

No. 677,092.

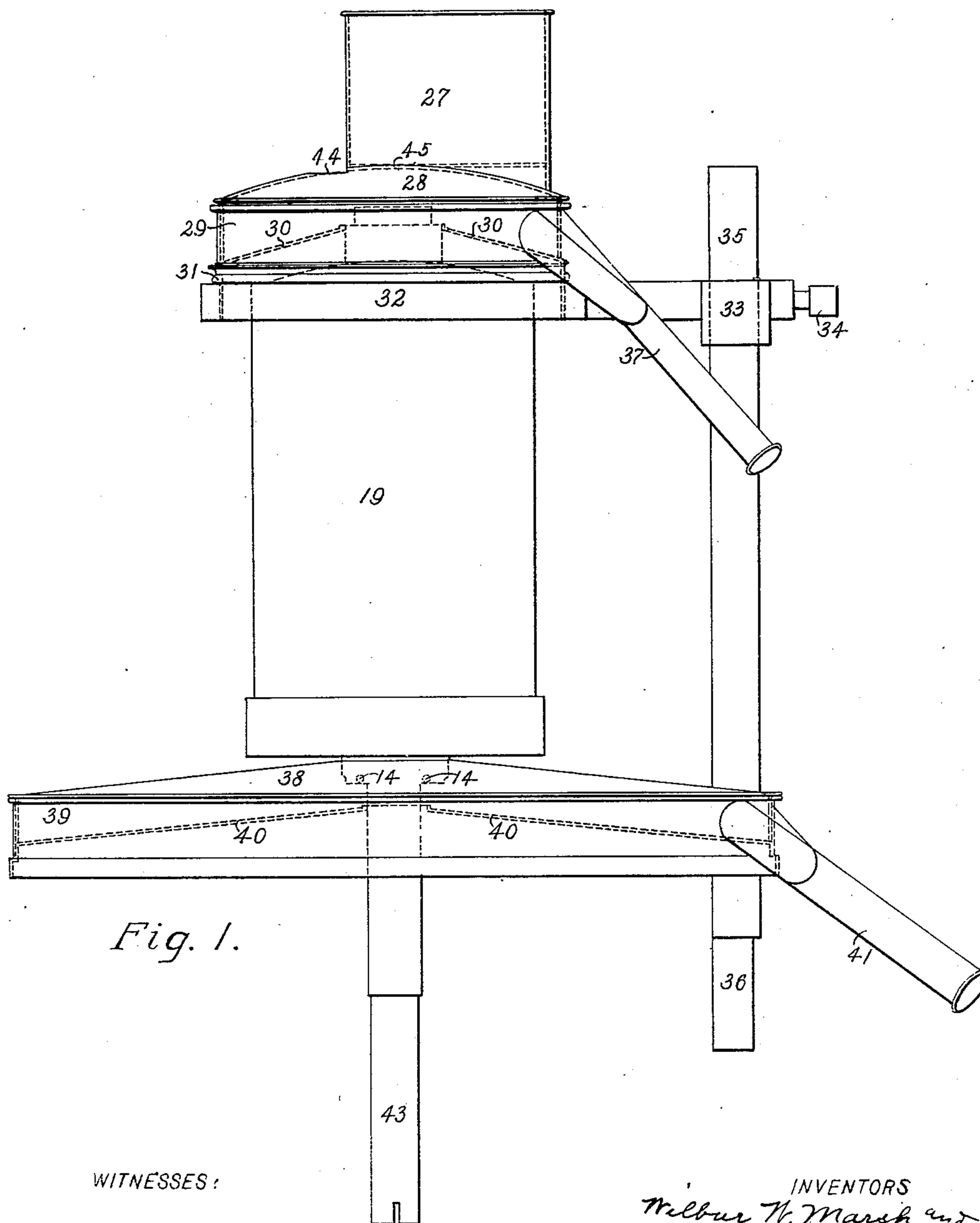
Patented June 25, 1901.

W. W. MARSH & C. H. HACKETT.
CENTRIFUGAL LIQUID SEPARATOR.

(Application filed Feb. 15, 1901.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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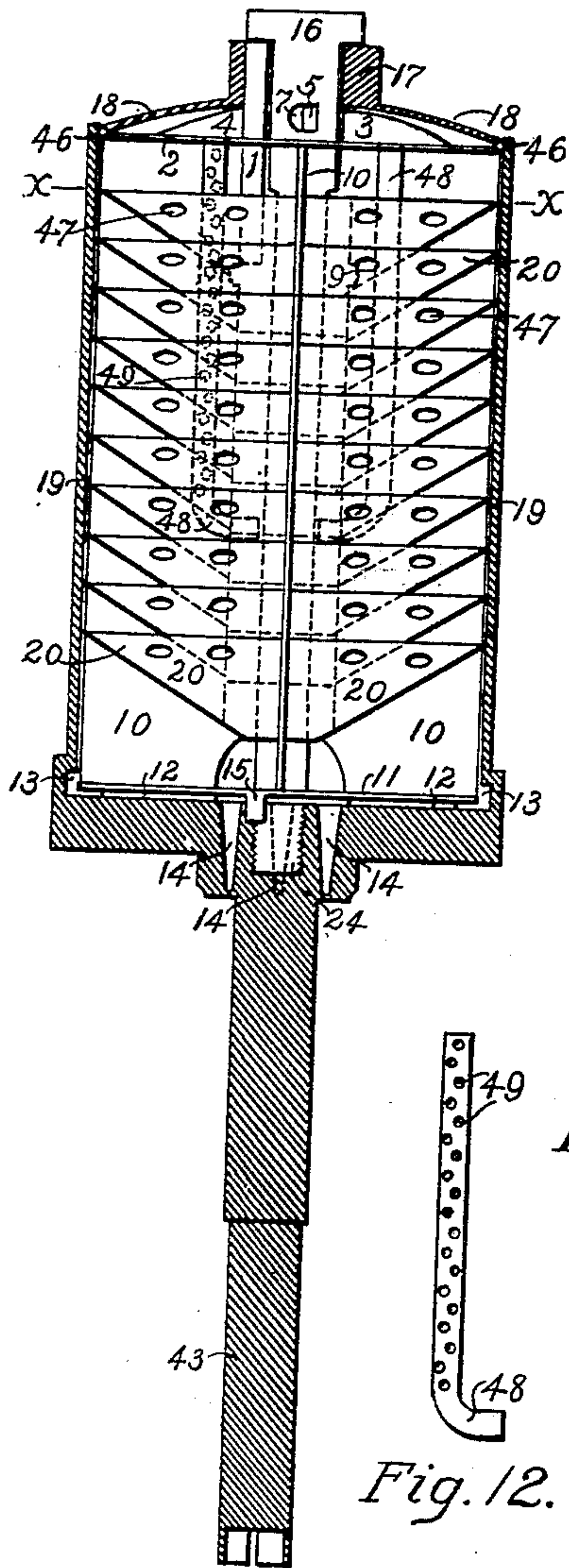


Fig. 2.

