No. 689,572. Patented Dec. 24, 1901.

J. J. BERRIGAN.

CENTRIFUGAL MACHINE.

(Application filed July 2, 1901.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

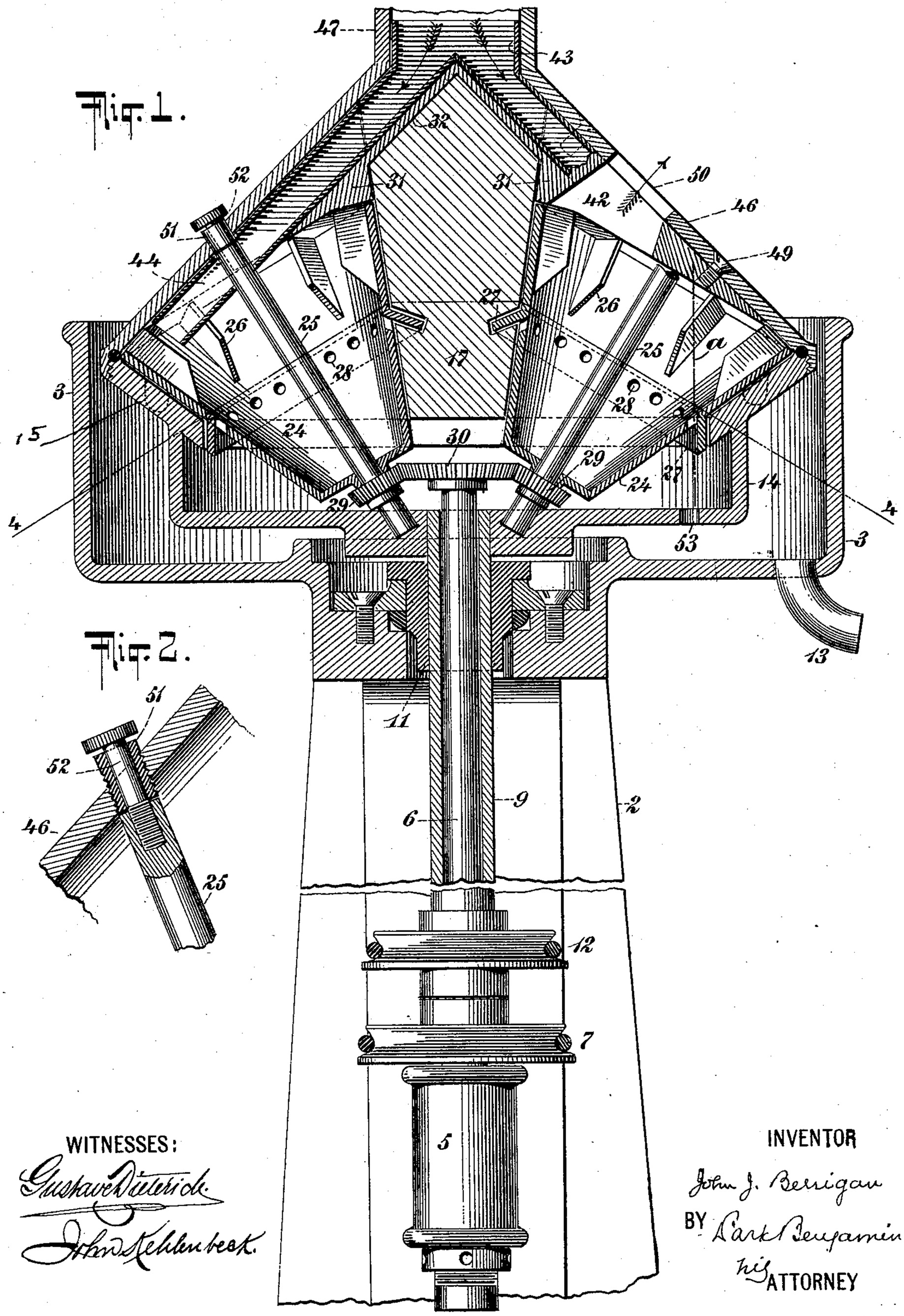

Fig. 2.

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Fig. 3.

