No. 668,745. Patented Feb. 26, 1901.

P. H. ADAMS.

CENTRIFUGAL SIZER.

(No Model.) (Application filed May 27, 1899.) 2 Sheets—Sheet 1.

Fig. 1.

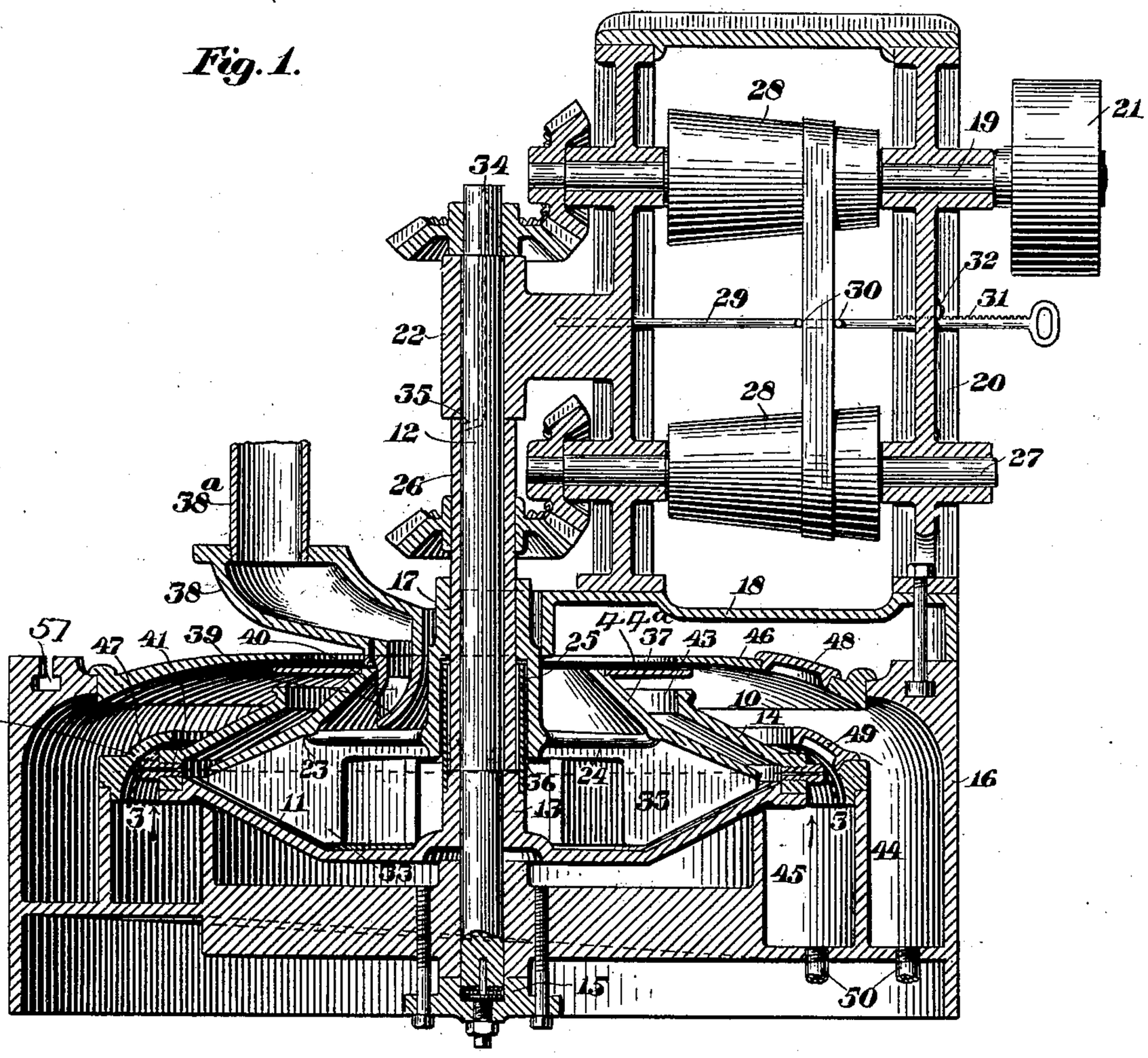


Fig. 4.