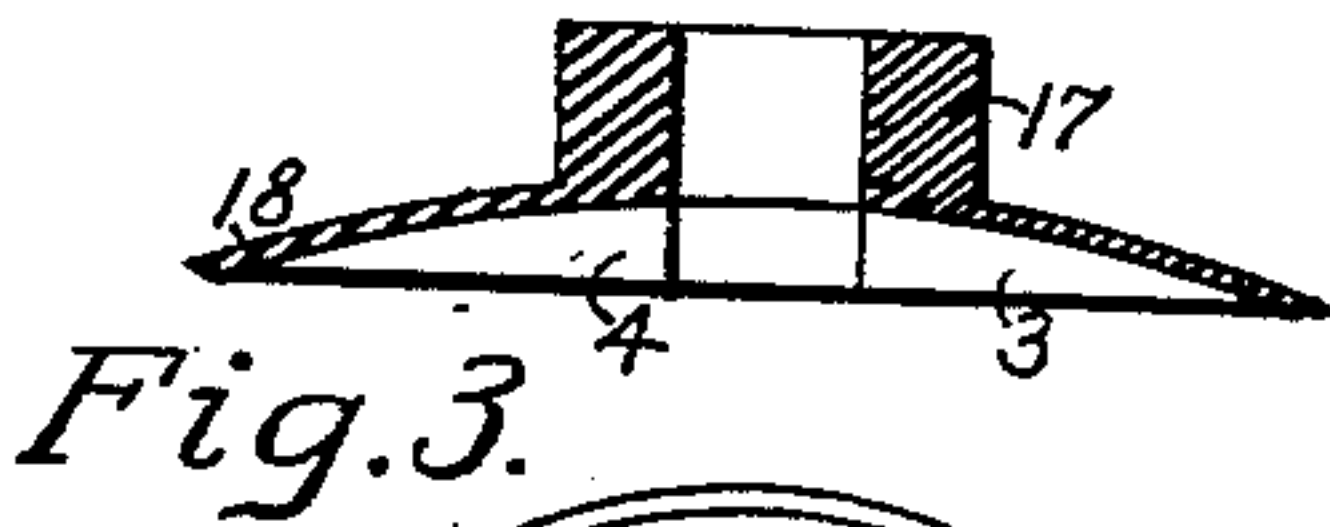


Fig. 3.

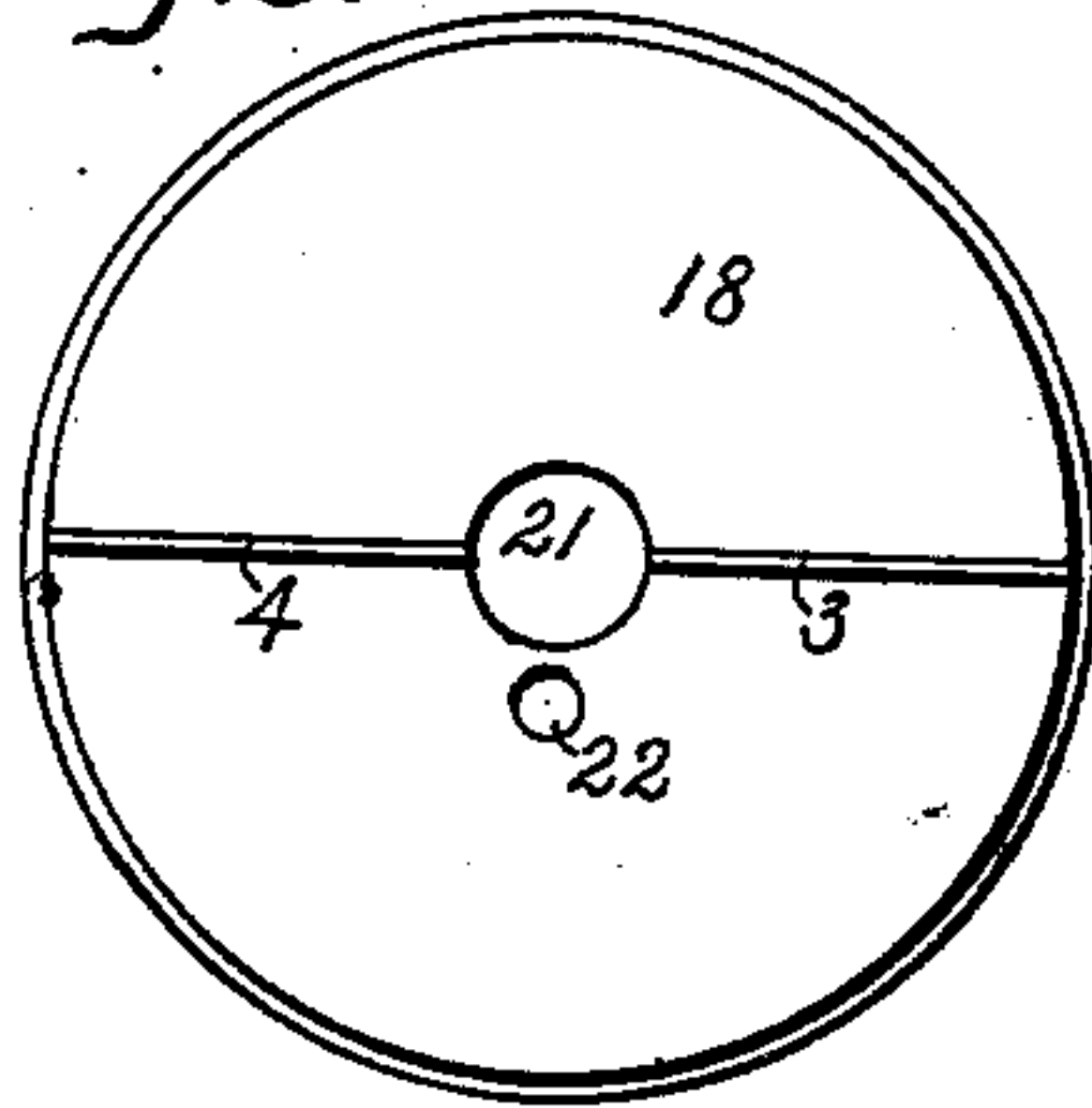


Fig. 4.

