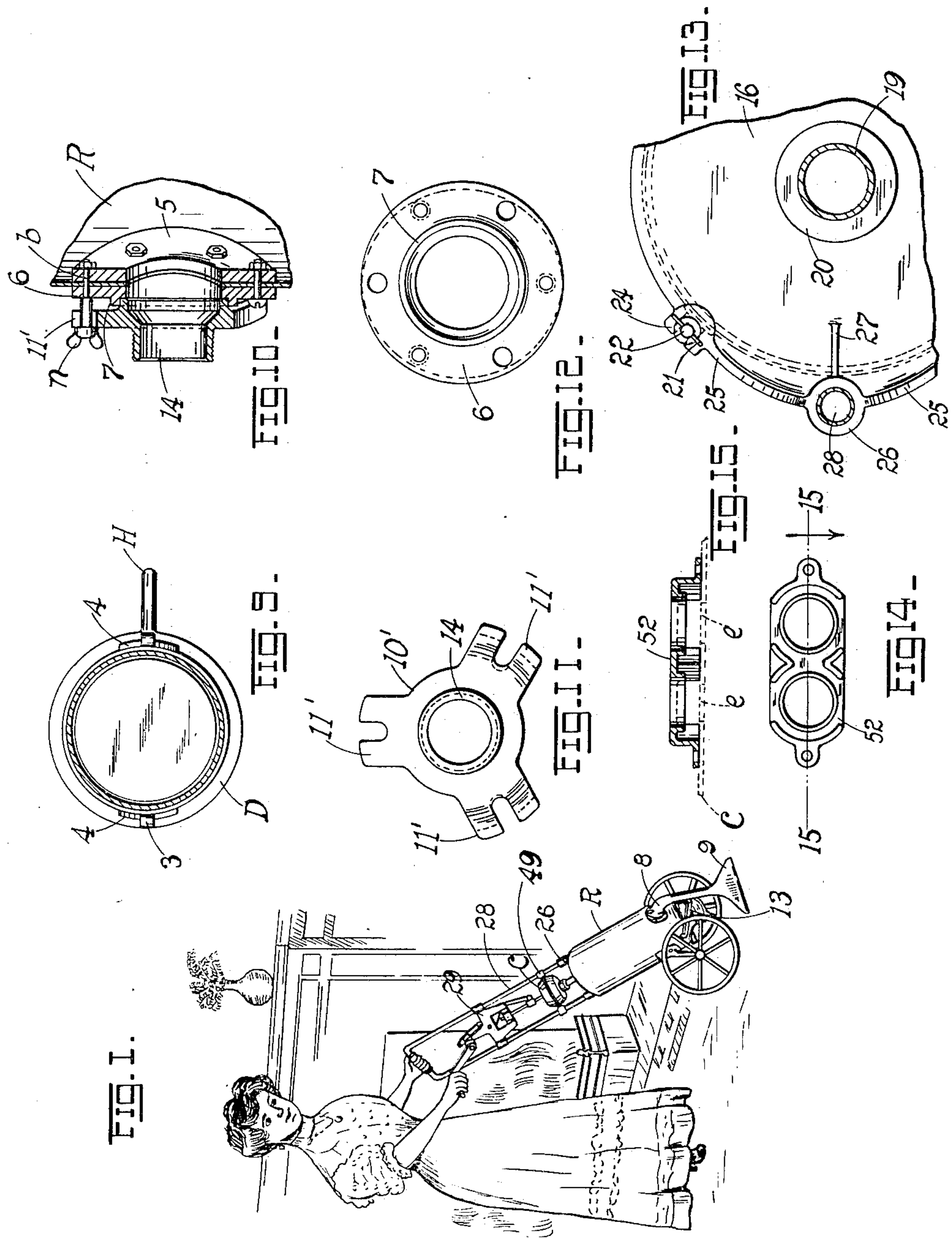


956,452.

J. S. THURMAN.
HAND VACUUM CLEANER.
APPLICATION FILED AUG. 28, 1909.

Patented Apr. 26, 1910.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

FIG. 2.

