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SEPARATOR.

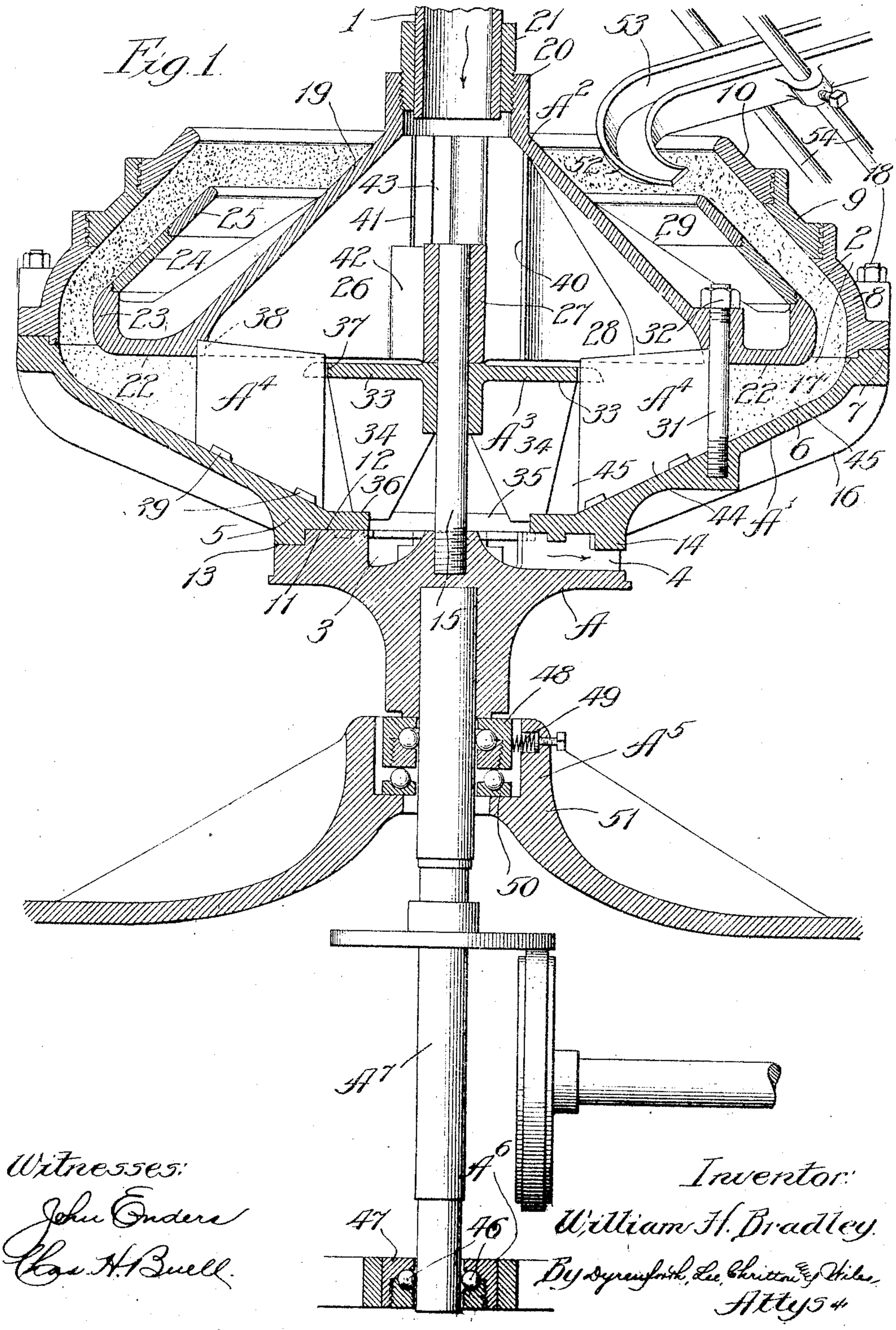
APPLICATION FILED SEPT. 14, 1908.

962,117.