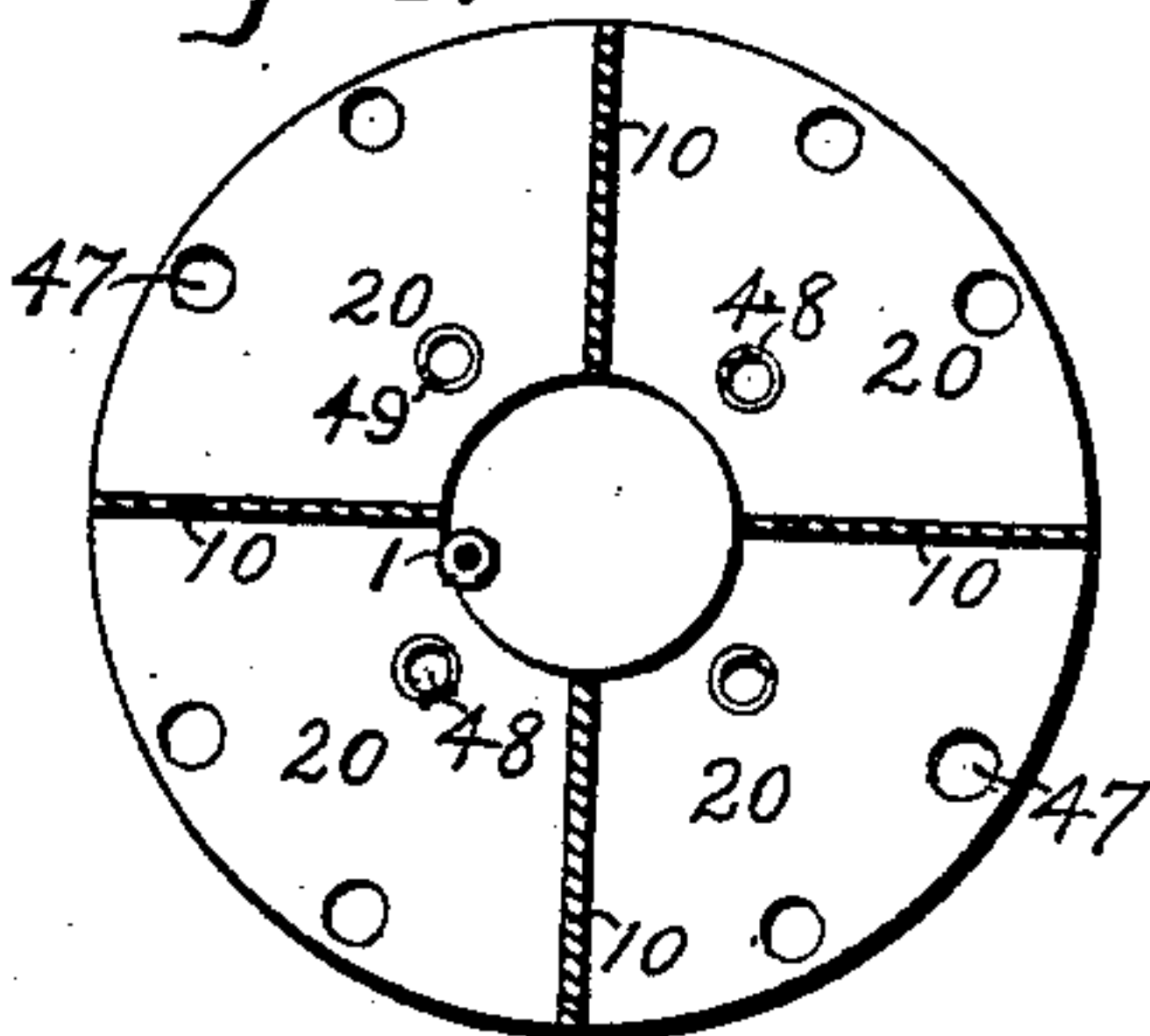


Fig. 5.

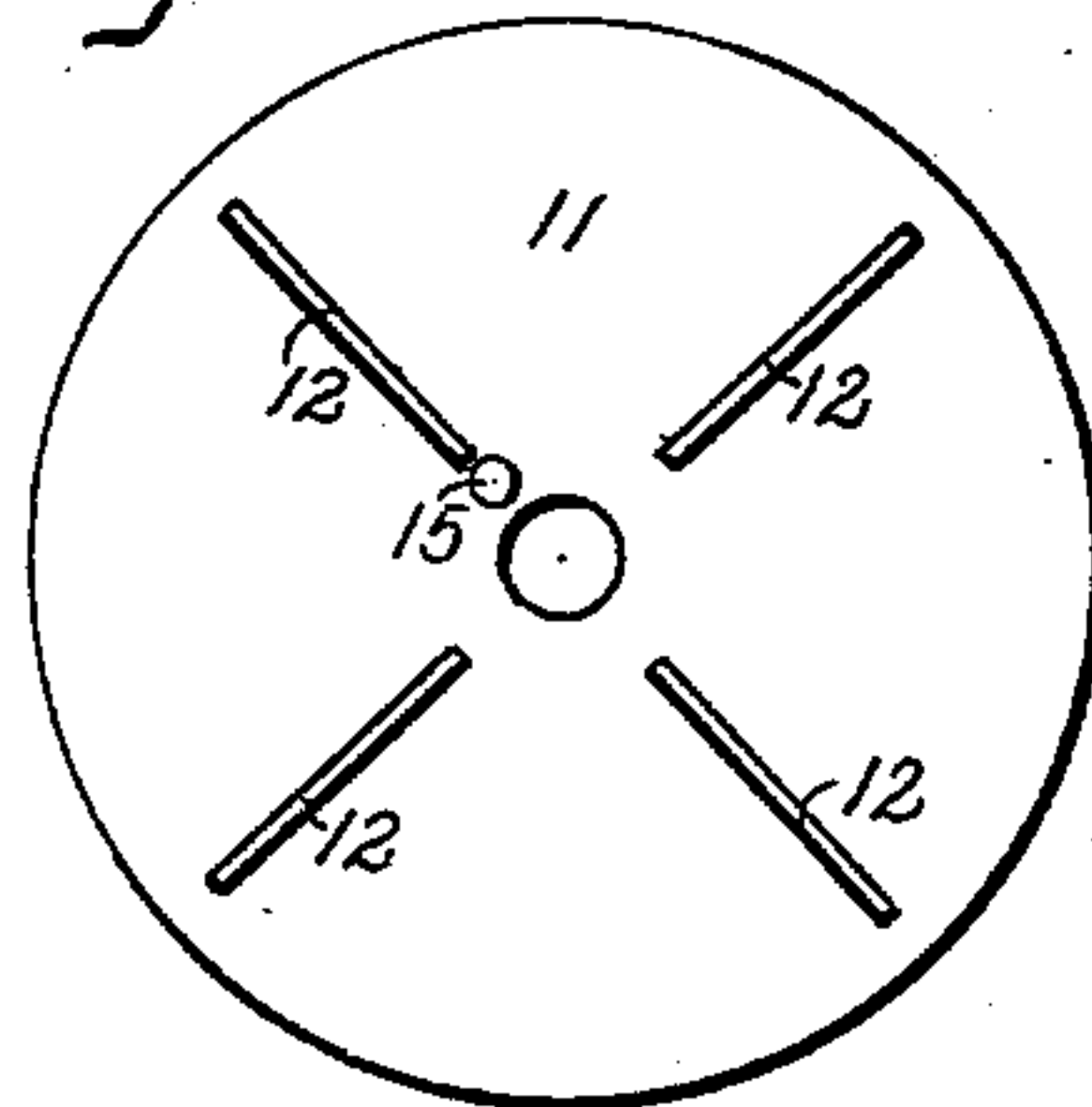


Fig. 6.