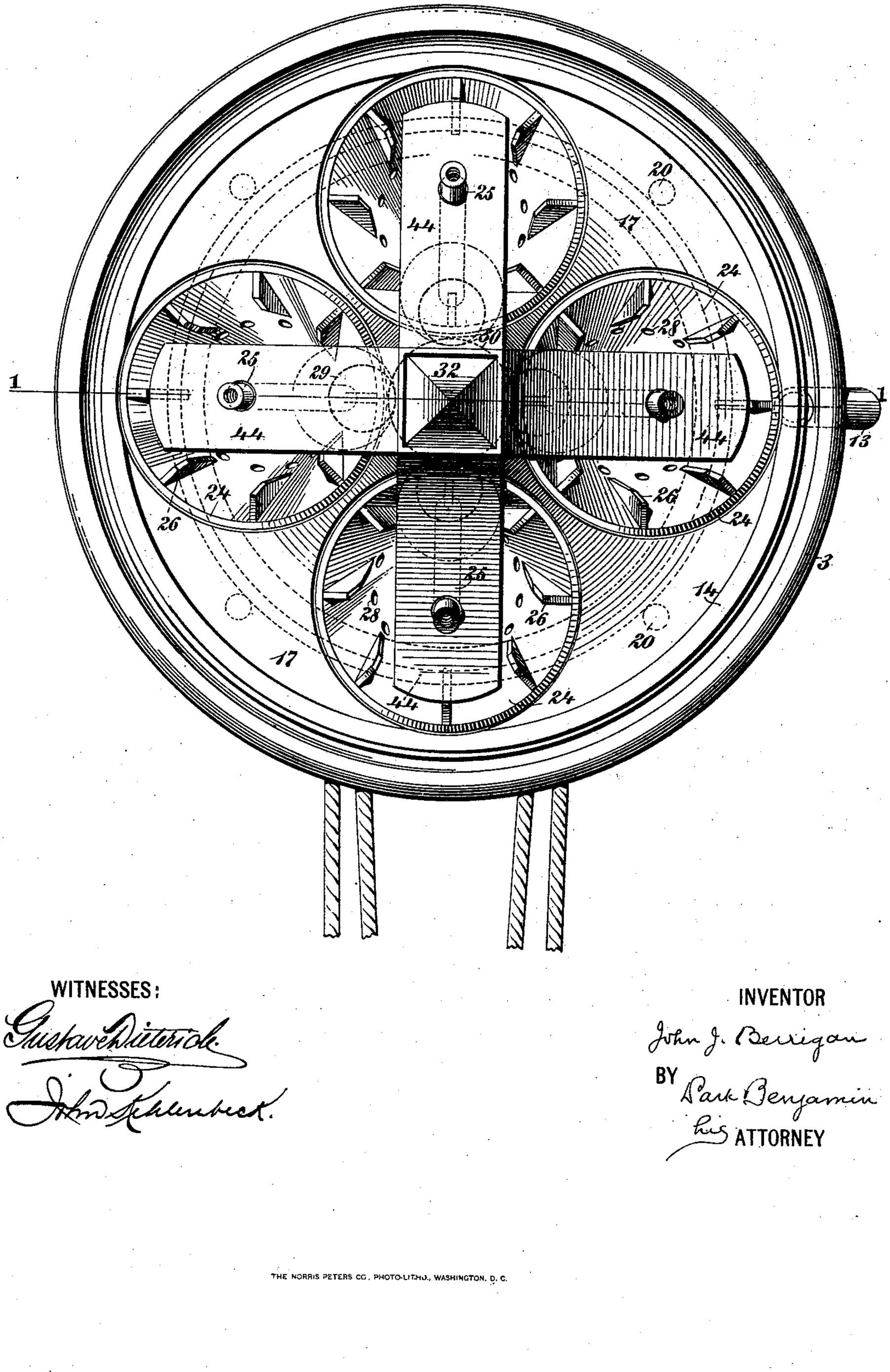

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Fig. 4.

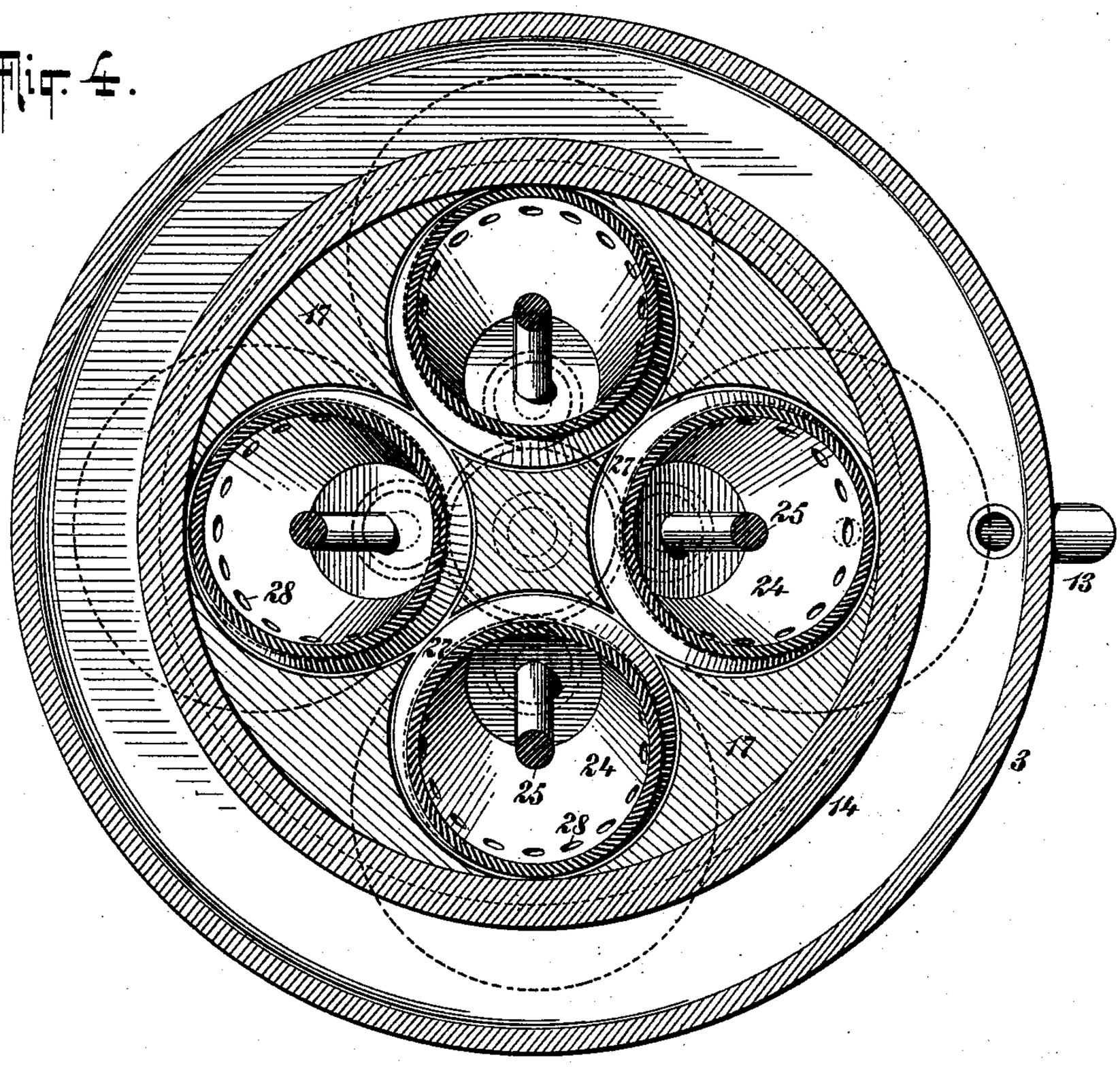
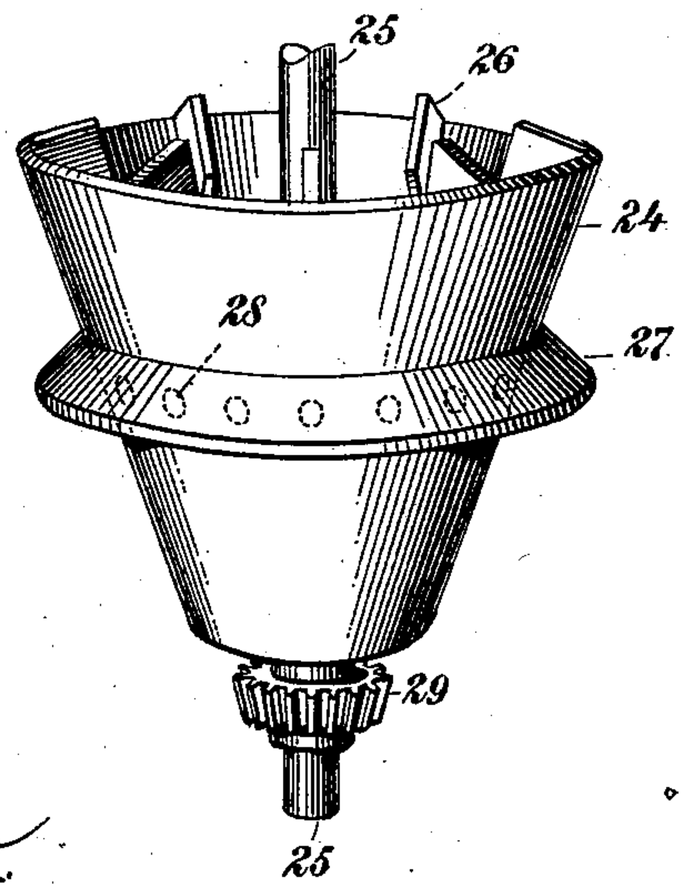