Patented June 21, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

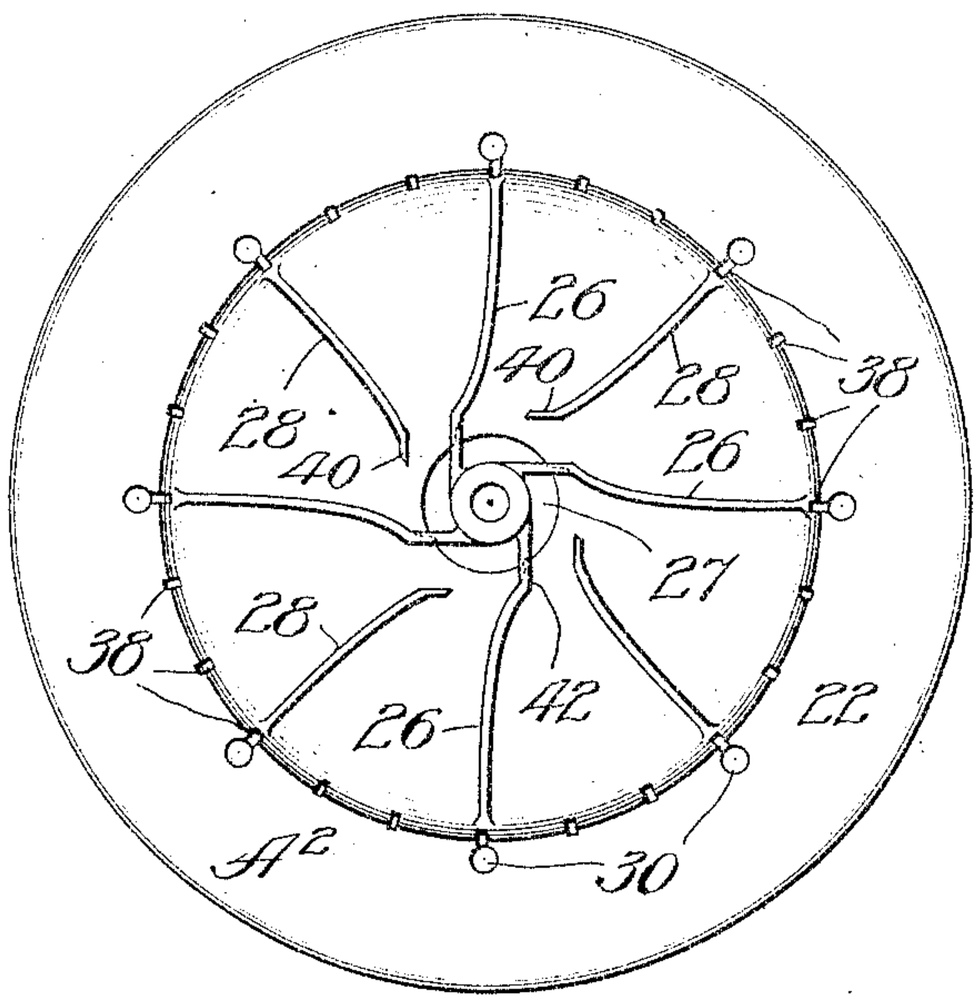
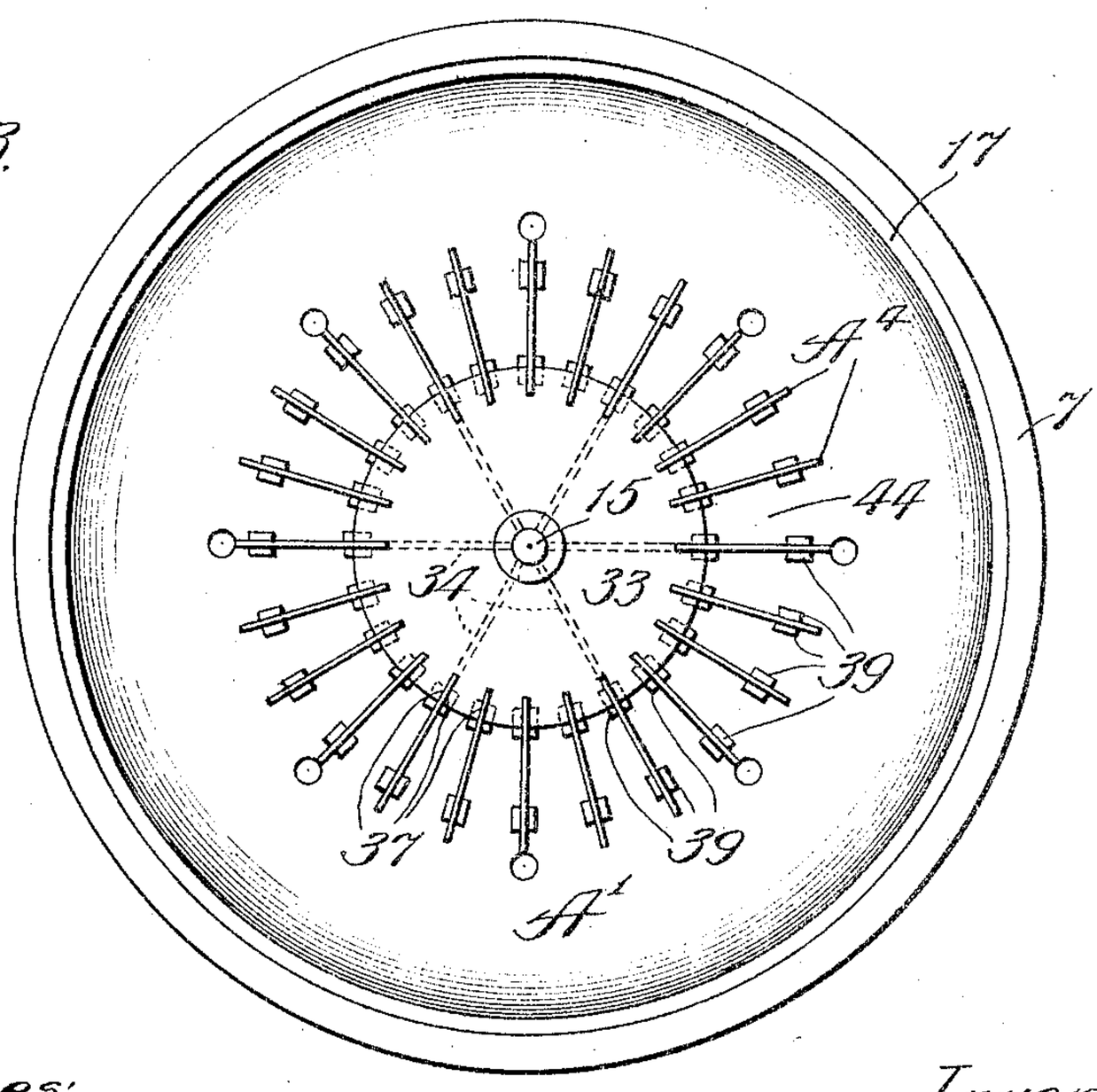