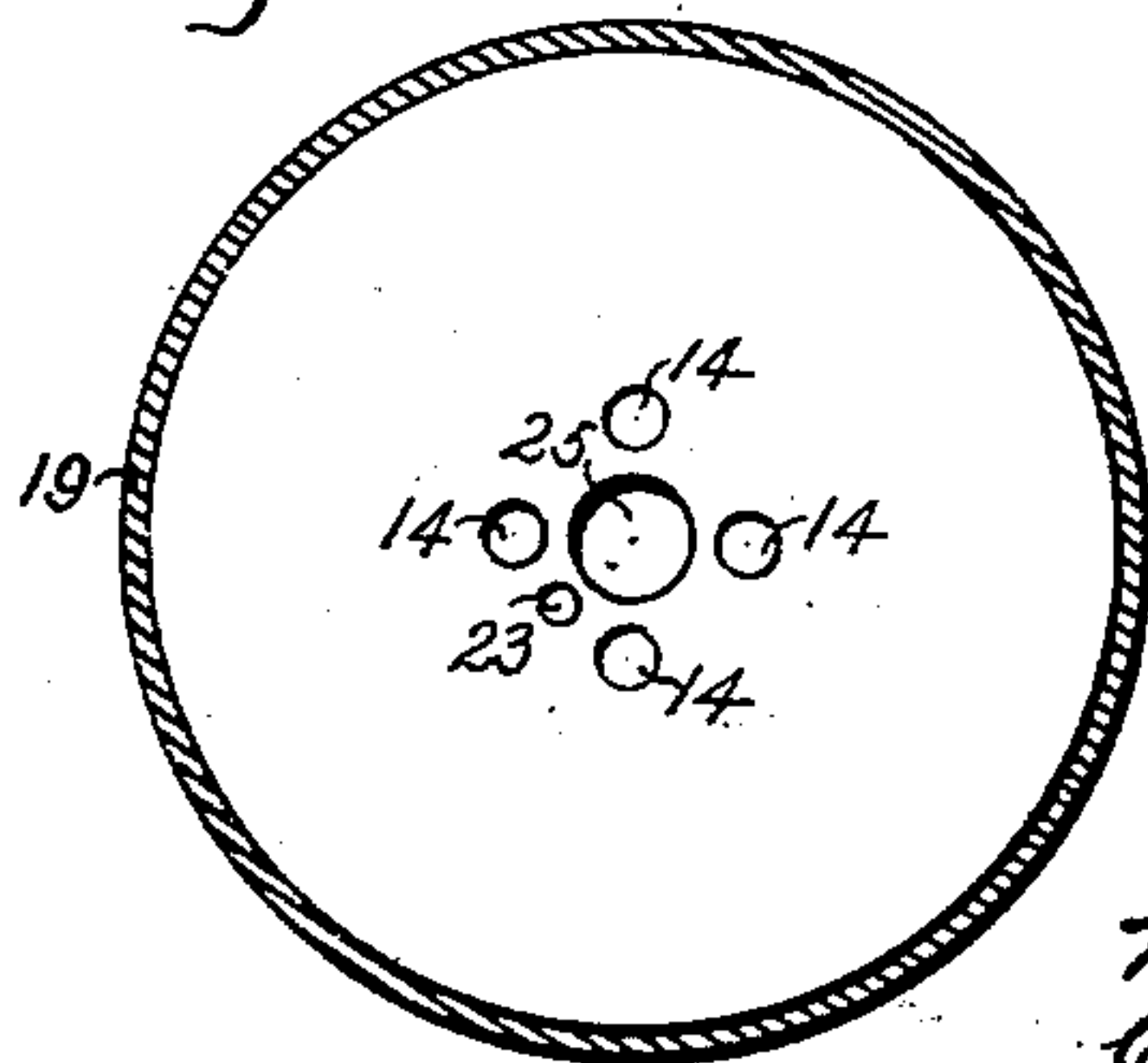


Fig. 7.

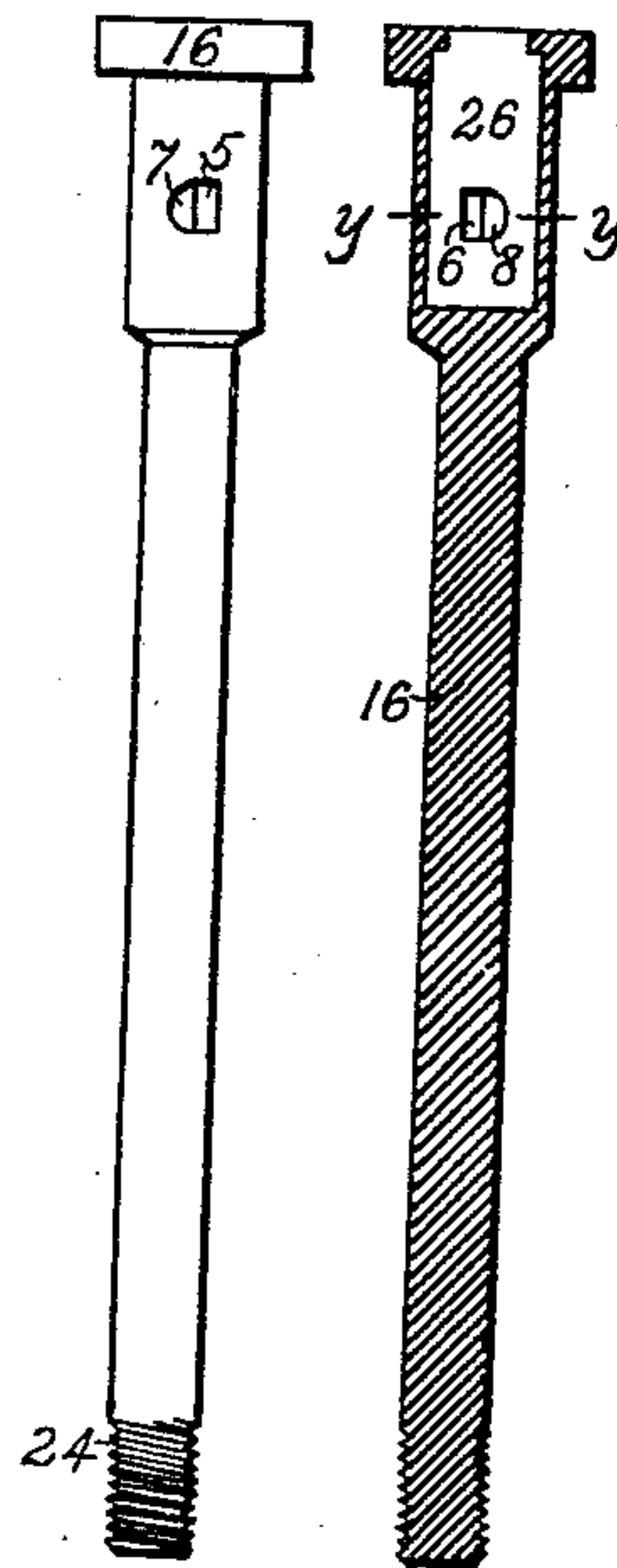


Fig. 8. Fig. 9.