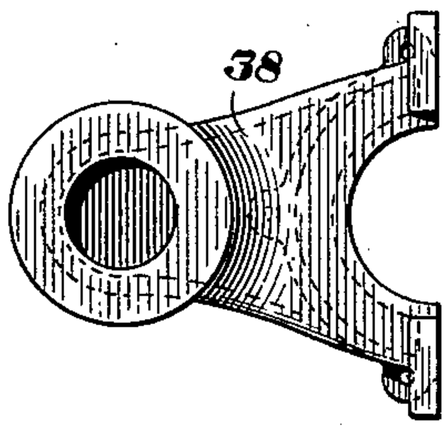
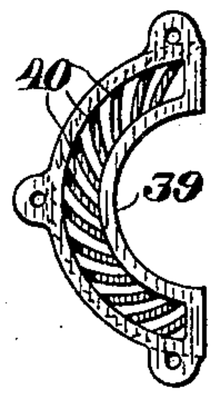


Fig. 5.



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CENTRIFUGAL SIZER.

(Application filed May 27, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

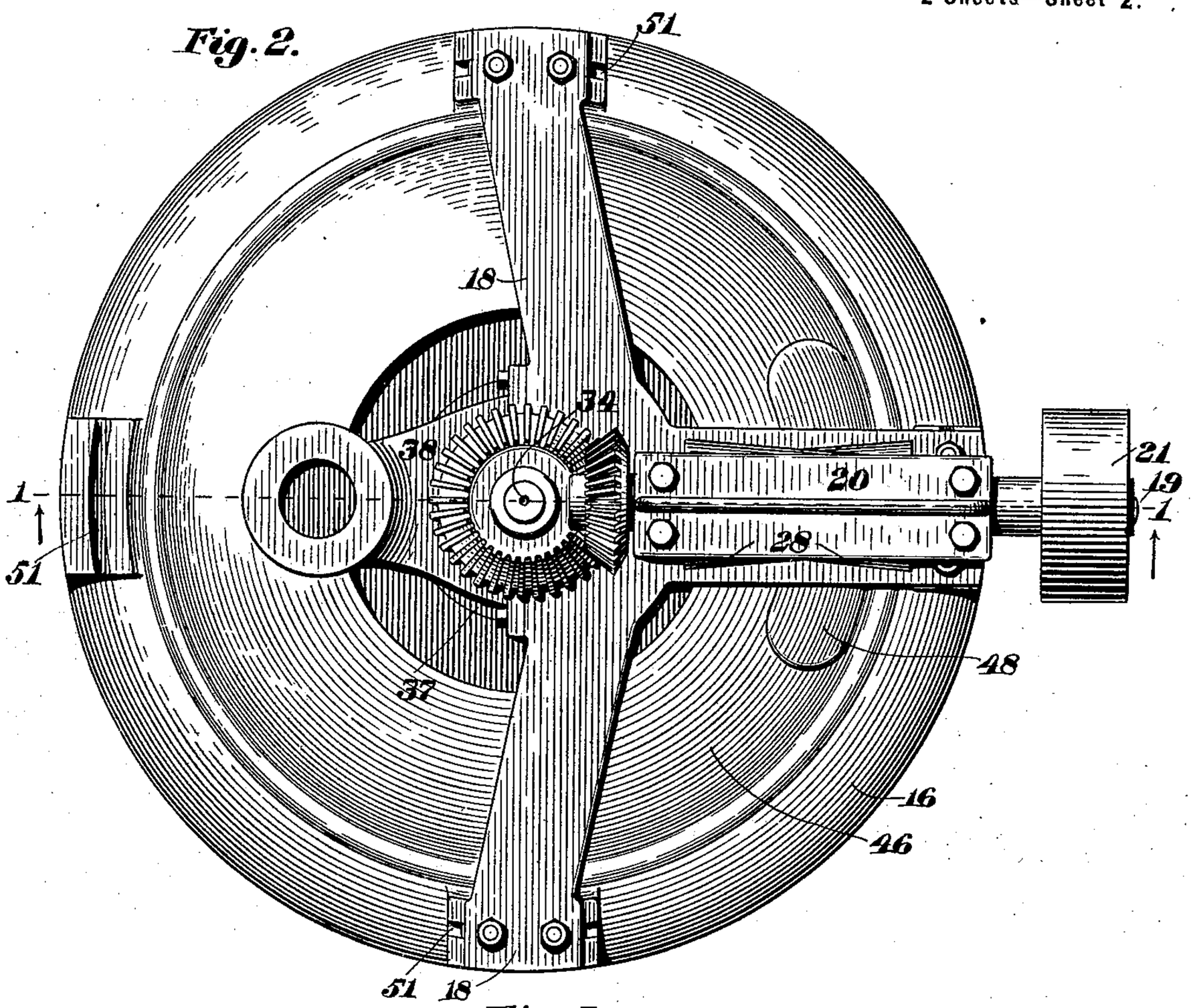
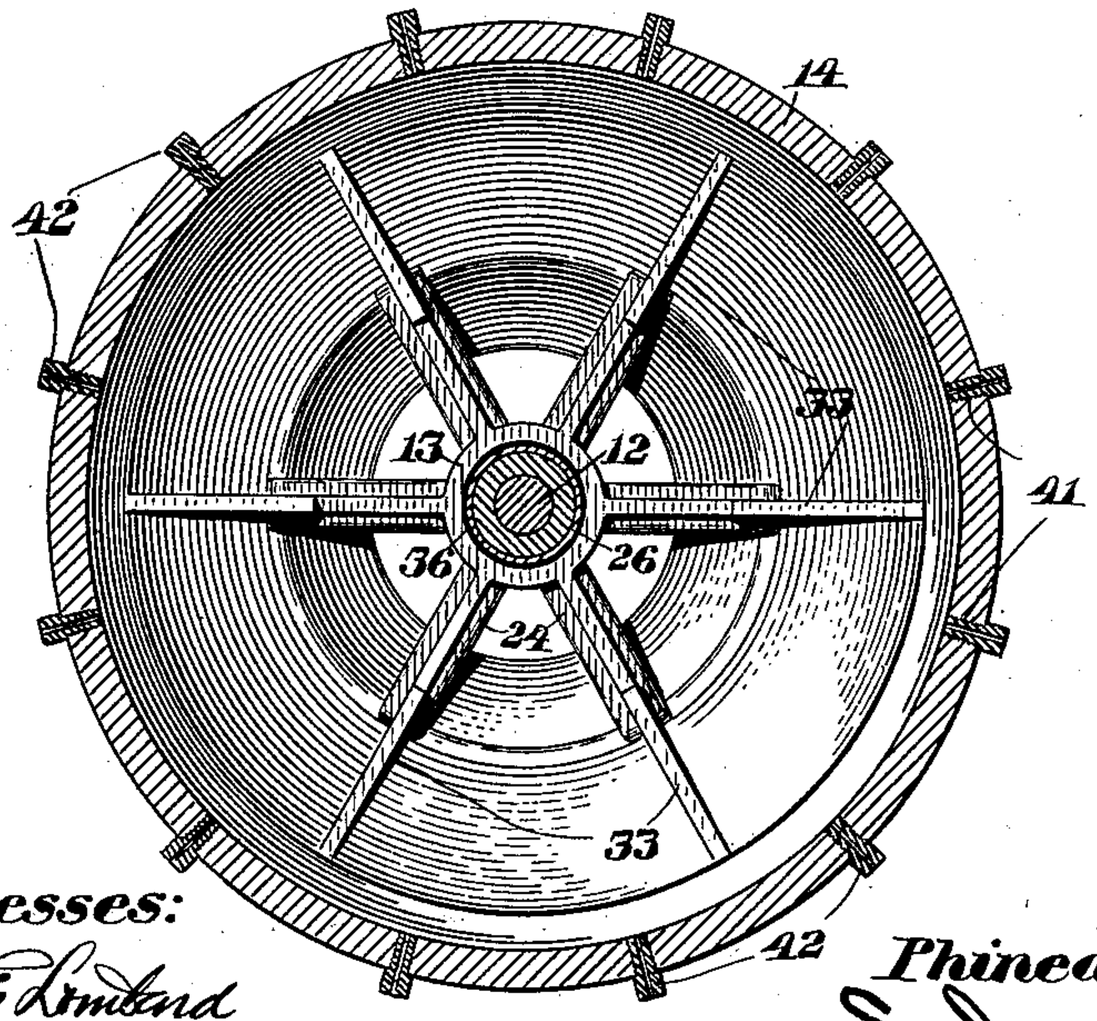


Fig. 3.



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UNITED STATES PATENT OFFICE.