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4

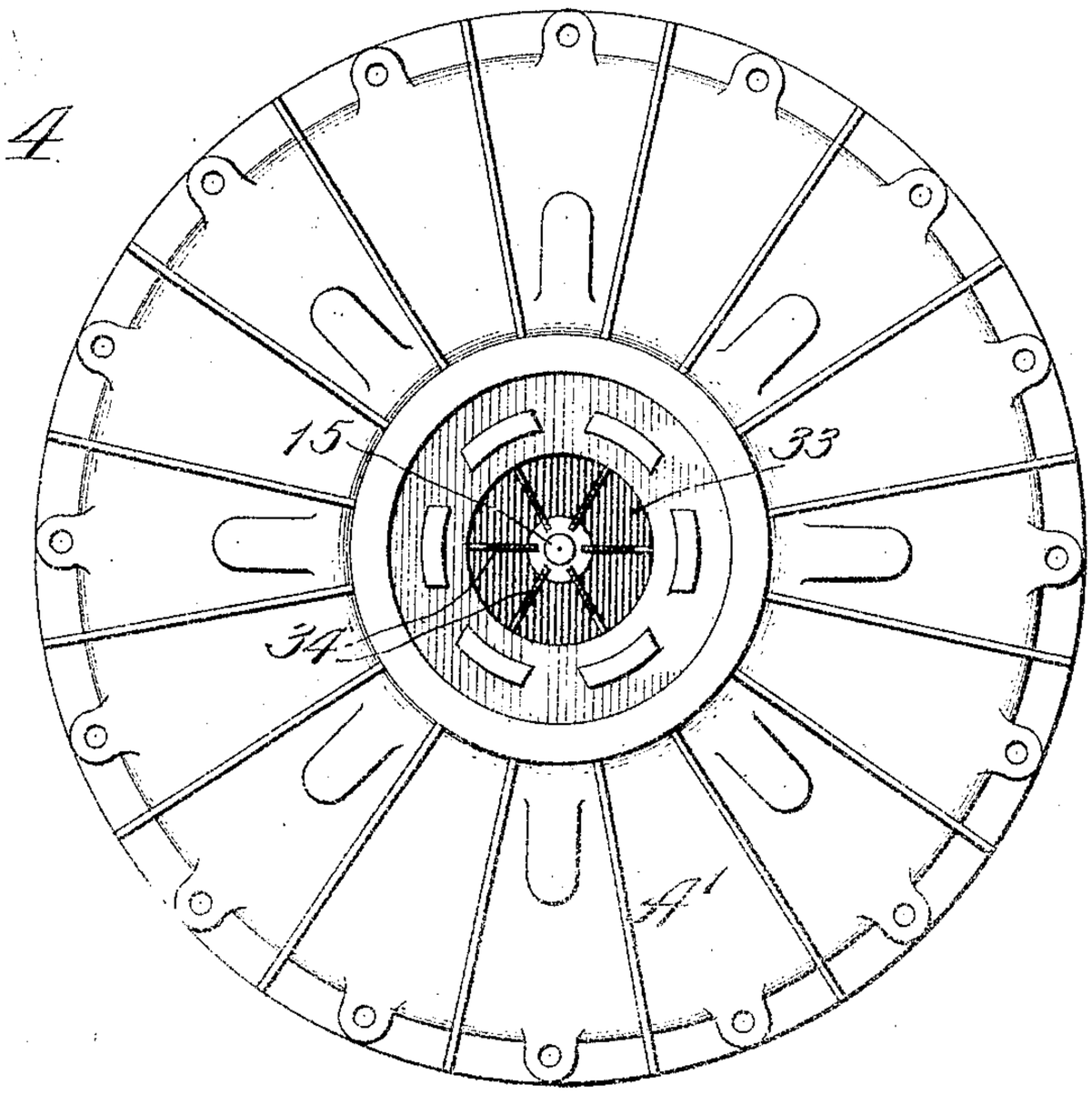


Fig. 5.

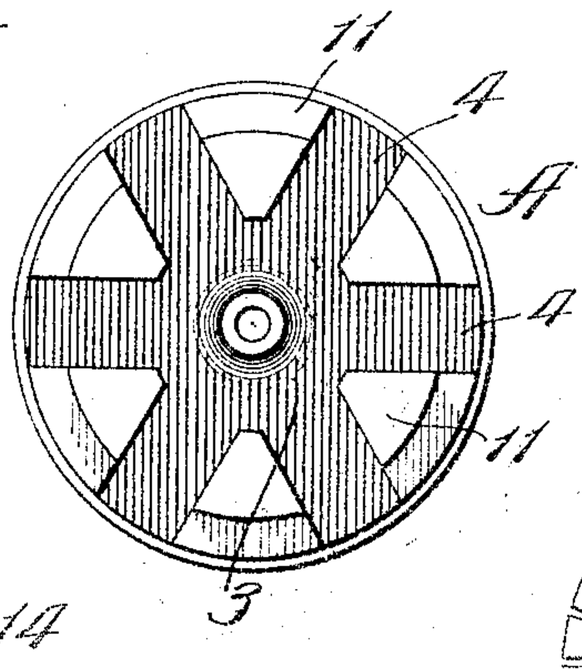


Fig. 6.

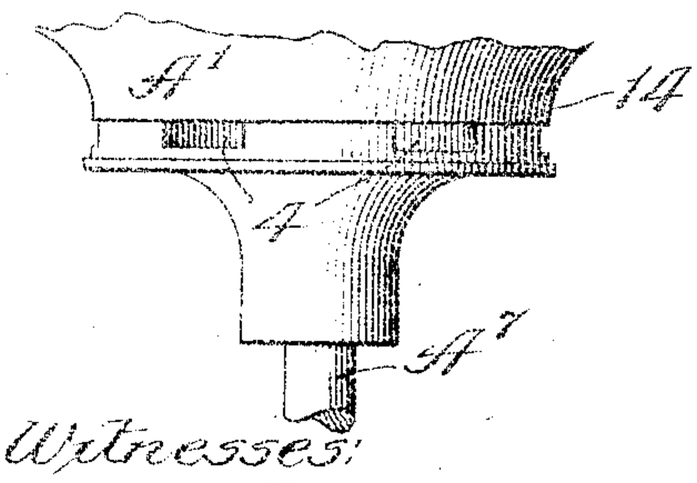
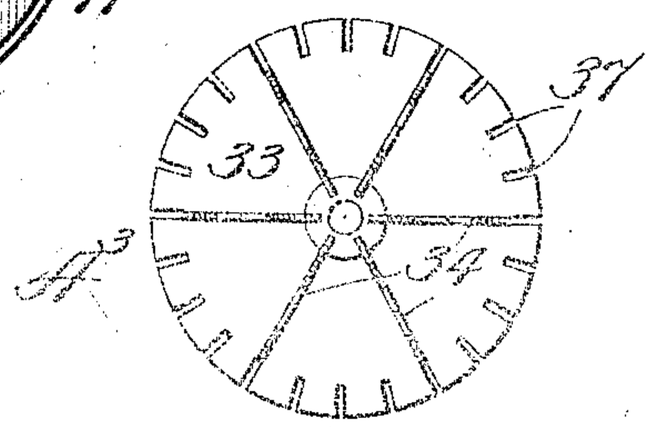


Fig. 7.



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UNITED STATES PATENT OFFICE.

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962,117. Specification of Letters Patent. **Patented June 21, 1910.**

Application filed September 14, 1908. Serial No. 452,964.