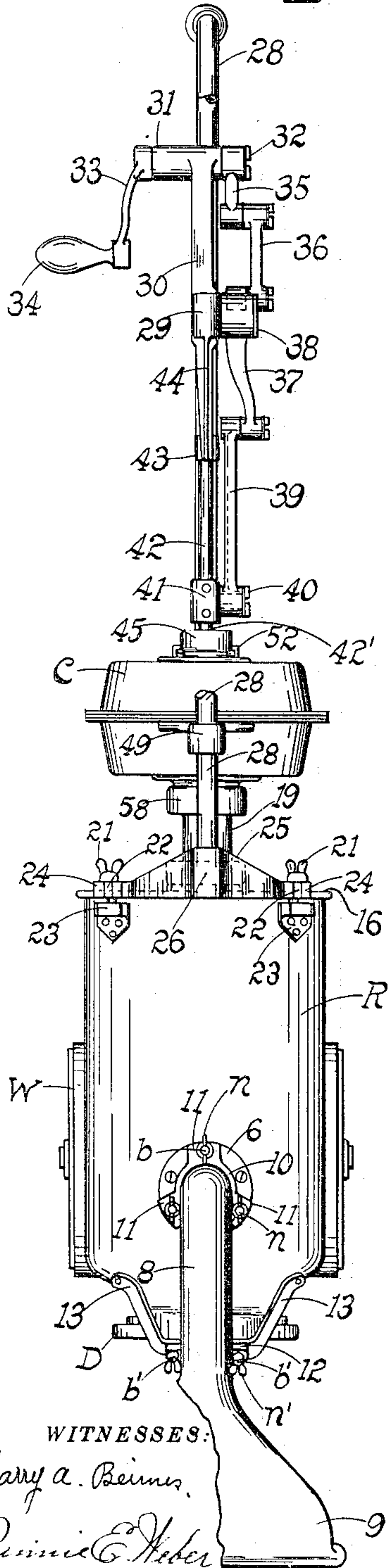
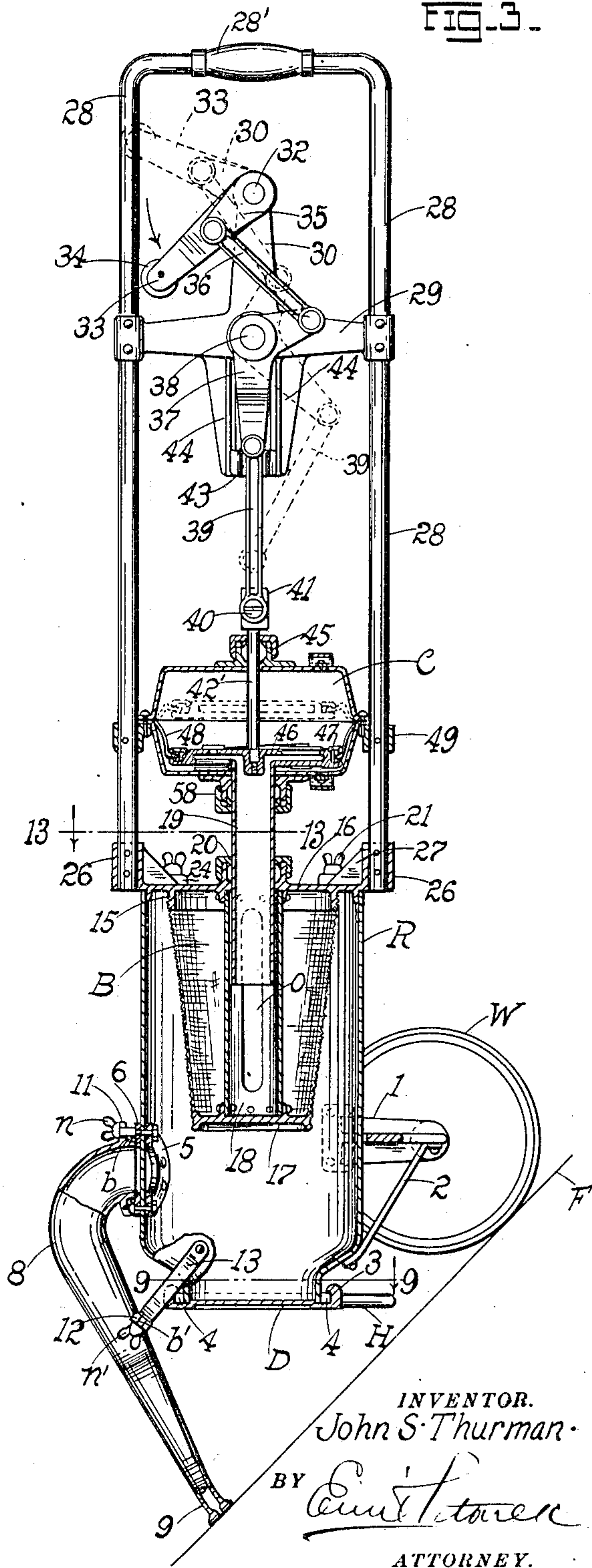