Fig. 5.



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5 Sheets—Sheet 4.

Fig. 6.

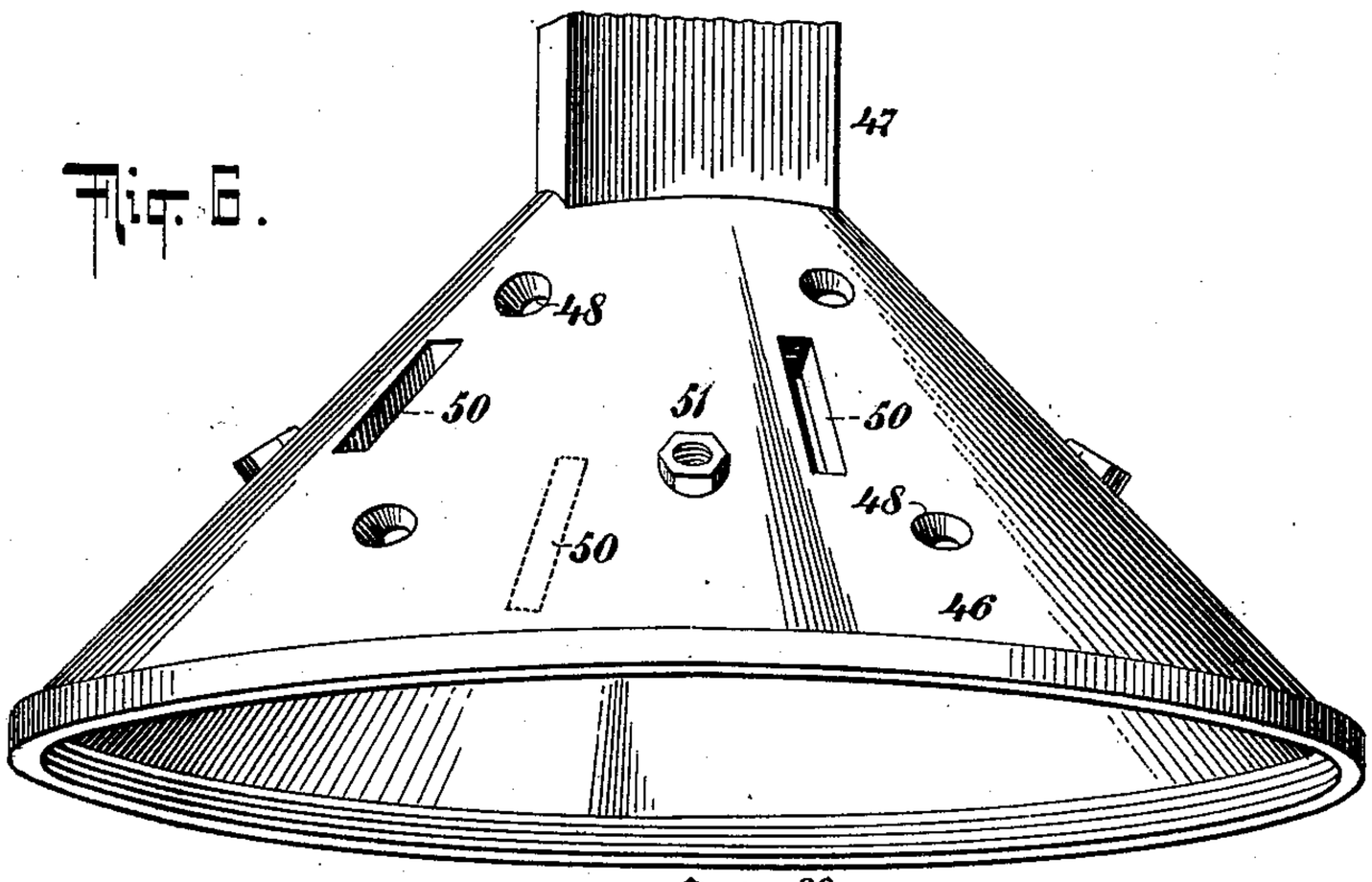


Fig. 7.