To all whom it may concern:

Be it known that I, WILLIAM H. BRADLEY, 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 Separators, of which the following is a specification.

My invention relates particularly to centrifugal machines adapted for separating solids from liquids; and my primary object is to provide a centrifugal machine which will operate effectively and economically to separate solid matter in a finely divided state from water in which the solid matter is practically suspended.

It may be preliminarily stated that according to a process for preparing peat invented by me, the peat is reduced to a practical state of fluidity and uniform quality and consistency, and is then subjected to centrifugal action to separate the peat from the water of suspension. The centrifugal machine herein described may be very usefully employed for such a purpose.

The accompanying drawings illustrate the preferred embodiment of my invention.

In the drawings—Figure 1 represents a broken vertical sectional view of a centrifugal separator constructed in accordance with my invention; Fig. 2, an inner or lower face view of the casing-top employed; Fig. 3, a plan view showing the interior of the machine, the casing-top and the removable flange of the lower or main casing-section being removed; Fig. 4, a bottom view of the lower or main casing-section; Fig. 5, a plan view of the hub which supports and is removably connected with the lower casing-section; Fig. 6, a broken elevational view of said hub and the lower portion of the lower casing-section; and Fig. 7, a bottom view of an internal deflector or spreader employed, said member serving also as a spacing member located between the hub of the casing-top and the central portion of the lower casing-section.

In the construction illustrated, A represents a hub or base-member of a rotary casing; A^1, a lower casing-section mounted on said hub; A^2, the upper casing-section which is firmly secured to and rotatable with the lower casing-section; A^3, a spreader and spacing member interposed between the inlet with which the upper casing-member is provided and the water outlet with which the lower casing-member is provided; A^4, substantially radial division plates confined between the upper and lower casing-members; and A^5, A^6, anti-friction bearings for the vertically disposed shaft A^7 upon which the hub A is mounted.

The inlet to the machine is through a pipe 1 which is suitably connected with the casing-top A^2 so as not to interfere with the rotation of the casing; the outlet for the peat or other solid material, which emerges in a plastic condition, is through a peripheral channel 2 between the peripheral portions of the bottom and top sections of the casing; and the water outlet is through an annular space 3 and radial passages 4 extending therefrom which are formed in the upper portion of the hub A.

The lower casing-section A^1 comprises a hub-portion 5 and an upwardly flaring conical wall 6 having at its periphery an upturned flange 7 upon which are removably secured flange-sections 8, 9 and 10. The hub A is firmly secured on the upper end of the shaft A^7, and between the radial channels 4 of the hub are projections 11 which are received in recesses 12 with which the lower face of the hub-portion of casing-section A^1 is provided. The upward projections 11 of the hub A are cut away or recessed peripherally, as indicated at 13, and the hub-portion of the casing-section A^1 has a corresponding flange 14, accommodated by said recess. Thus the hub A and the hub-portion of the casing-section A^1 have a stepped engagement which prevent any rotation of said parts with relation to each other and which will also prevent any shifting from axial alinement. The central portion of the hub A is provided at the upper side of the hub with a socket which receives a threaded bolt or rod 15 which extends upwardly through the hubs of the spreader A^3 and the top casing-section A^2 and bind the parts together. The lower casing-section A^1 is provided on its lower side with radial strengthening ribs 16. The upturned flange 7 is provided with an inner peripheral groove or recess 17 which receives a corresponding annular lip with which the flange-section 8 is provided. The flange-section 8 is secured to the flange 7 by bolts 18. The flange-sections 9 and 10 are joined by screw connections, as shown in Fig. 1.

The casing-top A^2 comprises a down-

wardly flaring hollow conical wall 19 provided at its upper end with a hollow boss 20 in which is secured a bearing 21 for the pipe 1: an outwardly turned flange 22 at the lower end of said conical wall 19, carrying an upturned flange 23: removable flange-sections 24 and 25 carried by the flange 23: a plurality of approximately radial internal ribs 26 (Figs. 1 and 2) formed integral with the casing-top and having formed integral with their inner ends a hub 27; a plurality of approximately radial shorter internal ribs 28 located between the ribs 26; and a plurality of external strengthening ribs 29 reinforcing the conical wall 19 and the flange 23. The horizontal flange 22 of the casing-section A^2 is provided with perforations 30 through which extend posts or bolts 31 whose lower ends have screw connection with the casing-section A^1 and whose upper ends are equipped with nuts 32.

