No. 685,559. Patented Oct. 29, 1901.

J. J. BERRIGAN.

CENTRIFUGAL MACHINE.

(Application filed Dec. 26, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

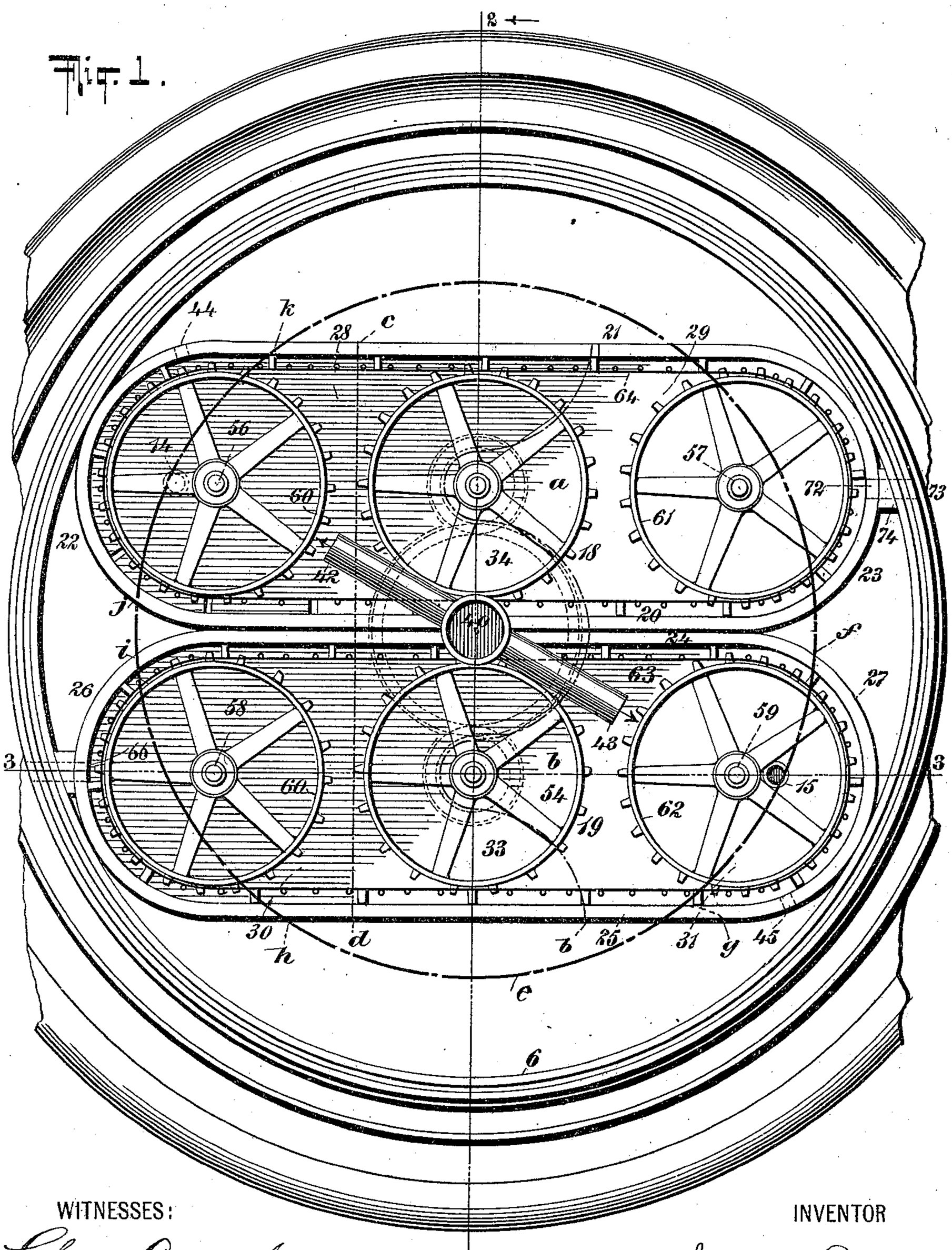

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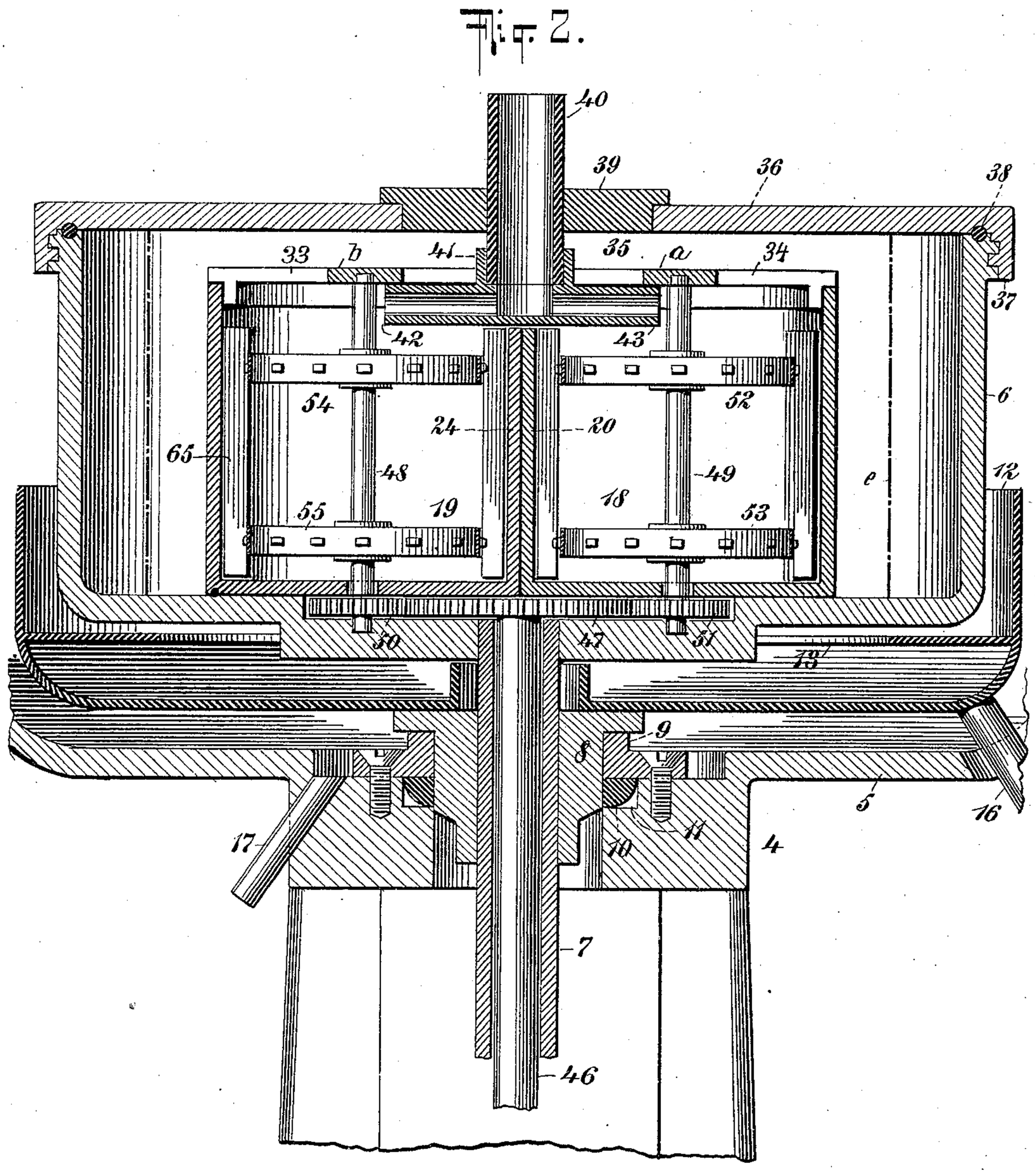
Fig. 2.