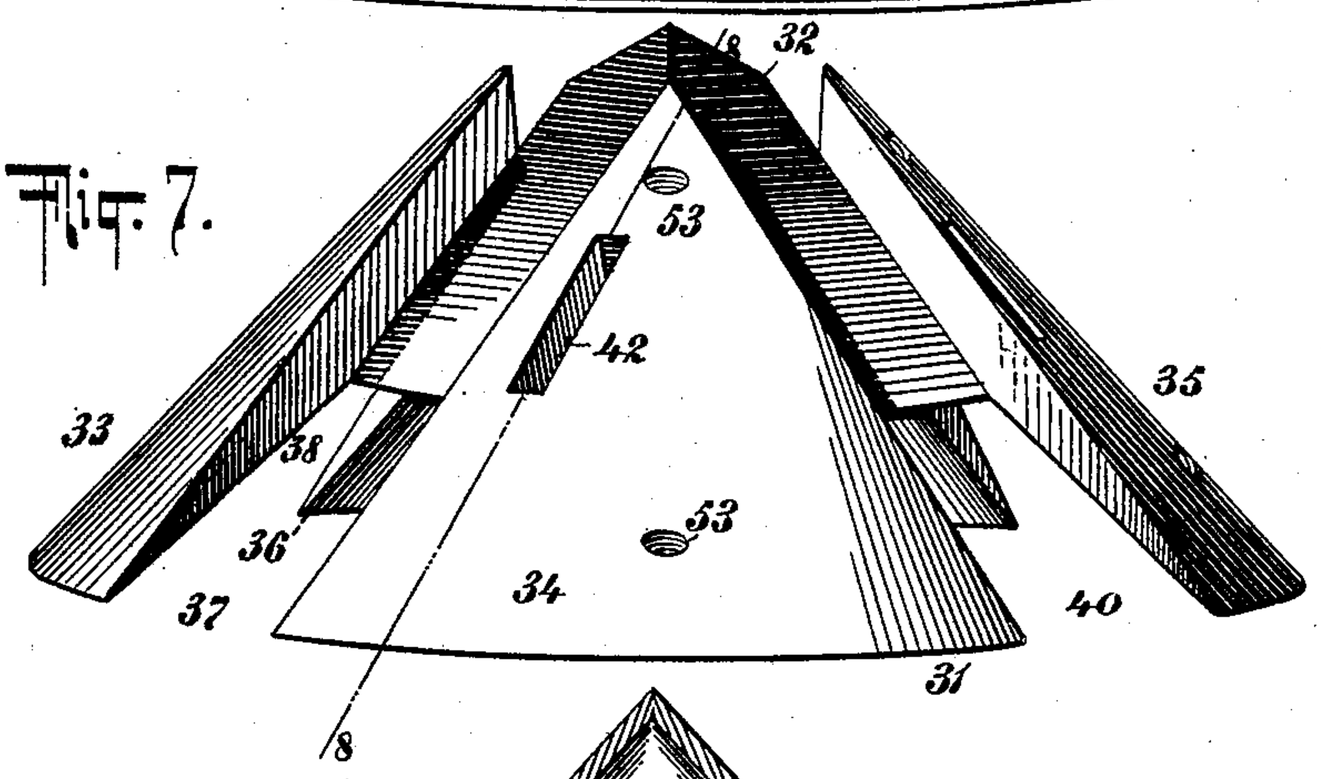
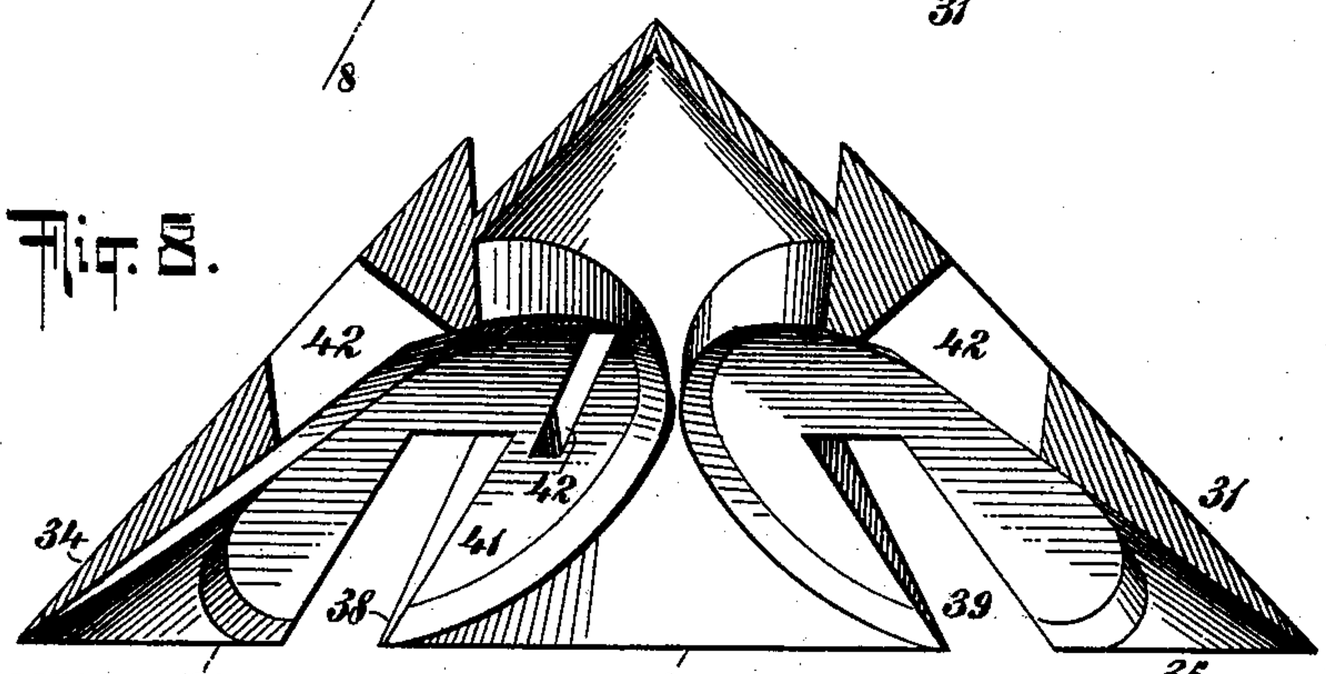


Fig. 8.



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(Application filed July 2, 1901.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 9.