The spreader A^3 comprises a horizontal disk 33 having a central hub with a perforation therethrough to receive the central bolt 15: and depending substantially radial flanges 34 which space the disk 33 the desired distance above the central outlet 35 of the lower casing-section A^1. The lower ends of the flanges 34 are notched, as indicated at 36, thereby affording horizontal shoulders which rest upon the upper surface of the hub-portion of the casing-section A^1, and vertical shoulders which bear against the wall of the central outlet 35. The lateral edges of the flanges 34 converge downwardly, so that the flanges may be said to taper downwardly. The outer margin of the disk 33 of the spreader A^3 projects beyond the flanges 34 and is provided with peripheral notches 37 which receive the inner upper corner portions of the division plates A^4. The division plates A^4 have their upper portions confined between the disk 33 and the flange 22 of the upper casing-section A^2, the flange 22 being provided with notches 38 which receive the upper outer corner portions of said division plates. The lateral edges of the division plates are substantially vertical, and the lower edges incline downwardly and inwardly, so as to conform to the flare of the wall 6 of the lower casing-section. The wall 6 of the lower casing-section is equipped with lugs 39, which confine said division plates.

As has been indicated, the internal flanges 28 of the casing-top stop short of the axis of the casing-top, so that the inner vertical edges 40 of said flanges 28 are separated by a considerable space, as appears from Fig. 2. The inner portions of said flanges or ribs are curved or offset backwardly from the direction of rotation of the casing, as appears from Fig. 2, so that the fluid entering the machine will be set in motion without undue shock. The internal ribs 26 of the casing-top are cut away at the top portions of their inner edges, as indicated at 41, and the hub 27 is carried by the extensions 42 at the lower portions of the ribs 26. The inner portions of the ribs 26 are curved with a view to aiding the entering fluid to be given a rotary motion without undue shock.

From the description thus far given, it will appear that above the hub 27 of the separator A^3 is an unobstructed central space 43 to accommodate the entering fluid, and that the construction is adapted to permit the fluid to spread from the space 43 between the internal ribs of the casing-top and over the edges of the disk 33, where the fluid enters the annular separating zone 44 which, as has been indicated, is crossed by the division plates A^4. Outside of the annular separating zone 44 is a tapering annular compacting zone 45 which terminates in the annular peripheral channel 2. As shown, the flanges carried by the peripheral members of the lower and upper casing-sections are so shaped and disposed as to cause the peripheral channel 2 to converge inwardly and upwardly. The purpose is to provide such resistance as may be necessary to secure the desired compacting result upon the issuing peat, so that the peat will be self-sealing and thus prevent the fluid—that is, the water carrying the peat in suspension—from forcing its way through the annular peripheral outlet provided for the plastic peat. The outer edges of the flanges 34 of the separator A^3 do not reach quite to the inner vertical edges of the division plates A^4, so that a comparatively small unobstructed annular space 45 is afforded, which tends to equalize the passage of the water between the internal vanes or flanges of the machine.

It is desirable to construct the bearings A^5, A^6 so as to allow a certain freedom of movement to the shaft A^7 in order that the machine, which rotates at a very rapid speed, may find its own center, assuming that the machine is not perfectly balanced, as is very apt to be the case where ordinary methods of construction are followed. For this purpose, the lower end of the shaft A^7 is confined horizontally by anti-friction balls 46 confined in a fixed box or run-way 47; and the upper portion of the shaft passes through a floating anti-friction bearing 48 confined by springs 49, the bearing 48 supporting the hub A and itself rotating upon the anti-friction bearing 50 carried by the base-casting 51. This feature is not claimed, however, in the present application.

In practice, it is usually desirable to provide means for conveying the plastic peat from the annular peripheral channel 2. For this purpose, I have shown a plow or blade 52 dipping into the open upper end of the peripheral channel 2 and provided with a

passage or conduit 53 through which the material is forced as it is shaved or cut from the channel 2. The plow is shown adjustably supported on inclined rods 54, whose inclination corresponds with the inclination of the upper portion of the channel 2, so that the plow or blade may be adjusted to cut to any desired depth in the channel 2.

The operation will be readily understood from the foregoing detailed description.