Fig. 10.

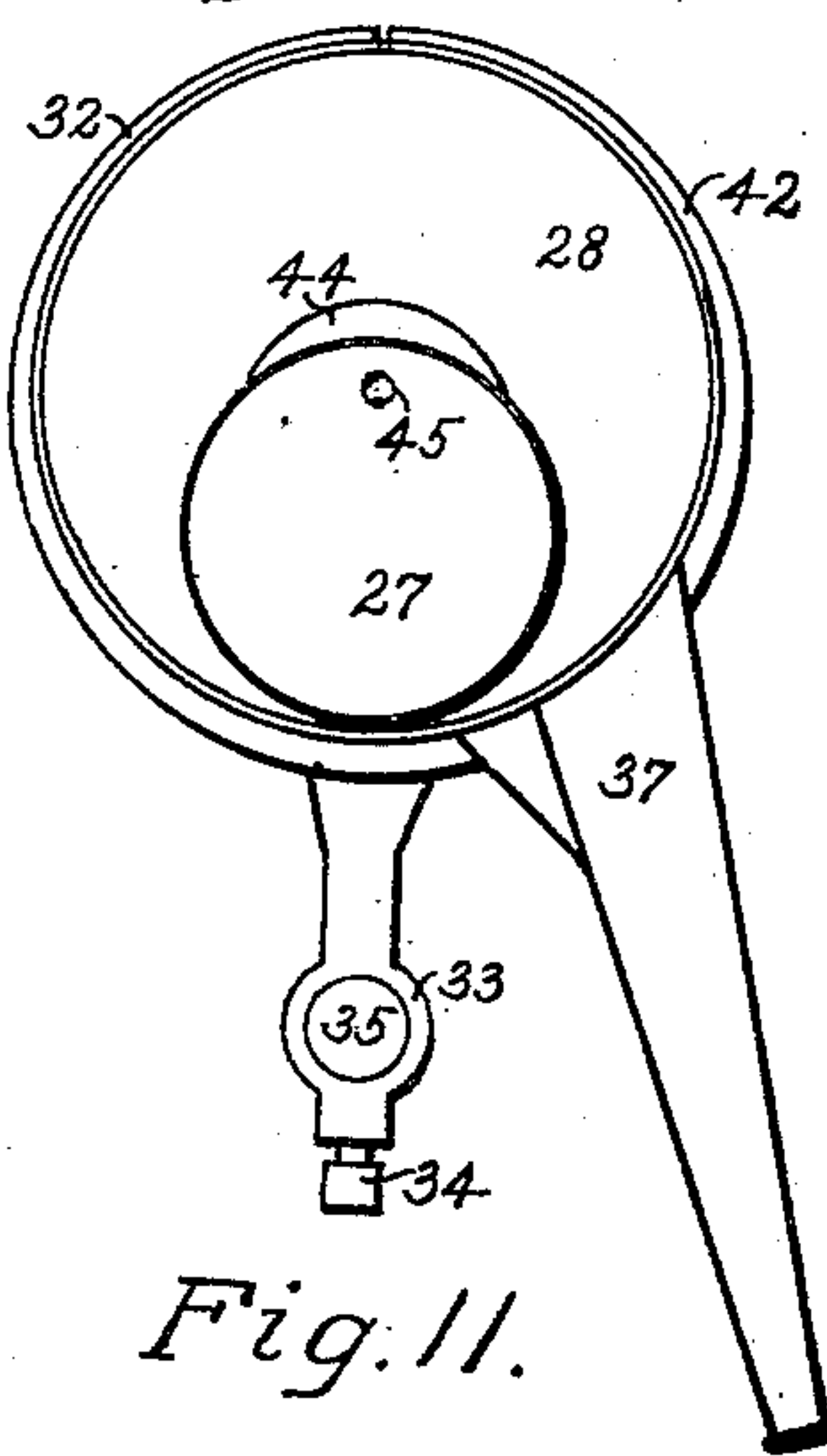


Fig. 11.

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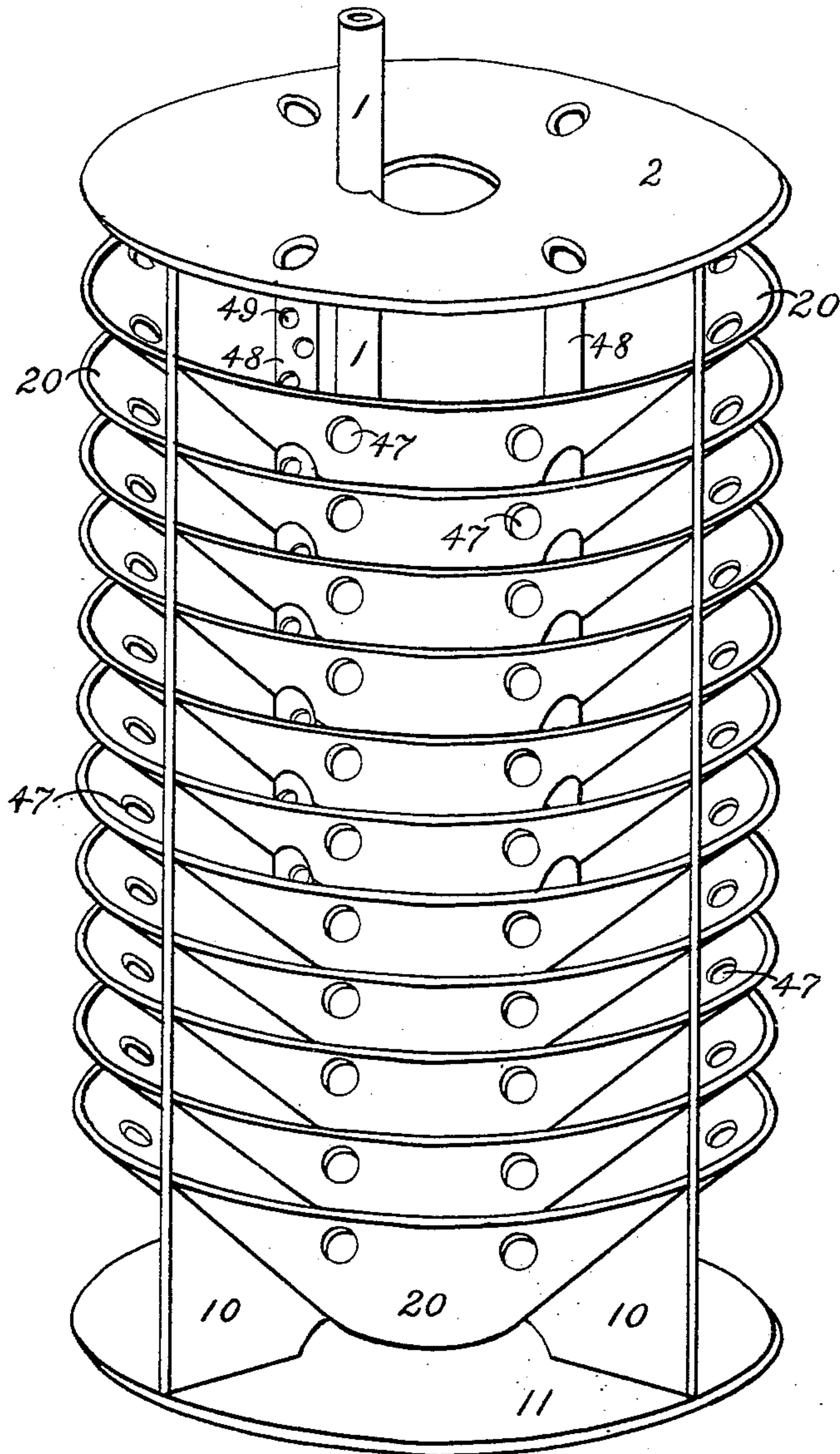