FIG. 3.



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3 SHEETS—SHEET 3.

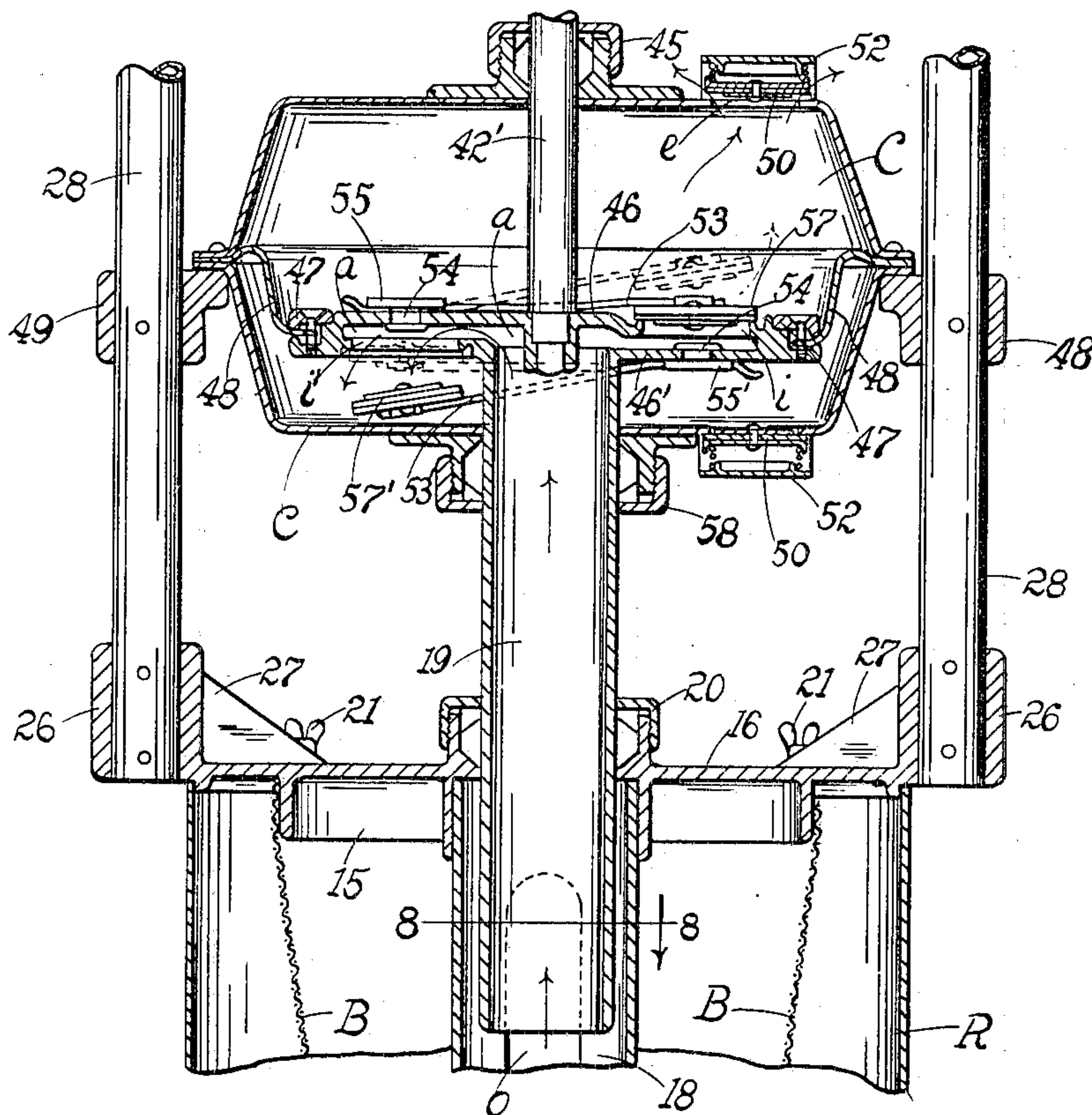


FIG. 4.