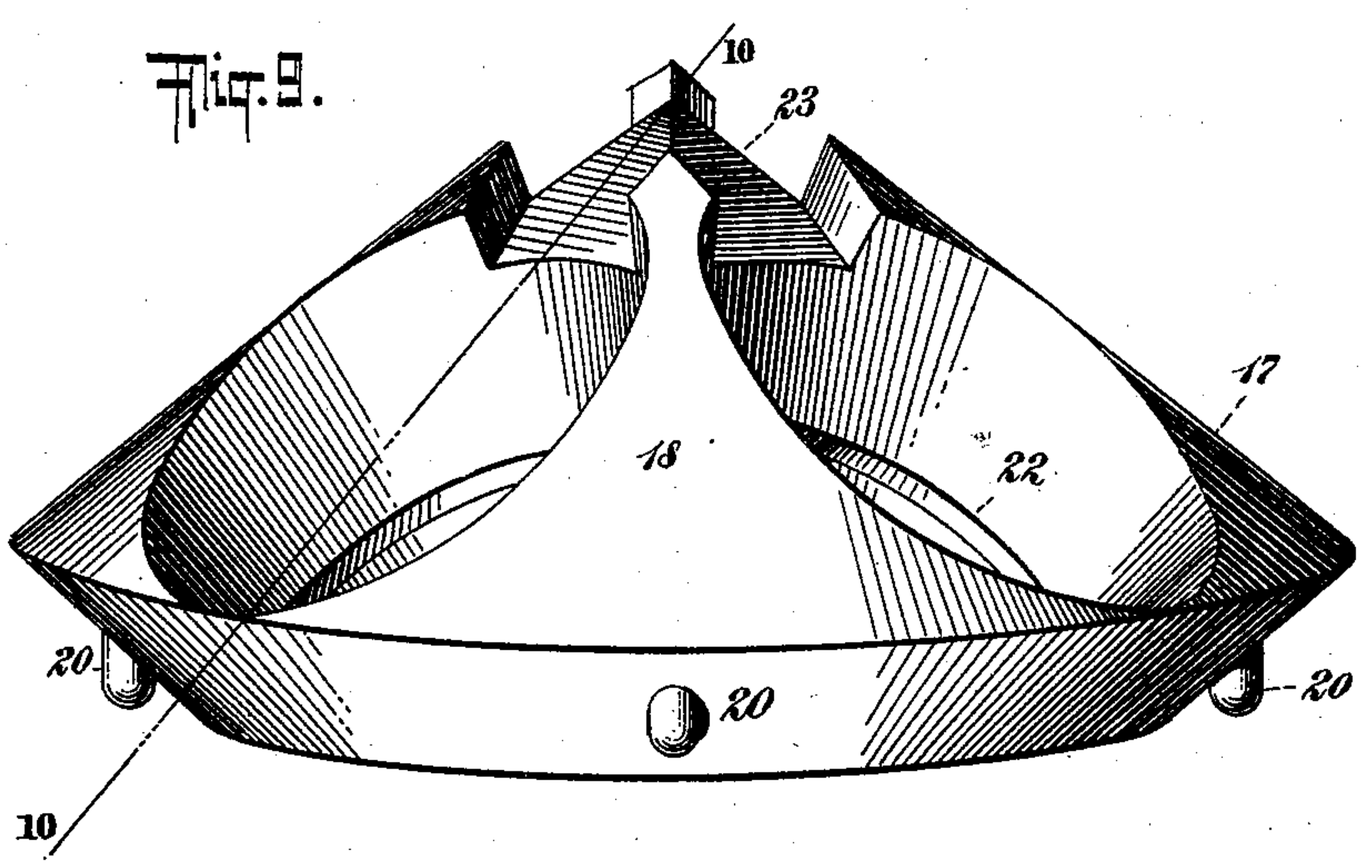


Fig. 10.

