

Having thus described my invention, what I claim is:—

1. In an ore concentrator, the combination of a table, a plurality of parallel scrapers set at a sharp angle to a radius of the table, and means for continuously moving said scrapers back and forth over said table and radially thereto, substantially as described.

2. In an ore concentrator, the combination of a table, having a substantially flat surface, a plurality of parallel scrapers set at a sharp angle to a radius of the table, a carriage on which said scrapers are carried, said carriage being provided with anti-friction wheels, a frame supporting said carriage, and means for continuously moving said carriage back and forth over the surface of said table and radially thereto, substantially as described.

3. In an ore concentrator, the combination of a table, a carriage, a plurality of parallel scrapers carried by said carriage, said scrapers having their ends over-lapping and arranged at a sharp angle to a radius of the table, said carriage being provided with roller bearings, a frame supporting said bearings, means for continuously moving said carriage back and forth on said frame on the line of a radius of said table, and means for automatically stopping the movement of said carriage at a predetermined point, substantially as described.

4. In an ore concentrator, the combination of a table, a carriage arranged to travel in the direct center line from the circumference of said table toward and away from its center, and provided with a plurality of scrapers diagonally mounted thereon, said scrapers being parallel to each other and having their ends over-lapping, and means for moving said carriage, including a screw-shaft arranged radially with relation to said table, a friction wheel mounted on said screw-shaft, a friction disk adapted to engage said friction wheel, means for moving said disk into different positions relatively to said friction wheel, and means for automatically stopping the travel of said carriage at a predetermined limit in either direction, substantially as described.

5. In an ore concentrator, the combination of a table, a plurality of parallel, diagonally-arranged scrapers, a carriage to which said scrapers are pivotally attached, said carriage being provided with roller bearings, a frame comprising L-shaped bars supporting said carriage, means for moving said carriage radially over the surface of said table, and automatic trips and levers against which said carriage is adapted to strike as it moves, to automatically stop its movement in either direction at a predetermined limit, substantially as described.

6. In an ore concentrator, the combination of a supporting frame, a table rotatably mounted therein, means for rotating said table, an independent angle iron frame supported by said first-named frame and extending thereover to a point nearly to the center of the table, and radially to said table, a carriage provided with roller bearings, mounted on said independent frame, a plurality of parallel, diagonally-arranged scrapers pivotally mounted on said carriage, a screw-shaft rotatably mounted in said frames and engaging said carriage, means for rotating said screw-shaft and automatic means for stopping the motion of said screw-shaft at a predetermined point, substantially as described.

7. In an ore concentrator, the combination of a supporting frame, a rotatable table carried thereby, a carriage carrying a plurality of diagonally-arranged scrapers, a screw-shaft for driving said carriage and gearing for rotating said table and driving said shaft, including a shaft with a slidable

friction wheel mounted thereon, a friction disk mounted on said screw-shaft, and devices for moving said disk out of contact with said wheel at a predetermined point in the movement of said carriage in either direction, substantially as described.

8. In an ore concentrator, the combination of a table, a shaft on which said table is mounted, means for rotating said shaft, a sleeve surrounding said shaft, a distributing receptacle attached to said sleeve and located centrally over said table, a second sleeve mounted on said first-named sleeve, a hopper provided with a dome mounted on said second-named sleeve, and means for revolving said sleeves in different directions and for revolving said shaft, substantially as described.

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

FRANK D. MELHUISH.

Witnesses:

E. W. Born,

J. S. Hoffman.