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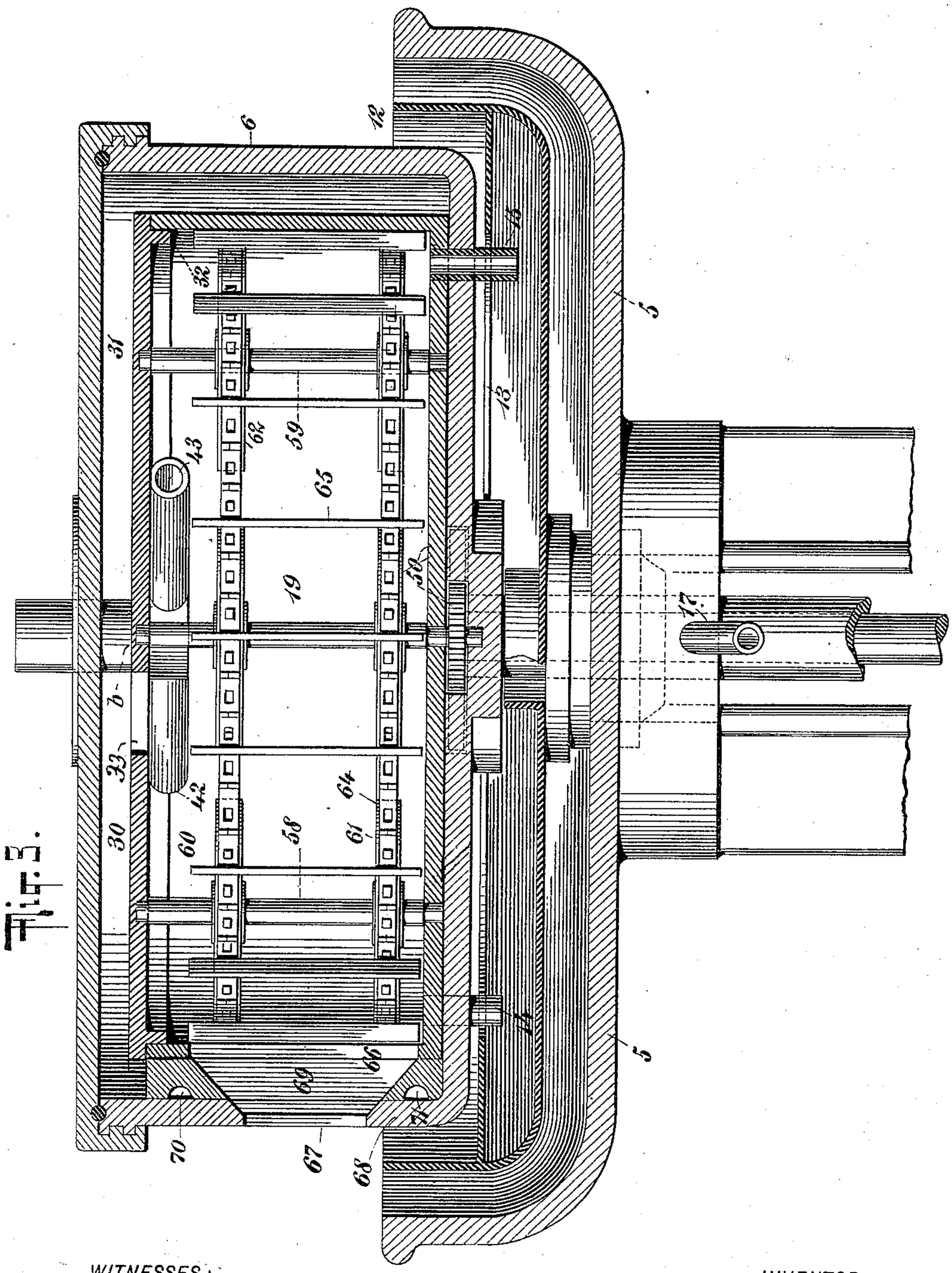

Fig. 5.

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CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 685,559, dated October 29, 1901.

Application filed December 26, 1900. Serial No. 41,096. (No model.)

To all whom it may concern:

Be it known that I, JOHN JOSEPH BERRIGAN, of Orange, Essex county, New Jersey, have invented a new and useful Improvement in Centrifugal Machines, of which the following is a specification.

My invention relates to a machine for effecting by the action of centrifugal force the separation of the constituents of a fluid mass and the delivery thereof continuously from the machine during its operation.

My invention consists in a centrifugal machine wherein the rotary receiving vessel for the combined constituents to be separated is of elongated form, having two opposite sides plane and parallel and two opposite sides inwardly concave; also, in the combination of such a vessel with a rotary drum; also, in the combination of two such vessels, disposed as hereinafter stated, in such a rotary drum; also, in a receiving vessel constructed as set forth and having a directing inlet and outlet for the separated materials placed as described, and also in the various combinations and mechanisms more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a top view of the upper portion of a centrifugal apparatus embodying my invention. Fig. 2 is a vertical section on the line 2 2, and Fig. 3 is a vertical section on the line 3 3, of Fig. 1.

Similar numbers of reference indicate like parts.