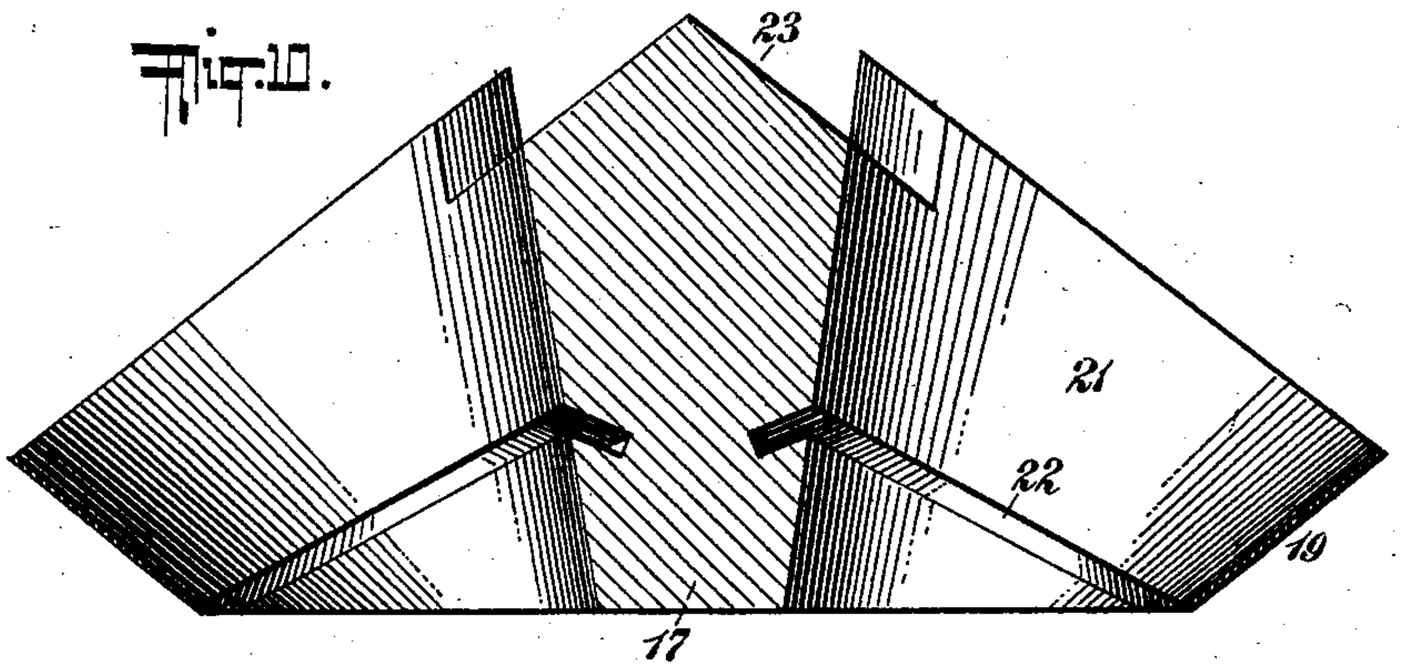
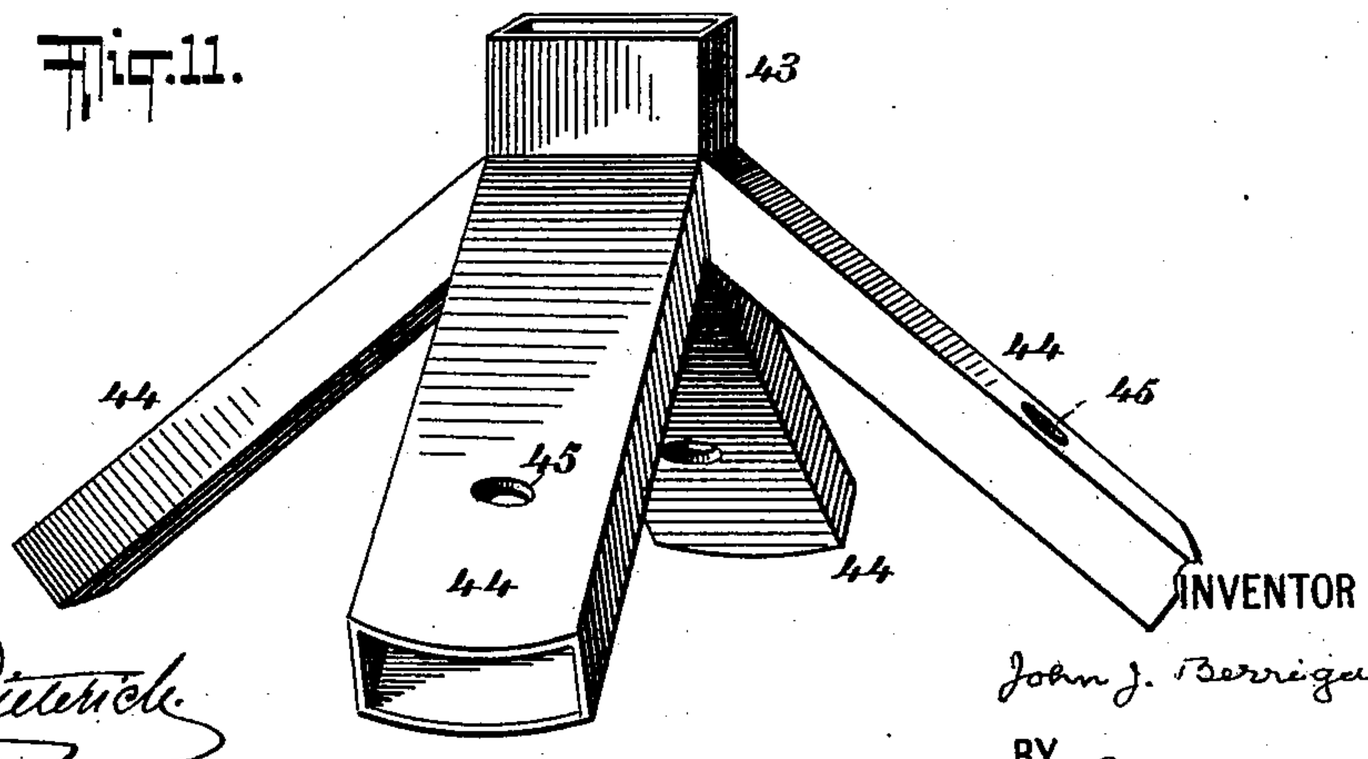


Fig. 11.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 689,572, dated December 24, 1901.

Application filed July 2, 1901. Serial No. 66,863. (No model.)

To all whom it may concern:

Be it known that I, JOHN JOSEPH BERRIGAN, of East 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 centrifugal machines for the separation of solids and liquids.

My invention consists, broadly, in a centrifugal machine provided with a separating-chamber for the combined constituents rotary on its own axis and a rotary support for said chamber, the axis of said chamber being disposed at an angle to the axis of rotation of said support and included in the same plane, also a plurality of said chambers symmetrically disposed around the axis of said support, also in the arrangement of said chambers in openings in a fixed core within a supporting rotary bowl, also in the combination, with chambers thus arranged, of the wedge, cover, and feed-ducts, all as hereinafter more particularly pointed out.

In the accompanying drawings, Figure 1 is a vertical section of the machine on the line 1 1 of Fig. 3. Fig. 2 is a detailed view showing the mode of journaling in the cover the shafts of the receptacles for the materials that are separated. Fig. 3 is a plan view with the cover removed. Fig. 4 is a section on the line 4 4 of Fig. 1. Fig. 5 is a side elevation of one of the said receptacles, which I shall hereinafter call "separating-chambers." Fig. 6 is a side elevation of the cover. Fig. 7 is a side elevation of the wedge. Fig. 8 is a section of the wedge on the line 8 8 of Fig. 7. Fig. 9 is a side elevation of the core. Fig. 10 is a section of the core on the line 10 10 of Fig. 9; and Fig. 11 is an elevation of the feed-duct and its branches, or, as for convenience I shall hereinafter term it, the "feed-spider."

Similar numbers of reference indicate like parts.

The rotating part of the machine includes the following principal portions: First, the bowl 14; second, the core, (separately shown in Figs. 9 and 10;) third, the separating-chambers, one of which is shown in Fig. 5; fourth, the wedge, (shown separately in Figs. 7 and 8;) fifth, the feed-spider, (shown separately in Fig. 11; sixth, the cover or hood, (shown separately in Fig. 6,) and, seventh, the shafts and gears whereby the bowl and chambers are rotated.

The stationary part of the machine includes the standard which supports the moving portions and also the cup on which the bowl rotates.

The standard 2 (portions of which are broken away in Fig. 1) carries the cup 3, which may be cast integrally with it. It also supports the step 5, which receives the lower end of shaft 6, which shaft is rotated by the pulley and belt (shown at 7) and passes through the hollow shaft 9. Shaft 9 passes through the gland 11 in standard 2 and terminates below in the hub of belt-pulley 12, by which pulley it is rotated. The hub of pulley 12 is supported on the hub of pulley 7. In the bottom of cup 3 is the outlet-pipe 13 for the separated liquid. I will now describe the bowl and working portions therein in the order in which they are assembled.