PHINEAS H. ADAMS, OF CHICAGO, ILLINOIS, ASSIGNOR TO EDMOND C. PECK, OF SAME PLACE.

CENTRIFUGAL SIZER.

SPECIFICATION forming part of Letters Patent No. 668,745, dated February 26, 1901.

Application filed May 27, 1899. Serial No. 718,595. (No model.)

To all whom it may concern:

Be it known that I, PHINEAS H. ADAMS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Centrifugal Sizers, of which the following is a specification.

My invention relates to machines for separating various materials, more particularly ores, into grades of particles of different size, usually as a preliminary step to concentration or other treatment, and has for its object various improvements in the construction of such devices hereinafter particularly described and claimed.

In the drawings, Figure 1 is a vertical section of my improved sizer on the line 1 1 of Fig. 2 looking in the direction of the arrows. Fig. 2 is a top plan view of the entire machine. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1 looking in the direction of the arrows, and Figs. 4 and 5 are details in top plan of portions of the feed-spout.

Like numerals refer to similar parts throughout the several figures of the drawings.

10 designates a treatment vessel, preferably composed of two portions or plates, the lower, 11, being secured to a vertical shaft 12, preferably by an upwardly-extending hub 13. This plate is upwardly inclined at its outer portion, and upon its outer edge rests a ring or plate 14, upwardly inclined from its point of contact with the lower plate, so that a space is left between them to form the interior of the treatment vessel. The shaft 12 is supported in a step 15, removably secured to the lower and central portion of a casing 16, surrounding the vessel. This step is preferably provided with a suitable antifriction-bearing, which has adjusting mechanism for taking up the wear. Upon the upper end of the vessel-shaft is fixed a bevel-gear meshing with another bevel-gear upon the inner end of a horizontal shaft 19, journaled in the upper portion of a vertical open frame 20, preferably carried upon one arm of a spider 18, secured to the top of the casing. The shaft 19 is provided with a driving-pulley 21, by means of which the treatment vessel may be rotated at the desired speed. The frame 20 is also provided at its inner side with bearing 22 for the shaft 12.

Within the treatment vessel is a substantially radial or horizontal partition 23, the outer portion of which, however, preferably conforms to the inclination of the upper portion of the treatment vessel. The central portion consists of a series of arms 24, radiating from an elongated hub 25, which is secured to a hollow shaft or sleeve 26, surrounding the vessel-shaft and having a bearing thereon and stepped at its lower end upon the bottom of the vessel or the supporting-hub thereof. Near the upper end of this shaft 26 is secured a bevel-gear meshing with a similar gear upon the end of a horizontal shaft 27, journaled in bearings in the lower portion of the frame 20. This shaft, and consequently the deflector, is preferably rotated from the driving-shaft 19 of the treatment vessel and by some type of variable-speed gearing. A simple form is here shown, consisting of a pair of oppositely-inclined cone-pulleys 28 28, fixed to the shafts 19 27 between the sides of the frame 20 and connected by a belt. This belt is preferably provided with some form of shifting mechanism (here illustrated as a bar 29) sliding in the frame 20 and provided with pins 30, contacting with the belt on either side. One side of the bar may be notched, as at 31, these notches being engaged by a movable latch 32, serving to retain the belt at the desired point. Upon the lower side of the partition 23 are downwardly-extending projections or agitating-wings 33, reaching from points at some greater or less distance from the axis into proximity with the outer circumference and also nearly to the bottom of the treatment vessel, conforming to the shape thereof. A change in the position of the belt upon the pulleys will vary the differential in speed between the vessel and partition, thus controlling the agitation produced by these wings.

To lubricate the bearing of the partition-shaft upon the vessel-shaft, the latter is provided with a central channel 34, extending downward to a transverse channel 35, through which the oil may flow to the upper point of contact of the two shafts, downward along the entire contacting surfaces, and into the

step-support at the bottom. At this point, to retain the oil and to prevent the material under treatment from reaching the bearing, the hub 13 is provided with an annular flange or sleeve 36, surrounding the step and extending upward into a recess in the partition-hub to a point above the body of mixture contained in the vessel.