Fig. 13.

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UNITED STATES PATENT OFFICE.

WILBUR W. MARSH AND CHARLES H. HACKETT, OF WATERLOO, IOWA.

CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 677,092, dated June 25, 1901.

Application filed February 15, 1901. Serial No. 47,406. (No model.)

To all whom it may concern:

Be it known that we, WILBUR W. MARSH and CHARLES H. HACKETT, citizens of the United States of America, and residents of the city of Waterloo, Blackhawk county, and State of Iowa, have invented certain new and useful Improvements in Centrifugal Liquid-Separators, of which the following is a specification.

Our invention relates to improvements in centrifugal liquid-separators; and the objects of our improvements are, first, to provide an improved liner having a series of plates superimposed one above another and inclined toward its center to retard the progress of the liquid in its descent from the top to the bottom of the separator-bowl; second, a bowl so devised as to permit of the withdrawal of the lighter constituent of its contents from the top and the heavier constituent from the bottom; third, a bowl containing a compartment so arranged as to separate any solid particles or impurities from the liquid before the introduction of said liquid into the compartment of the bowl which contains the liner; fourth, a connecting-rod having at its top portion a central cavity for the reception of a liquid, said cavity communicating with the upper compartment of the bowl through openings on the sides thereof; fifth, a bowl separated into compartments and provided with an annular recess in the bottom of the interior periphery of its sides to permit the passage of the liquid beneath the bottom of the liner; sixth, a liner arranged to closely engage the interior periphery of the bowl; seventh, a liner so arranged as to permit of the withdrawal of the lighter constituent of the liquid through the top of the bowl; eighth, an improved packing for upper compartment of bowl to prevent escape of solid particles from the liquid by centrifugal force, and, ninth, an improved holder for retaining the upper pan of separator in proper position surrounding but not touching the top of the bowl. We attain these objects by the means illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the bowl with the top and bottom pans in operative position, the top pan supported by our pan-holder and the interior construction of the pans indicated by dotted lines; Fig. 2, a vertical section of

the bowl, showing the liner in position within it; Fig. 3, a vertical section of the separable top of the bowl; Fig. 4, a plan view of the under side of the separable upper portion of the bowl; Fig. 5, a horizontal section of the liner on the line *x x* of Fig. 2; Fig. 6, a plan view of the under side of the bottom plate of the liner; Fig. 7, a plan view of the upper surface of the bottom of the interior of the bowl; Fig. 8, a side elevation of the connecting-rod; Fig. 9, a vertical section of the connecting-rod; Fig. 10, a horizontal section of the hollow upper portion of connecting-rod on the line *y y* of Fig. 9; Fig. 11, a top plan view of the pan-holder, showing the top pan of separator in position within it. Fig. 12 is a front elevation of one of the spraying-tubes of liner, and Fig. 13 is a perspective view of the liner.

Similar numbers refer to similar parts throughout the several views.

The cylindrical bowl 19 is provided with the usual spindle 43. About the bottom of its interior periphery is an annular recess 13. A threaded hole 25 is placed at the center of the upper surface of the bottom of the interior of the bowl for the reception of the screw 24 on the connecting-rod 16. About this are disposed the ducts 14 for the purpose of withdrawing the heavier constituent of the liquid.

23 is a hole in the bowl for the reception of a stud 15 on the bottom of the liner, which latter serves to retain the liner in place within the bowl.

The ducts 14 deliver the heavier constituent of the liquid into the bottom pan 39 of the separator. This bottom pan is provided with central openings, through which the spindle of the separator passes. The liquid is ejected from the ducts 14 into the pan 39, between its cover 38 and its inclined bottom 40, whence it flows to any convenient receptacle through the spout 41.

18 is a cover of a circular shape and arched in section, having its top part provided with a cylindrical opening for the reception of the connecting-rod 16 and having a hole 22 for the reception of the duct 1. The lower side of the cover 18 is provided with transverse partitions 3 and 4, extending from its edge to the edge of the central opening, the lower edge of said partitions being arranged to come in

close contact with the upper surface of the top plate of the liner. The circumferential edge of the cover 18 is beveled to permit of the introduction of the packing-ring 46 between it and the liner. The packing-ring 46, which may be constructed of rubber or any other suitable material, is placed within the recess formed between the beveled edges of the cover and the top plate of liner and the interior periphery of the bowl. Its function is to prevent the escape of matter collected within the interior of the upper compartment. The interior partitions 3 and 4 carry the liquid with the revolving bowl, placing it under pressure, and results in the solid particles of impurities therein being thrown to the circumference of the compartment. The connecting-rod 16 serves to clamp and compress together the cover and liner of the separator by being passed through openings in both and having its threaded end 24 screwed into the hole 25 in the bottom of the bowl 19. This method of clamping produces a compression upon the packing free from twisting stress such as is produced by covers which are screwed directly to bowl. The upper end of the connecting-rod 16 has a cylindrical cavity 26, open at the top and closed at the bottom. On the opposite sides of the enlarged portion of the rod 16 are placed the openings 7 and 8, each of said openings being provided with blades, such as 5 and 6, extending inwardly.