The bowl.—As shown at 14, this is a cylindrical vessel having a wide flange 15 at its upper edge. This flange is inclined or flares upwardly and projects both within and without the vertical wall of the bowl. In the bottom of the bowl is the liquid-outlet 53 and also suitably-inclined sockets for the shafts of the separating-chambers.

The core, Figs. 9 and 10.—This is formed, preferably, of a single mass of metal 17. Its upper portion 18 is conical. Its lower portion 19 is in the form of an inverted conical frustum, having its periphery at the same angle of inclination as the flange 15 of the bowl, so that the core fits and rests upon said flange and is prevented from turning thereon by the dowel-pins 20, which enter openings in said flange. In the core are as many openings 21 as there are separating-chambers, four being here represented. These openings conform in shape to said chambers—that is, they are in the form of a conical frustum having axes inclined upwardly and outwardly. Within each opening 21 is a peripheral score or channel 22, which is downwardly inclined, the purpose of which is to receive a similarly-disposed flange on the exterior of the separating-chamber, as hereinafter described. The apex of

the core is cut away, as shown at 23, in order to receive the cap of the wedge, also as hereinafter described.

The separating-chambers.—As shown in Fig. 5, each of these vessels is in the form of an inverted conical frustum 24, fast within which is a central shaft 25. Each chamber has on its inner periphery several upwardly-extending projections 26. On the exterior of the chamber is the downwardly-inclined flange 27, which, as above described, enters the channel 22 in the opening 21 of the core. Just below this flange are openings 28, extending through the chamber-wall and establishing liquid communication between the separating-chamber and the bowl 14. The shaft 25 of each chamber carries a gear 29, and all of the gears 29 engage with a gear 30 on the upper end of the shaft 6. The lower ends of the shafts 25 enter the inclined sockets, already referred to, in the bottom of the bowl. Their upper ends are journaled in the cover, as hereinafter described.

The wedge.—This is also, preferably, a solid body of metal 31, Figs. 7 and 8. The central portion 32 forms a pyramidal cap adapted to fit upon the correspondingly-shaped portion 23 of the core. The pyramidal cap carries four triangular-wedge-shaped projections 33 34 35 36, which extend below its base, so that four recesses or openings 37 38 39 40 are thus produced. Around these openings (see Fig. 8) the interior of the wedge is shaped to fit the mouths of the separating chambers—that is to say, there are four circular depressed portions, as 41, in each of which there is a recess, as 33. Also passing through the wedge-wall and in each of said depressed portions is an opening, as 42, there being of course four such openings, each tapering in cross-section outwardly. The separating-chambers being in place in their openings in the core, the wedge is placed directly on them, so that the shafts 25 of the chambers will protrude through the recesses 37 38 39 40, and an opening 42 will come above each chamber.

The feed-spider.—This, as shown in Fig. 11, consists of a central feed inlet-tube 43, having four downwardly-inclined branches 44, each of rectangular cross-section and adapted to fit in the spaces between the projections 33, 34, 35, and 36 of the core, as shown in plan in Fig. 3 and in section in Fig. 1. From Fig. 1 it will also be seen that the end of the branch arm extends inside the separating-chamber, so that the combined materials to be separated, entering, as shown by the arrows, Fig. 1, the central inlet 43, will pass down and through the four branch tubes and escape from the end of each into the separating-chambers, being projected against the upper portion of each chamber at the place of maximum eccentricity with respect to the shaft 6 and in the spaces between the internal projections 26. In each branch 44 is made an opening 45, through which passes the shaft 25 of the separating-chamber fed by that branch.

The cover or hood.—This, as shown in Fig. 6, consists of a conical piece 46, surmounted by a rectangular tube 47. When the hood is placed down upon the wedge, the tube 47 incloses the inlet-tube 43. In the conical portion 47 are countersunk holes 48 to receive screws 49, Fig. 1, which enter threaded holes 53 in the wedge. In this way the cover is attached firmly to the wedge. Also in the cover are openings 50, each of which registers with an opening 42 of the wedge. Also seated in the cover are screw-plugs 51, Figs. 2 and 6, which receive the journals 52 of the separating-chamber shafts 25. These journals are pins provided with milled heads and screwed into the shaft ends, as shown in Fig. 2. The flange around the bottom of the cover is threaded to engage with the threaded edge of the bowl-flange 15.

In assembling the foregoing parts the core is first placed in the bowl. The separating-chambers are then inserted in the openings provided in the core, with their lower shaft ends in the sockets in the bottom of the bowl and their respective gears 29 in engagement with gear 30. The wedge is then put in place over core and chambers, and then the feed-spider above the wedge, and finally the cover, which when screwed down binds all parts firmly together. The net result is that although the chambers are free to be revolved on their individual axes their mouths are completely closed except at the conjoint openings 42 50, and each conjoint opening is so placed as to be above that portion of each chamber which is nearest to the axis of rotation of the bowl. On the other hand, the branches of the feed-spider deliver the incoming material to that portion of each chamber which is farthest from the axis of rotation of the bowl.

The motion of the bowl is one of revolution due to the rotation of its shaft 6. The motion of the separating-chambers is the revolution of each on its own axis due to the rotation of its shaft 25. The chambers being within the bowl of course rotate with the bowl; but they have no motion of revolution around the interior of the bowl, a fact manifest from the journaling of the shafts 25 in the bottom of the bowl.

The operation of the machine is as follows: The combined solid and liquid constituents to be separated being admitted to the central feed-tube 43 escape at the ends of the branches 44, and by reason of the centrifugal force due to the rotation of the bowl 14 they are projected into the separating-chambers 24. These chambers being eccentrically placed with reference to the axis of rotation of the bowl 14 and also inclined, the combined materials are delivered to the portion of the inner periphery thereof which is farthest from said axis of rotation. Also by reason of the

inclination this portion of the periphery is adjacent to the upper edge of the chamber. The said materials are thus deposited between the projections 26. The liquid constituent escapes from the chamber through the openings 28 and thence into the bowl 14, whence it flows through the opening 53 into the cup 3 and out of the machine by the pipe 13. Inasmuch as the separating-chambers are completely covered above, the solid material deposited between the projections 26 cannot escape; but as the chamber rotates on its individual axis it is carried around between said partitions until it comes opposite the openings 42 50. Then it escapes from said openings by the action of centrifugal force. The object of the flange or guard 27 is to prevent the material escaping at the openings 28 from working up between the chamber periphery and the core.