Upon the upper side of the partition, extending upwardly and somewhat inwardly from the outer end of the arms 24, is an annular flange 37, preferably cast integral with the partition, forming a receptacle into which the material to be treated is delivered, preventing its being thrown from the vessel by centrifugal force. Above the vessel is located a feed spout or nozzle, preferably consisting of two parts, the upper, 38, being conveniently bolted to the spider 18, encircling the shafts for about one-half their circumference, and having its lower opening over the annular space between the flange 37 and the hub 17. To the bottom of this portion 38 is attached a lower portion 39, having an opening registering with that of the upper portion of the spout. It is preferably downwardly and outwardly curved and opens at the side toward the periphery of the vessel. In the discharge-opening is located a series of vertical partitions 40, which are curved or inclined in the direction of rotation of the vessel to impart to the feed an initial rotative movement. A feed conduit or pipe 38^a is connected to the opening at the top of the spout-section 38.

At the periphery of the treatment vessel, where the upper and lower plates join, are discharge-openings 41, in which may be inserted removable nipples 42 to receive the wear of the passing material. In the upper plate 14 is a central opening 43, which leaves an annular discharge-space between the edge of the plate and the flange 37 of the partition.

Surrounding the vessel and forming a part of the casing 16 is a double annular trough having the two sections 44 45, which receive the discharge, respectively, from the upper opening 43 and the peripheral openings 41. A substantially horizontal annular plate or flange 44^a is preferably secured to the top of the rotating partition at the end of the flange 37, extending out toward the trough. This serves to direct the discharge from the opening 43 into the outer trough, preventing its being thrown over the same. The tops of the trough-sections 44 45 are provided with annular covers 46 47, respectively, which rest at their outer edges from the outer walls of the sections, the inner edges extending over the inner and outer portions of the top plate 14 of the vessel. To permit ready access to the discharge-nipples for changing or clearing them, the covers 46 and 47 are provided with sector-shaped removable panels or sections 48 49, respectively, extending for a portion of the circumference, the lower registering with the upper. When access to the vessel as a whole is desired, the covers are taken off; but if it is merely necessary to change the nipples the panels may be readily removed and the vessel rotated to bring different parts under the sector-shaped opening. Pipes or conduits 50 50 conduct away the contents of the troughs.

The vertical frame 20 is preferably secured to the top of the casing by bolts which enter a slot 51 therein, or, as it is here shown, a sectional slot formed in bosses thereon. This arrangement allows the driving-gear to be mounted at any one of four points about the machine, permitting the relation thereof to the feed and discharge conduits to be adjusted according to the peculiar conditions existing in any particular installation.

In operation the treatment vessel is rotated at a speed sufficient to develop the desired degree of centrifugal force and the agitator at a preferably-slighter slower speed, the differential rotation preventing the material from accumulating upon the bottom of the vessel and keeping it suspended in the water. The ore or other material to be sized mingled with water is introduced through the feed-spout, being ejected between the inclined partitions in the direction of rotation of the vessel, thus aiding in bringing it quickly to the same speed. The mixture passes down between the arms 24, and under the influence of centrifugal force moves outward toward the periphery of the vessel. Here the coarser particles and a portion of the water will be discharged through the openings 41 into the section 45 of the trough, the centrifugal force imparted to these particles being sufficient to throw them out of the current formed by the excess of water which cannot escape at the periphery, but flows upward by the end of the partition, carrying with it the finer particles. These are discharged through the opening 43 in the top of the vessel and received by the trough-section 44. The partition 23, the periphery of which lies in substantially the same plane as the orifices 41 and in proximity thereto, prevents the material from following the shortest path and being mainly discharged at the top of the vessel without having been brought sufficiently close to the said orifices for the coarser particles to be there discharged. The pipes or conduits 50 carry the sized material from each portion of the trough to the desired point as a receiving-tank or concentrating-machine.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a centrifugal sizer, the combination of a rotatable treatment vessel, an independently-rotatable partition therein, openings in said partition through which material may be delivered to the inner portion of the vessel, an opening in the vessel upon the opposite side of the partition for the discharge of finer particles, and peripheral openings for the discharge of coarser particles lying in substantially the same plane as the periphery of the

partition and in proximity thereto, substantially as described.

2. In a centrifugal sizer, the combination of a rotatable treatment vessel, an independently-rotatable partition therein carrying agitators, openings in said partition through which material may be delivered to the inner portion of the vessel, an opening in the vessel upon the opposite side of the partition for the discharge of finer particles, and peripheral openings for the discharge of coarser particles lying in substantially the same plane as the periphery of the partition and in proximity thereto, substantially as described.