The function of the blades 5 and 6 is to divert the liquid which is conveyed into the cavity 26 through the openings 7 and 8 into the upper compartment, between the cover 18 and the top plate 2 of the liner. The openings 7 and 8 are so placed within the sides of the enlargement of the connecting-rod 16 as to open wholly within the interior of the upper compartment.

The liner is composed of the circular top and bottom disks 2 and 11, connected together by means of the radial wings 10. The disks 2 and 11 are provided with holes for the reception of the connecting-rod 16. The top disk 2 is beveled at its outer circumferential edge for the reception of the packing-ring 46. The bottom disk 11 has transverse supporting-pieces 12 to keep it a sufficient distance from the bottom of the bowl, and also has a stud 15 for the purpose of retaining it in position in the bowl. The tubes 48 are attached to the top disk of liner, opening through it to communicate between the upper and lower compartments of the bowl. The lower ends of the tubes 48 are incurved beyond the inner side of duct 1. This curving in of the tubes 48 renders the closing of the tubes at the bottom unnecessary, because the line of the outlet to the lighter particles is the point where they cease to flow toward the center. Perforations 49 are placed within the walls of the tubes 48 along that side of the tubes which follow the revolution thereof, and the liquid in descending within the tubes is sprayed

through these perforations upon the inclined plates 20. A duct 1 is placed vertically within the upper part of liner and secured to one of the uprights 10. Notches 9 are cut within the inner edges of the uprights 10 just below the lower end of the duct 1 to assist in diverting into said duct the stratum of the lighter constituent of the liquid disposed in the central column in contact with them. The upper end of said duct 1 passes through the top disk 2 of the liner and the upper part 17 of the cover 18, and the lighter constituent of the liquid which is forced through it is received within the interior of the top pan 29, between its cover 28 and its inclined bottom 30, whence it passes off to any convenient receptacle through the spout 37. The liner is provided with a series of partition-plates inclined toward the center, superimposed one above another and attached to the radial wings 10. The outer edges of these partition-plates 20 are so curved as to closely engage the inner periphery of the bowl and are furnished with apertures 47 to allow the liquid to descend through them. The inner edges of the plates 20 are placed at a sufficient distance from the connecting-rod 16 to permit of the free ascent of the lighter constituent of the liquid.

The upright support 35 has its lower end 36 turned eccentrically in order to allow any desired adjustment of the pan 29 about the bowl 19. The pan-holder 33 may be set at any desired height by means of the thumb-screw 34. This pan-holder is formed of the separable members 32 and 42, whose inside edges are formed of a shape suitable to engage and hold the lower part of the pan 29 when placed within them. The pan 29 engages the inner periphery of the members 32 and 42, but does not touch the outer surface of the bowl 19. After long use a bowl becomes unbalanced. It may then be violently shattered exterior boxing, endangering the operator. The use of our pan-holder with an unboxed bowl obviates this danger. The top pan 29 has a cup 27, in whose bottom is placed a small circular orifice, through which liquids may pass downward into the cavity 26 of the connecting-rod 16. A crescent-shaped opening 44 is placed in the top of the cover 28 in order to permit the operator to look within the pan when adjusting the pan over the top of the separator-bowl.

The operation of our improved separator is thus described: When the liquid is poured into the cup 27, it drains thence through the orifice 45 into the cavity 26. The centrifugal force imparted to the liquid by its contact with the blades 5 and 6 causes it to move through the openings 7 and 8 into the spaces of the upper compartment of the separator which are formed by the partitions 3 and 4 of the cover 18. The partitions 3 and 4 carry the liquid with the rapidly-revolving bowl, causing the solid particles or impurities contained in the liquid to be separated therefrom and accumulated at the outer limits of the

spaces, where they collect and are prevented from passing into the bowl by the packing-ring 46. The milk or other liquid to be separated being thus purified descends into the bowl through the perforated tubes 48. As it descends into the bowl and is sprayed through the perforations 49 the liquid impinges upon the inclined plates 20 and the lighter constituent of the liquid separates from the heavier particles, the lighter particles seeking the center of the bowl, while the heavier move toward the inner periphery thereof. As the lighter particles are deflected back from the inner periphery of the bowl they flow down the under surfaces of the partition-plates 20 until they have passed below the inner edge thereof, when they join the current moving toward duct 1. The heavier particles descend to bottom of bowl through the openings 47, whence they pass beneath the bottom plate 12 of liner through the annular recess 13 into the ducts 14 and thence out into the bottom pan 39.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A liner for a centrifugal liquid-separator composed of radial wings attached at top and bottom to centrally-perforated disks, a cylindrical duct attached to one of said wings and passing vertically near the axis of the liner through the top disk, the top disk beveled on its outer edge, the bottom disk provided with transverse supports on its lower surface and having a projecting stud to engage a hole in the bottom of separator-bowl, substantially as shown and described.

2. A liner for a centrifugal liquid-separator composed of radial wings attached at top and bottom to centrally-perforated disks, a cylindrical duct attached to one of said radial wings and passing vertically through the top disk near the axis of the liner, perforated inturned tubes passing vertically through said top disks, the top disk beveled on its outer edge, the bottom disk provided with transverse supports on its lower surface and having a projecting stud to engage a hole in the bottom of separator-bowl, substantially as shown and described.

3. A liner for a centrifugal liquid-separator composed of radial wings attached at top and bottom to centrally-perforated disks, a cylindrical duct attached to one of said radial wings and passing vertically through the top disk near the axis of liner, perforated plates attached to said radial wings and inclined downward toward the axis of liner, the top disk beveled on its outer edge, the bottom disk provided with transverse supports on its lower surface and having a stud adapted to engage a hole in the bottom of separator-bowl substantially as shown and described.

4. A liner for a centrifugal liquid-separator composed of radial wings attached at top and bottom to centrally-perforated disks, a cylindrical duct attached to one of said uprights

and passing vertically near the axis of liner through the top disk, perforated inturned tubes passing vertically through said top disk, perforated plates attached to said radial wings and inclined downward toward the axis of liner, the top disk beveled on its outer edge, the bottom disk provided with transverse supports on its lower surface and having a stud adapted to engage a hole in the bottom of separator-bowl, substantially as shown and described.

5. A centrifugal liquid-separator consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk having on its lower surface a stud and radially-disposed projecting ribs, a duct attached to one of said radial wings and passing through the said top disk, in combination with a cylindrical bowl having an annular recess about the bottom of its interior periphery, ducts disposed about the center of bottom of said bowl, a cover beveled on its outer edge, provided with orifices for the reception of a connecting-rod and duct, and having radial ribs on its lower surface, a connecting-rod adapted to clamp the cover and liner in position, said connecting-rod having an enlarged portion containing an interior cavity open at the top, and having openings in its walls provided with inwardly-extending blades, and a packing-ring, substantially as shown and described.