Fluid, such as water carrying peat in suspension (ordinarily of about the consistency of cream), enters the machine from the top through the central vertical inlet pipe 1, spreads into the chambers between the internal ribs of the casing-top, acquiring the rotary motion of the casing, and passes over the peripheral edge of the disk 33 of the spreader A^3 into the annular separating zone 44 of the machine, the fluid being confined against eddying and washing movements by the division plates 44. Preparatorily, the channel 2 is filled with a temporary packing 55 of dirt, clay or other suitable substance adapted to seal the channel. As the fluid rotates with the machine, the solid particles of the peat are thrown into the compacting zone 45 and then forced into the peripheral channel 2, forcing the preparatorily placed yielding packing ahead of it. The water, under the head of fluid back of it, passes through the central outlet 35 of the lower casing-section and emerges through the radial openings 4 of the hub A. As the operation proceeds, the peat maintains the sealing of the channel 2, so that the fluid cannot pass directly through the machine. Moreover, as has been indicated, the division plates A^4 prevent the fluid from washing against the compacting peat in the compacting zone 45, thus aiding in preventing the seal from being broken. The resistance afforded to the passage of the peat through the channel 2 may be varied by varying the position of the plow 52, and also may be varied by varying the extent of the flanges flanking the annular peripheral channel. That is to say, the removable flange-sections may be removed according to necessity or expediency, depending upon the quality and consistency of the fluid being operated upon. In the operation of the machine, it is important that care be taken to have the fluid which is to be subjected to centrifugal action of uniform quality and consistency and also to prevent any fibrous substances entering the machine with the fluid, such as might create minute channels through the sealing material contained in the annular peripheral channel 2, which would defeat the object of the machine. While it is preferred to employ a peripheral peat-outlet in the machine which is completely annular in form, it is obvious that any substantial peripheral outlet or outlets through which the peat may pass and which will serve to render the peat self-sealing against the passage of the liquid behind it, would be within the scope of my invention. Also, while it is preferred to have the peripheral channel 2 curved upwardly or made angular (considering a vertical cross-section of the machine), it is likewise obvious that the peripheral flanges of the casing-sections of the machine may become rudimentary, the outlet channel for the peat being sufficiently contracted in any desired manner to render the peat self-sealing in its passage therethrough.

The foregoing detailed description has been given for clearness of understanding only, and no undue limitation should be understood therefrom.

What I regard as new, and desire to secure by Letters Patent, is—

1. A centrifugal machine for the purpose set forth, comprising a rotary casing equipped with an inlet conduit for the fluid to be separated and equipped with a water outlet, a peripheral conduit adapted to be sealed by the issuing solid, a compacting zone inside said peripheral conduit and communicating therewith, and a separating zone inside said compacting zone having closely-related division walls crossing it and adapted to prevent the solid material from being washed from said compacting zone.

2. A centrifugal machine for the purpose set forth, comprising a rotary casing equipped with an inlet conduit for the fluid to be separated and equipped with an outlet water conduit, a peripheral conduit of bent or curved contour adapted to cause the issuing solid to maintain a seal therein, and closely related division walls encircled by said peripheral outlet and protecting the same from washing action of the liquid.

3. A centrifugal machine for the purpose set forth, comprising a rotary casing having an outwardly and upwardly converging lower wall and a downwardly and outwardly converging upper wall, inlet and outlet conduits connected with the upper and lower central portions of said casing and adapted to permit entrance of the fluid to be separated and exit of the water of suspension, and an annular peripheral outlet between the perimeters of said converging walls adapted to maintain a seal of the issuing solid therein.

4. A centrifugal machine for the purpose set forth, comprising a rotary casing having therein an annular separating zone, and an outlet conduit leading from said separating zone and having an upturned orifice and inner inlet and outlet conduits connected with said casing and adapted to permit entrance of the fluid to be separated and exit of the water of suspension.

5. A centrifugal machine for the purpose set forth, comprising a rotary casing having

converging upper and lower walls and a peripheral channel between the perimeters thereof, a central inlet conduit connected with the upper wall, an outlet conduit connected with the lower wall, and a spreader interposed between the inlet and outlet conduits.

6. A centrifugal machine for the purpose set forth, comprising a rotary casing having converging upper and lower walls and a peripheral channel between the perimeters of said walls adapted to maintain a seal therein of the issuing solid, a central inlet conduit connected with the upper wall of the casing, a central outlet conduit connected with the lower wall of the casing, a spreader interposed between the inlet and outlet conduits, and division walls adapted to prevent the fluid from washing the seal from said peripheral channel.

7. In a centrifugal machine for the purpose set forth, the combination of an upper casing-section having a downwardly flaring wall, a lower casing-section having an upwardly flaring wall, a peripheral conduit between the perimeters of said casing-sections, division plates interposed between said casing-sections, inlet and outlet conduits connected with the upper and lower portions of said casing-sections, and a spreader interposed between said inlet and outlet conduits.

8. In a centrifugal machine for the purpose set forth, the combination of an upper casing-section having a downwardly converging wall, a lower casing-section having an upwardly converging wall, said casing-sections forming a tapering peripheral outlet between their peripheral portions, inlet and outlet conduits connected with the central portions of said casing-sections, a spreader interposed between said inlet and outlet conduits, and division walls confining the fluid against washing action with relation to said peripheral outlet.