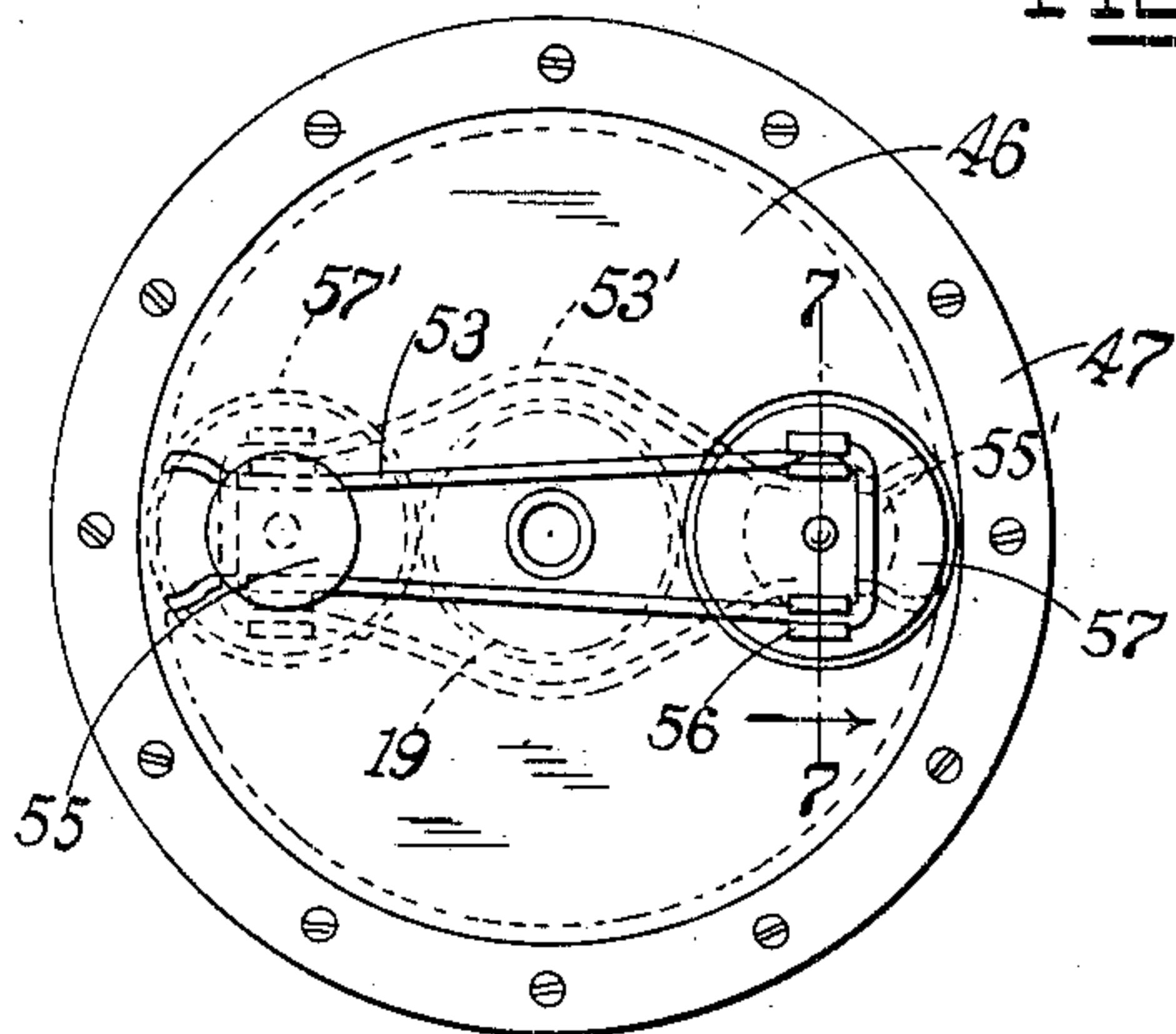


FIG. 5.