I claim—

1. In a centrifugal machine, a rotating support and a separating-chamber carried thereby and disposed eccentrically to the axis of rotation thereof; the said chamber being rotary on its individual axis and having said axis inclined in a plane including the axis of said support and means for delivering said constituents into said chamber at a point farther distant than said individual axis from said support-axis.

2. In a centrifugal machine, a rotary support and a separating-chamber carried thereby and disposed eccentrically to the axis of rotation thereof; the said chamber being rotary on its individual axis and having said axis inclined in a plane including the axis of said support and provided with a feed-inlet for delivering said constituents into said chamber and an escape-outlet for the separated solid constituent therefrom; the said escape-outlet being disposed radially nearer than said feed-inlet to the axis of said support.

3. In a centrifugal machine, a rotary bowl and a rotary separating-chamber disposed therein, the said bowl and chamber rotating on different axes, the axis of rotation of said chamber being at an angle to the axis of said bowl and included in the same plane, and the said chamber having an opening in its wall permitting fluid communication with said bowl.

4. In a centrifugal machine, a rotary bowl and a plurality of separating-chambers therein symmetrically disposed around the axis thereof, the said chambers having openings in their walls permitting fluid communication with said bowl and rotating about individual axes included in planes including the axis of said bowl.

5. In a centrifugal machine, a rotary bowl, a plurality of separating-chambers therein individually rotary on inclined shafts converging toward the axis of rotation of said bowl and a plurality of feed-inlet conduits communicating respectively with said chambers.

6. In a centrifugal machine, a rotary bowl, a plurality of separating-chambers therein, a cover for said bowl, and inclined central shafts supporting said chambers, converging toward the axis of rotation of said bowl and journaled at their extremities respectively in said bowl and cover.

7. In a centrifugal machine, a rotary bowl, a cover therefor and inclosed within said bowl and cover a plurality of separating-chambers, a central feed-inlet duct having branch ducts communicating with said chambers, inclined central shafts supporting said chambers and means for rotating said shafts.

8. In a centrifugal machine, a rotary bowl, a plurality of separating-chambers rotary on their individual axes, and a core disposed within said bowl and having openings adapted to receive said chambers.

9. In a centrifugal machine, a rotary bowl, a plurality of separating-chambers rotary on their individual axes and in the form of inverted conical frusta, and a core disposed within said bowl and having openings adapted to receive said chambers with the axes in inclined position.

10. In a centrifugal machine, the rotary bowl 14 having upwardly-flaring flange 15, the core 17 within said bowl and supported on said flange and provided with openings to receive the separating-chambers, and a plurality of separating-chambers 24 rotary on their individual axes and disposed in said openings.

11. In a centrifugal machine, a rotary support, a separating-chamber rotary on an individual axis thereon, a feed-duct entering said chamber and constructed to deliver combined materials to be separated against the inner periphery of said chamber and a cover for said chamber independently carried by said support and having an outlet-opening for the escape of said separated solid material.

12. In a centrifugal machine, a support rotary on a vertical axis, a separating-chamber rotary on an axis inclined to said vertical axis, a feed-duct entering said chamber and constructed to deliver combined materials to be separated against a portion of the inner periphery of said chamber farther distant than said individual axis from said support-axis, a cover for said chamber independently carried by said support and having an outlet-opening for the escape of said separated solid materal.

13. A separating-chamber for centrifugal machines, in the form of an inverted conical frustum having around its inner periphery internal projections 26 disposed longitudinally in said chamber and in its wall openings 28.

14. A separating-chamber for centrifugal machines, in the form of an inverted conical frustum having in its wall openings 28 and

provided with an exterior inclined guard-flange 27 secured to its outer periphery and extending over said openings.

15. In a centrifugal machine, the combination of a rotary bowl, a fixed core therein having openings to receive separating-chambers, a plurality of separating-chambers rotary on their individual axes disposed in said openings, and a cover independently supported on said bowl over said chambers and having outlets for the escape of separated solid material from said chambers.

16. In a centrifugal machine, the combination of a rotary bowl, a fixed core therein having openings to receive separating-chambers, a plurality of separating-chambers rotary on their individual axes disposed in said openings, a feed-duct having branches extending respectively into said chambers and a cover independently supported on said bowl over said chambers, and having outlets for the escape of separated solid material from said chambers.

17. In a centrifugal machine, the combination of a rotary bowl, a separating-chamber rotary on its individual axis therein, a cover for said bowl having on its under side a recess or depression adapted to receive the open mouth of said chamber and provided with inlet and outlet openings.

18. In a centrifugal machine, the combination of the rotary bowl 14, core 17 therein having openings to receive separating-chambers, a plurality of separating-chambers rotary on their individual axes disposed in said openings, a feed-duct having branches extending respectively into said chambers, an inner cover or wedge 31 independently supported over said chambers and having openings at each chamber for the entrance therein of the feed-duct and the escape of the separated solid material.

19. In a centrifugal machine, the combination of the rotary bowl 14, core 17 therein having openings to receive separating-chambers, a plurality of separating-chambers rotary on their individual axes disposed in said openings, a feed-duct having branches extending respectively into said chambers, an inner cover or wedge 31 independently supported over said chambers and having openings at each chamber for the entrance therein of the feed-duct and the escape of the separated solid material, and an outer cover or hood 46 above said wedge 31 having a central feed-opening and openings registering with said solid escape-openings in said wedge.

20. In a centrifugal machine, the combination of the rotary bowl 14, core 17 therein having openings to receive separating-chambers, a plurality of separating-chambers rotary on their individual axes disposed in said openings, a feed-duct having branches extending respectively into said chambers, an inner cover or wedge 31 over said chambers and having openings at each chamber for the entrance therein of the feed-duct and the escape of the separated solid material, and an outer cover or hood 46 carrying said wedge 31 and supported on said bowl and having a central feed-opening and openings registering with said solid escape-openings in said wedge.

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