6. A centrifugal liquid-separator consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk having on its lower surface a stud and radially-disposed projecting ribs, a duct attached to one of said radial wings and passing through the said top disk, perforated inturned tubes passing vertically through said top disk, in combination with a cylindrical bowl having an annular recess about the bottom of its interior periphery, ducts disposed about the center of bottom of said bowl, a cover beveled on its outer edge, provided with orifices for the reception of a connecting-rod and a duct, and having radial ribs on its lower surface, a connecting-rod adapted to clamp the cover and liner in position, said connecting-rod having an enlarged portion containing an interior cavity open at the top, and having openings in its walls provided with inwardly-extending blades, and a packing-ring, substantially as shown and described.

7. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, a series of perforated inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-

perforated lower disk having on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passed through the top disk of said liner and the cover of the bowl, in combination with a bowl having an annular recess about the bottom of the interior periphery, and ducts passing through the bottom of said bowl, a cover having beveled edges and perforations for the admission of a duct and a connecting-rod, and having transverse ribs extending from edge to central perforation, a separable packing-ring placed between the beveled edges of cover and top disk and inner periphery of bowl, a connecting-rod adapted to clamp together said cover, liner and bowl, and which contains central hole with openings through its side walls provided with blades extending inwardly, substantially as shown and described.

8. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, a series of perforated inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-perforated lower disk having on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passed through the top disk of said liner and the cover of the bowl, perforated inturned tubes passing vertically through said top disk, in combination with a bowl having an annular recess about the bottom of its interior periphery, and ducts passing through the bottom of said bowl, a cover having beveled edge and perforations for the admission of a duct and a connecting-rod, and having transverse ribs extending from edge to central perforation, a separable packing-ring placed between the beveled edges of cover and top disk and inner periphery of bowl, a connecting-rod adapted to clamp together said cover, liner and bowl, and which contains central hole with openings through its side walls provided with blades extending inwardly, substantially as shown and described.

9. A centrifugal liquid-separator consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk bearing on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passing through the top disk and cover, in combination with a bowl having an annular recess about the bottom of its interior periphery, ducts passing through the bottom of said bowl, a cover beveled on its outer edge, furnished with perforations for the reception of a duct and a connecting-rod, and having its lower surface divided by radially-disposed ribs extending

from central perforation to the edge of said cover, a connecting-rod having an enlarged upper portion containing cavity open at top and which communicates with interior of bowl through openings provided with blades extending inwardly, a separable packing-ring, a top receiving-pan, and a bottom receiving-pan substantially as shown and described.

10. A centrifugal liquid-separator consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk bearing on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passing through the top disk and cover, perforated inturned tubes passing vertically through said top disk, in combination with a bowl having an annular recess about the bottom of its interior periphery, ducts passing through the bottom of said bowl, a cover beveled on its outer edge, furnished with perforations for the reception of a duct and a connecting-rod, and having its lower surface divided by radially-disposed ribs extending from central perforation to the edge of said cover, a connecting-rod having enlarged upper portion containing cavity open at top end which communicates with interior of bowl through openings provided with blades extending inwardly, a separable packing-ring, a top receiving-pan, and a bottom receiving-pan, substantially as shown and described.

11. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by means of vertically-disposed radial wings, a series of inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-perforated lower disk having on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to said liner and passed through its top disk and the cover of the separator, in combination with a bowl having an annular recess about the bottom of its interior periphery and ducts passing through the bottom of said bowl, a cover having its edge beveled and possessing perforations for the reception of a duct and a connecting-rod and having radial ribs, a packing-ring, a connecting-rod, a top receiving-pan and a bottom receiving-pan, substantially as shown and described.

12. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by means of vertically-disposed radial wings, a series of inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-perforated lower disk having on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to said liner and passed vertically

through its top disk and the cover of the separator, perforated inturned tubes passing vertically through said top disk, in combination with a bowl having an annular recess about the bottom of its interior periphery and ducts passing through the bottom of said bowl, a cover having its edge beveled and possessing perforations for the reception of a duct and a connecting-rod and having radial ribs, a packing-ring, a connecting-rod, a top receiving-pan and a bottom receiving-pan, substantially as shown and described.

13. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk bearing on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passed through the top disk and cover, in combination with a bowl containing an annular recess above the bottom of the sides of the interior periphery, ducts perforated through the bottom of said bowl near its axis, a cover with outer edge beveled, and provided with ribs on its lower surface, a connecting-rod having central cavity and orifices in its side walls, a packing-ring, a top receiving-pan, a bottom receiving-pan, and a pan-holder having separable members, substantially as shown and described.

14. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk connected to the centrally-perforated lower disk by vertically-disposed radial wings notched on their inner edges, the centrally-perforated lower disk bearing on its lower surface radially-disposed projecting ribs and a projecting stud, a duct attached to one of said radial wings and passed through the top disk and cover, perforated inturned tubes passing vertically through said top disk, in combination with a bowl containing an annular recess above the bottom of the sides of its interior periphery, ducts perforated through the bottom of said bowl near the axis, a cover with its outer edge beveled, and provided with ribs on its lower surface, a connecting-rod having central cavity and orifices in its side walls, a packing-ring, a top receiving-pan, a bottom receiving-pan, and a pan-holder having separable members, substantially as shown and described.

15. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perfo-

rated upper disk having beveled edge and connected to the centrally-perforated lower disk by means of vertical radial wings, a series of inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-perforated lower disk having on its lower surface radially-disposed ribs and a projecting stud, a duct attached to said liner and passed vertically through its top disk and the cover of the separator, in combination with a bowl having an annular recess about the bottom of the sides of its interior periphery, ducts perforated through the bottom of said bowl near its axis, a cover with beveled outer edge, and provided with ribs on its lower surface, a connecting-rod having central cavity and orifices in its side walls, a packing-ring, top and bottom receiving-pans, a pan-holder having separable members, and means for adjustably supporting said pan-holder, all substantially as shown and described.

16. A centrifugal liquid-separator, consisting of a liner composed of a centrally-perforated upper disk having beveled edge and connected to the centrally-perforated lower disk by means of vertical radial wings, a series of inclined plates attached to said radial wings and arranged concentrically about the axis of said liner, the centrally-perforated lower disk having on its lower surface radially-disposed ribs and a projecting stud, a duct attached to said liner and passed vertically through its top disk and the cover of the separator, perforated inturned tubes passing vertically through said top disk, and the cover of the separator, perforated inturned tubes passing vertically through said top disk, in combination with a bowl having an annular recess about the bottom of the sides of its interior periphery, ducts perforated through the bottom of said bowl near its axis, a cover with beveled outer edge, and provided with ribs on its lower surface, a connecting-rod having central cavity and orifices in its side walls, a packing-ring, top and bottom receiving-pans, a pan-holder having separable members, and means for adjustably supporting said pan-holder, all substantially as shown and described.

Signed at Waterloo, Iowa, this 12th day of February, 1901.

WILBUR W. MARSH.

CHARLES H. HACKETT.

Witnesses:

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CHAS. A. MARSH.