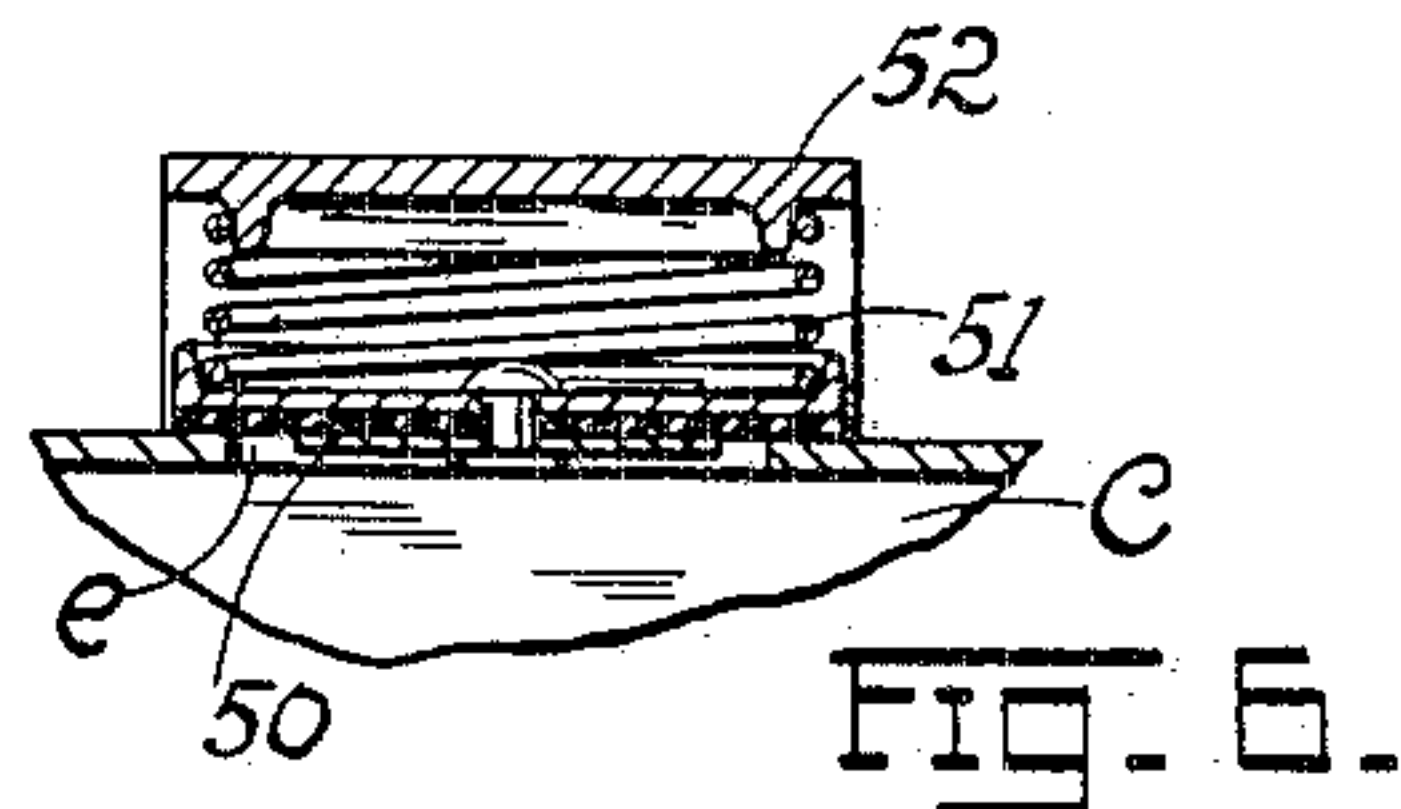


FIG. 6.