3. In a centrifugal sizer, the combination of a rotatable treatment vessel, a partition therein, a feed-conduit delivering to said vessel above the partition, openings in said partition through which the material may be delivered to the lower portion of the vessel, an opening in the vessel upon the upper side of the partition for the discharge of finer particles, and peripheral openings for the discharge of coarser particles lying in substantially the same plane as the periphery of the partition and in proximity thereto, substantially as described.

4. In a centrifugal sizer, the combination of a rotatable treatment vessel, an independently-rotatable partition therein, a feed-conduit delivering to the vessel at the outer side of said partition, and a flange upon the partition extending into an opening in the vessel and surrounding said conduit whereby the material fed is prevented from being thrown from the vessel by centrifugal force, substantially as described.

5. In a centrifugal sizer, the combination of a rotatable treatment vessel, an independently-rotatable partition therein, a feed-conduit delivering to the vessel at the outer side of said partition, a flange upon the partition extending into an opening in the vessel, and surrounding said conduit whereby the material fed is prevented from being thrown from the vessel by centrifugal force, and a plate or flange extending outward from the first-named flange over the edge of the opening, substantially as described.

6. In a centrifugal sizer, the combinaton of a rotatable treatment vessel, an independently-rotatable partition therein, openings at or near the center of said partition and projections or wings upon one side of the partition extending from points at some distance from the axis into proximity with the outer circumference, substantially as described.

7. In a centrifugal sizer, the combination of a rotatable treatment vessel, openings at the periphery thereof, an independently-rotatable shaft within the vessel, arms radiating therefrom, and a partition extending from the outer ends of said arms into substantially the same plane and into proximity with the peripheral openings, substantially as described.

8. In a centrifugal sizer, the combination of a rotatable treatment vessel, openings at the periphery thereof, an independently-rotatable shaft within the vessel, arms radiating therefrom, a partition extending from the outer ends of said arms into substantially the same plane and into proximity with the peripheral openings, and projections or wings upon one side of the partition, substantially as described.

9. In a centrifugal sizer, the combination of a rotatable treatment vessel having its sides inclined from the periphery toward the center, an independently-rotatable partition therein substantially conforming in inclination to one side of the vessel, and openings at or near the center of said partition, substantially as described.

10. In a centrifugal sizer, the combination of a rotatable treatment vessel having its sides inclined from the periphery toward the center, an independently-rotatable partition therein substantially conforming in inclination to one side of the vessel, projections or wings upon the opposite side of said partition, and openings at or near the center, substantially as described.

11. In a centrifugal sizer, the combination of a rotatable treatment vessel, gearing for driving the same, a partition within said vessel, variable-speed gearing for rotating said partition from the driving mechanism of the vessel, openings in the partition through which material may be delivered to the lower portion of the vessel, and openings in the vessel for the discharge of sized particles, substantially as described.

12. In a centrifugal sizer, the combination of a rotatable treatment vessel mounted upon a vertical shaft, an independently-rotatable partition within the vessel mounted upon a sleeve surrounding the shaft and stepped upon the bottom of the vessel, and a sleeve secured to the vessel surrounding the step and extending above the contained body of mixture, substantially as described.

13. In a centrifugal sizer, the combination of a rotatable treatment vessel mounted upon a vertical shaft, an independently-rotatable partition within the vessel mounted upon a sleeve surrounding the shaft and stepped upon the bottom of the vessel, a recess in the bottom of the partition, and a sleeve secured to the vessel and projecting into the recess, substantially as described.

14. In a centrifugal sizer, the combination of a rotatable treatment vessel, driving mechanism therefor, a casing surrounding said vessel, slots in the top of the casing, and a supporting-frame for the driving mechanism adapted to be bolted in the slots at different points about the casing, substantially as described.

15. In a centrifugal sizer, the combination of a rotatable treatment vessel, an annular trough surrounding the same, a removable cover for said trough, and a removable section in the cover extending for a portion of the circumference, substantially as described.

16. In a centrifugal sizer, the combination of a rotatable treatment vessel, a double annular trough surrounding the same, removable covers for said trough, and registering removable sections in said covers extending for a portion of the circumference, substantially as described.

17. In a centrifugal sizer, the combination of a rotatable treatment vessel, a spout delivering thereto, and partitions in the discharge-opening of said spout inclined in the direction of rotation of the vessel, substantially as described.

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