4 is the upper portion of the standard on which the machine is supported, which standard is preferably cast in one piece with the cup 5. Within the cup 5 is the rotary drum 6, secured upon the hollow shaft 7. Shaft 7 extends through a gland 8, which rests upon an annular plate 9, secured to the top of standard 4. Beneath said plate is a packing-ring 10, which is received in a recess 11 and which bears against the exterior of gland 8.

Within the cup 5 and resting on the gland 8 is a fixed pan 12, having an annular horizontal partition 13. The escape-pipes 14 and 15, Fig. 3, which convey liquid from the drum 6, pass through the opening in said partition, so that said liquid is received in pan 12 and thence flows out through the pipe 16 into any suitable receptacle. The pipe 17 serves to drain the cup 5 of any leakage which may enter.

Within the drum 6 are two receiving vessels 18 and 19 for the material to be separated. The receptacle 18 has parallel sides 20 and 21 and rounded or inwardly-concaved ends 22 and 23. The similarly-shaped receptacle 19 has parallel sides 24 and 25 and rounded or inwardly-concaved ends 26 and 27. The two receptacles have their respective sides 20 and 24 in juxtaposition and on opposite sides of the axis of rotation of the drum. The receptacles at their curved end portions are preferably tangent to the inner periphery of said drum. Each receptacle is provided with two partial covers 28, 29, 30, and 31. These covers are best shown in Fig. 3 and are provided with flanges 32 to fit within the receptacle. Covers 28 and 30 extend from the curved end of the receptacle to the dotted line *c d*, Fig. 1. Covers 29 and 31 are provided with projections *a* and *b*. Spaces at the middle of the receptacles 18 and 19 (shown at 33, Figs. 3 and 34) are thus left uncovered. From Figs. 2 and 3 it will be seen that the height of the wall of the receptacles 18 and 19 is not as great as that of the wall of drum 6, so that there is a space 35 above the receptacles 18 and 19 and beneath the cover 36, which closes the drum 6. The cover 36 has a threaded flange 37, by which it is secured to the correspondingly-threaded upper portion of drum 6, and a packing-gasket 38 is interposed at the joint.

In the central portion of the cover 36 is a flanged plug 39, which supports the inlet-tube 40. This tube carries at its lower end a transverse tube 41, which is open at both ends 42 and 43. The inlet-tube 40 extends downwardly through the opening 33. The transverse tube 41 comes within the receptacle 18 and is so placed on the tube 40 as that one delivery-outlet, as 43, will direct the discharge into one end of a receptacle, as the end 27 of receptacle 19, while the other delivery-outlet, as 42, will direct the discharge into the opposite end of the other receptacle, as the end 22 of receptacle 18. In order to afford space for the delivery-pipe to enter the receptacles, the

upper portion of side walls 20 and 24 is cut away, as shown in Fig. 2. It will also be noticed that (see Fig. 1) the liquid-escape pipe 14, which extends through the bottom of drum 6, is located near the end 22 of receptacle 18 and the liquid-escape pipe 15 near the end 27 of receptacle 19, or, in other words, near the ends of the receptacles toward which ends the incoming material is directed, as already described. Also through the walls of said receptacles, near said ends, are made openings 44 and 45, whereby liquid communication is established between the receptacles and the interior of drum 6.

With the apparatus so far as explained assume that the drum 6 being in rotation a liquid is introduced into receptacles 18 and 19 through inlet 40. This liquid will enter the drum 6 through the openings 44 and 45. In that drum by the action of centrifugal force it will form a ring against the inner circular periphery of said drum. The inner perimeter of the ring may be represented by the dotted circle *e* of Fig. 1 and the dotted lines *e* of Fig. 2. Consider now for convenience only one of the receptacles 18 and 19—say the receptacle 19. The ring of liquid will be within that receptacle at the end 26 and will occupy the crescent-shaped space between the curved inner perimeter and the arc *f g*, the points *f g* marking the place where the circle *e* intersects the receptacle-wall. From *g* around to *h* the ring will be wholly away from the side wall 25 of receptacle 19, while from *h* around to *i* the receptacle 19 will be immersed in a ring; but as between these points the wall of the receptacle is imperforate and, moreover, is surmounted by the cover 30 the liquid of the ring cannot get into that receptacle at that end, so that as a net consequence the only part of the ring not within the drum 6 which is actually within the receptacle 19 is that which is included in the space of crescent-shaped outline bounded by the arc *f g* and the curved inner perimeter of the wall of said receptacle outside of said arc. All the rest of the inner perimeter of that receptacle will be substantially dry. In receptacle 18 similar results will follow—that is to say, at the end thereof toward which the material is directed from the inlet 42 a crescent-shaped part of the liquid ring will exist, this crescent-shaped part being included between the arc *j k* of circle *e* and the inner perimeter of receptacle 18 outside of said arc; but everywhere else inside that receptacle the inner periphery will be dry, or substantially so, so that as the ring is produced by the rotation of the apparatus it is impossible for the liquid to run centripetally away from the position which it takes in the ends 22 and 27 to other parts of the receptacle. Moreover, the thickness of the ring, measured radially, will be determined by the positions of the escape-outlets 14 and 15. This being understood, I resume the explanation of the mechanism.