9. In a centrifugal machine for the purpose set forth, the combination of a lower casing-section having a converging wall and a peripheral flange, an upper casing-section having a converging wall and a peripheral flange co-acting with said first-named peripheral flange and forming therewith a peripheral outlet, inlet and outlet conduits connected with the central portions of said casing-sections, and internal means adapted to confine the fluid against a washing action with relation to said peripheral outlet.

10. A centrifugal machine, comprising a rotary casing equipped with a peripheral conduit having a removable section, whereby the resistance upon the issuing solid may be varied, division walls serving to prevent washing of the fluid against the seal in said conduit, and inlet and outlet conduits connected with said casing and serving to permit entrance of fluid to be separated and exit of the water of suspension.

11. A centrifugal machine, comprising a rotary casing provided with a peripheral outlet and with inner inlet and outlet conduits, means for preventing a washing action with relation to a seal in said peripheral outlet, and means for varying the resistance of a solid issuing through said peripheral outlet.

12. In a centrifugal machine for the purpose set forth, the combination of a hub, a lower casing-section mounted thereon, a water outlet being provided between said hub and said lower casing-section, a spreader located above said water inlet, and an upper casing-section surmounting said spreader and equipped with a fluid inlet, the peripheral portions of said upper and lower casing-sections affording between them a peripheral outlet for solid material.

13. In a centrifugal machine for the purpose set forth, the combination of a lower casing-section provided with a central outlet, a spreader disposed above said outlet, an upper casing-section provided with a fluid-inlet, the peripheral portions of said upper and lower casing-sections affording between them a peripheral outlet for solid material, and division plates confined between said casing-sections and encircling said spreader.

14. In a centrifugal machine for the purpose set forth, the combination of a lower casing-section provided with a substantially central outlet, an upper casing-section provided with a central fluid-inlet, the peripheral portions of said casing-sections affording between them a peripheral outlet for solid material, internal ribs carried by said upper casing-section, and a spreader located beneath said internal ribs and above the central outlet of said lower casing-section.

15. In a centrifugal machine for the purpose set forth, the combination of upper and lower casing-sections having converging walls and having their perimeters spaced to afford between them a peripheral outlet for solid material, a fluid inlet-conduit connected with the upper casing-section, a water outlet-conduit connected with the lower casing-section, a central spreader interposed between said fluid-inlet and said water-outlet, internal ribs carried by the upper casing-section, and division plates ranged about said spreader and confined between the upper and lower casing-sections.

16. A centrifugal machine for the purpose set forth, comprising a rotary casing having converging upper and lower walls and having their peripheral portions spaced to afford a peripheral outlet for solid material, inlet and outlet fluid-conduits connected with said casing-sections, internal ribs carried by the casing, said ribs terminating

so as to afford a central chamber beneath the inlet-conduit, and a spreader located beneath said central chamber.

17. In a centrifugal machine for the purpose set forth, the combination of a lower casing-section equipped with a central outlet, a spreader located some distance above said outlet and having flanges bearing upon the lower casing-section, an upper casing-section whose perimeter forms with the perimeter of the lower casing-section a peripheral outlet for solid material, and means securing said upper and lower casing-sections rigidly together.

18. A centrifugal machine for the purpose set forth, comprising upper and lower casing-sections having converging walls formed with a peripheral outlet for solid material, a fluid inlet-conduit connected with the central portion of the upper casing-section, internal flanges within the upper casing-section having curved inner portions adapted to set the entering fluid in rotary motion without undue shock, and a spreader beneath said flanges.

19. In a centrifugal machine, the combination of upper and lower casing-sections equipped with inlet and outlet conduits for fluid, and removable flanges carried by said casing-sections and affording between them a peripheral conduit for solid material.

20. In a centrifugal machine for the purpose set forth, the combination of upper and lower casing-sections provided with inlet and outlet conduits for fluid, and removable flanges carried by the peripheries of said casing-sections and affording between them a converging peripheral outlet for solid material.

21. In a centrifugal machine for the purpose set forth, the combination of a rotary casing provided with an inlet for the fluid to be separated and provided with an outlet conduit for water, a peripheral outlet for the separated solid adapted to be sealed by the issuing solid, and a temporary packing in said peripheral outlet.

22. In a centrifugal machine for the purpose set forth, the combination of a rotary casing provided with an inlet conduit for the fluid to be separated and provided with an outlet conduit for water, a peripheral outlet for the separated solid adapted to be sealed by the issuing solid, and closely related division walls encircled by said peripheral outlet and adapted to prevent the fluid from washing away the material sealing the said peripheral outlet.

WILLIAM H. BRADLEY.

In presence of—

RALPH A. SCHAEFER,

A. U. THORIEN.