Within the hollow shaft 7 is a solid shaft 46, which on its upper end and within a recess formed in the bottom of the drum 6 carries a gear 47. In the middle of each receptacle 18 and 19 (see Fig. 2) there are vertical shafts 48 and 49, and these shafts are journaled at their upper ends in the projections *a b* of covers 29 and 31 and at their lower ends extend through the bottom of the receptacle 18 and receptacle 19 and are stepped in the bottom of the drum 6. Below the bottom of receptacle 18 and receptacle 19 these shafts carry gears 50 and 51, which engage with the gear 47 on shaft 46, and in this way when the shaft 46 is rotated said gears 50 and 51, and hence shafts 48 and 49, are also rotated. The shaft 49 carries two sprocket-wheels 52 and 53. Shaft 48 carries two sprocket-wheels 54 and 55. In the receptacle 19 are vertical shafts 58 and 59, pivoted at their ends, respectively, in the covers and in the bottom of said receptacle. Each of these shafts carries two sprocket-wheels—that is to say, shaft 58, Fig. 3, carries the sprocket-wheels 60 and 61. Shaft 59 carries two sprocket-wheels, one of which is shown in Fig. 1 at 62. A chain belt 63 extends over the sprocket-wheels 60 and 62 and the middle sprocket-wheel 54 (see Fig. 1) and engages with the sprockets of all three wheels. A similar belt 64, also in receptacle 19, extends over the sprocket-wheels 61 and 55 and a second sprocket (not shown) on shaft 59. When the middle sprocket-shaft 48 is rotated from shaft 46 in the manner already described, it imparts through its sprockets 54 and 55 motion to the belts 63 and 64. Extending between these belts 63 and 64 are scraping-blades 65, Fig. 3, preferably placed at equal intervals. The outer edges of these blades are in proximity to the inner perimetrical wall of the receptacle 19, so that when said belts are set in motion these blades will act upon any material which lies against that wall to transport it along the wall from one place to another. A precisely similar arrangement of sprocket-wheels and belts is present in receptacle 18 and needs no special description.

At the end 26 of the receptacle 19 there is a vertical slot 66, Fig. 3. In the wall of the drum 6, opposite to the slot 66, is a shorter slot 67. Interposed between the exterior of the receptacle 19 and the wall of the drum 6 is a plate 68, in which there is a conduit 69, connecting the slots 66 and 67. Also in the plate 68 are openings 70 and 71, which permit of free circulation of liquid within the drum from one side of that plate to the other. In the end 23 of the receptacle 18 there is an opening 72, similar to 66, and opposite to it in the wall of drum 6 there is an opening 73, similar to 67, and between the receptacle and wall there is a plate 74, similar to 68, and having openings therein similar to 69, 70, and 71. The opening 66 in receptacle 19 and 72 in receptacle 18 are for the escape of the solid

constituent of the fluid mass, which mass is treated in the operation of the machine in the manner now to be described.

Liquid is first introduced through the inlet-pipe 40 until the ring already described is produced against the inner periphery of the drum 6, and then the combined material to be treated is continuously introduced through the pipe 40 and is ejected by centrifugal force through the openings 42 and 43. That coming from the opening 43 is thrown against the inner periphery of the receptacle 19 at the end 27. That coming from the opening 42 is thrown against the inner periphery of receptacle 18 at the end 22. The liquid contained in these masses within the receptacles 18 and 19 drains off through the pipes 14 and 15 into the pan 12 and escapes at the outlet 16, leaving the solid adherent upon the inner periphery of receptacle 19 between the points *f* and *g* and in receptacle 19 between the points *j* and *k*. This solid is at once removed by the traveling blades 65 and is carried over the dry surface within the receptacles until it reaches the outlet 72 in receptacle 18 and the outlet 66 in receptacle 19. From these outlets it is discharged by centrifugal force into any suitable receptacle placed for it.

For the sake of simplicity I do not show herein any receptacle for the solids; but of course in practice it would be desirable to provide some well-known mechanical means for receiving the ejected solids and conveying them continuously to any desired place from the machine.

In another application for Letters Patent, Serial No. 38,470, series of 1900, filed December 5, 1900, I have fully set forth my aforesaid principle and a construction embodying the same and have there made certain claims which broadly cover and include the structure herein disclosed. It is therefore to be understood that the subject-matter of said claims in said application is not herein claimed by me.

I claim—

1. In a centrifugal machine, a rotary drum, a receiving vessel therein for the combined materials to be separated; the perimeter of said drum being a circle and the perimeter of said receiving vessel in a plane at right angles to the axis of rotation, having a major and a minor axis; the said major axis coinciding with a chord of said circle, substantially as described.

2. In a centrifugal machine, a rotary drum and two receiving vessels therein for the combined materials to be separated; the perimeter of said drum being a circle and the perimeters of said receiving vessels in a plane at right angles to the axis of rotation each having major and minor axes; the said major axes respectively coinciding with parallel chords and the said minor axes coinciding with a diameter of said circle, substantially as described.

3. In a centrifugal machine, a rotary drum, a receiving vessel of elongated form disposed within and having its major axis extending transversely said drum, and its opposite ends located at or near the wall thereof; one of said ends having an opening for establishing liquid communication between vessel and drum.

4. In a centrifugal machine, a rotary drum, a receiving vessel of elongated form disposed within and having its major axis extending transversely said drum and its opposite ends located at or near the wall thereof, one of said ends having an opening for establishing liquid communication between vessel and drum and a feed-duct entering said vessel and constructed to direct the material into said last-named end.

5. In a centrifugal machine, a rotary drum and a receiving vessel for combined solid and liquid constituents to be separated; the said receiving vessel being elongated in form and having its ends extending into the ring of liquid formed within said drum by centrifugal force; one of said ends being closed to prevent liquid communication between drum and receiving vessel and provided with an outlet-opening for the separated solid, and the other end having an opening between receiving vessel and drum and an opening for the escape of liquid from the apparatus, means for directing the combined constituents into said last-named end, and means for conveying the solid constituent from said end to said outlet-opening, substantially as described.

6. In a centrifugal machine, a circular rotary drum, two elongated receiving vessels for the combined constituents to be separated disposed within said vessel and having their ends tangent to the inner circular periphery thereof, and means for discharging one of said constituents after separation through opposite ends of said receiving vessels and through the wall of said drum, substantially as described.

7. In a centrifugal machine, a circular rotary drum, two elongated receiving vessels for the combined constituents to be separated disposed within said drum and having their ends tangent to the inner circular periphery thereof, and means for introducing the combined constituents at opposite ends of said receiving vessels respectively and means for discharging one of said constituents after separation at the opposite ends of said receiving vessels, substantially as described.

8. In a centrifugal machine, a circular rotary drum, an elongated receiving vessel 18 for the combined constituents to be separated having at one end 29 an escape-opening 72 extending through said drum, and near the opposite end 28 an escape-opening 14 also extending through said drum, and an opening 44 communicating with the interior of said drum, and an inlet-duct 42 constructed and arranged to deliver said combined constituents to said receiving vessel 18, substantially as described.

9. In a centrifugal machine, a circular rotary drum, an elongated receiving vessel 18 for the combined constituents to be separated having at one end 29 an escape-opening 72 extending through said drum and provided with a cover 31 at said end and near the opposite end 28 an escape-opening 14 also extending through said drum and an opening 44 communicating with the interior of said drum and a delivery-duct 42 constructed and arranged to deliver said combined constituents to said receiving vessel at end 28, substantially as described.

10. In a centrifugal machine, a circular rotary drum, an elongated vessel 18 for solid and liquid constituents to be separated having near its ends 28 and 29 openings 14 and 72 extending through said drum, and near the end 28 an opening 44 communicating with said drum, a delivery-duct 42 constructed and arranged to deliver said solid and liquid constituents to said vessel at end 28, blades 65 and moving supports therefor within said vessel 18; the said blades operating to transport the solid material deposited at end 28 to the outlet 72 at end 29, substantially as described.

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