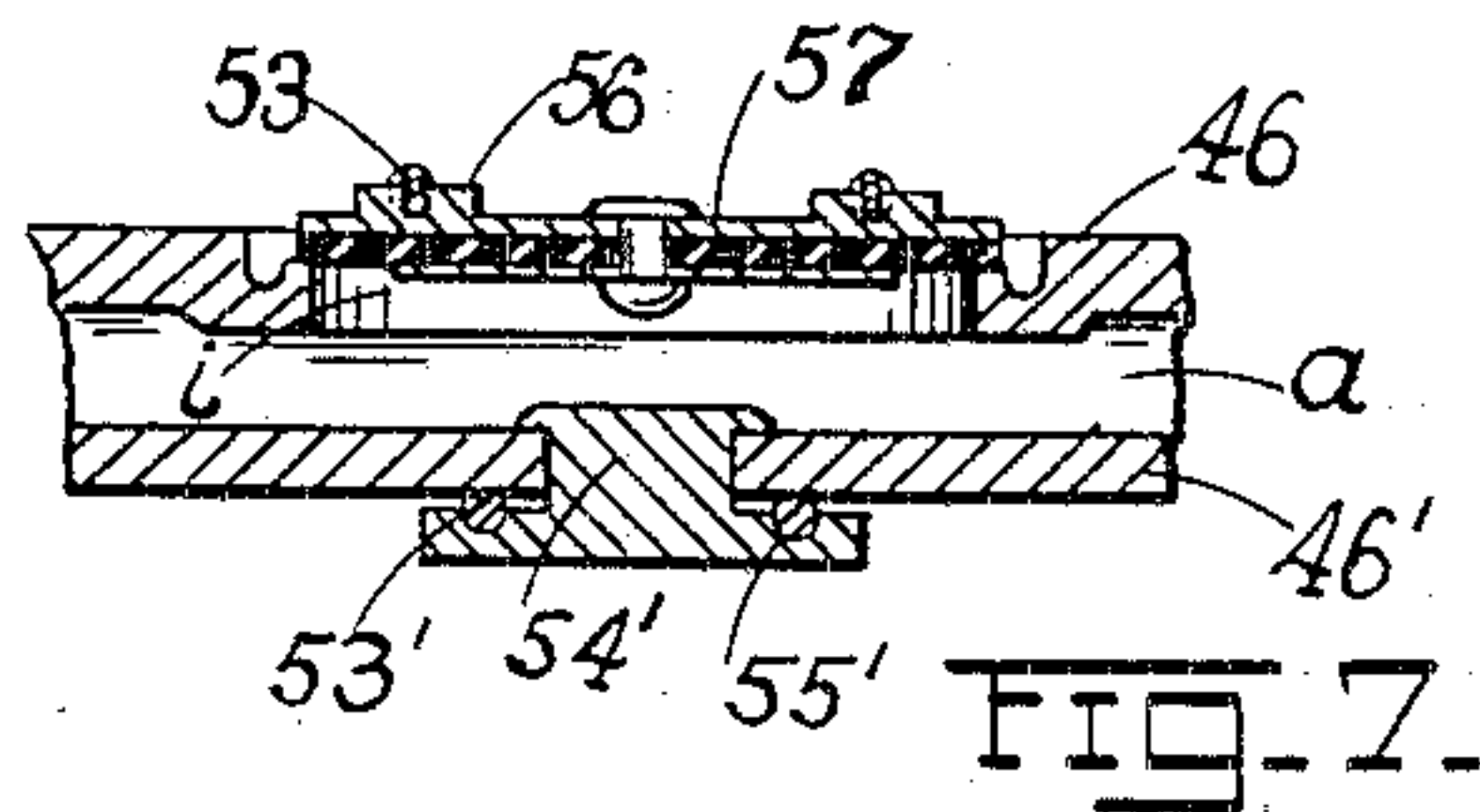


FIG. 7.

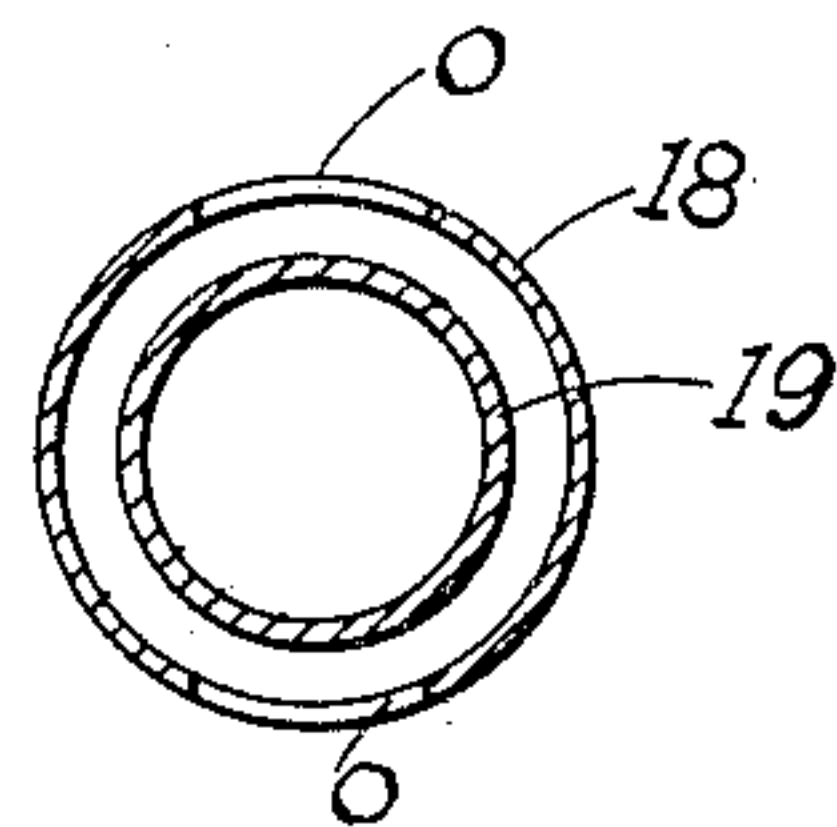


FIG. 8.

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HAND VACUUM-CLEANER.

956,452.

Specification of Letters Patent.

Patented Apr. 26, 1910.

Application filed August 28, 1909. Serial No. 515,088.

To all whom it may concern:

Be it known that I, JOHN S. THURMAN, citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Hand Vacuum-Cleaners, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in hand vacuum-cleaners and renovators; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a perspective showing the application of my invention; Fig. 2 is a front elevation of the apparatus; Fig. 3 is a combined side elevation and section of the same; Fig. 4 is an enlarged middle longitudinal section taken through the diaphragm chamber or cylinder and the upper portion of the dust receptacle; Fig. 5 is a top plan of the piston-head; Fig. 6 is a middle transverse section through the hood confining the spring which controls the exhaust valve on the diaphragm chamber; Fig. 7 is a sectional detail on the line 7—7 of Fig. 5; Fig. 8 is a cross-section on the line 8—8 of Fig. 4 taken through the hollow piston-rod and guide-tube therefor; Fig. 9 is a section on the line 9—9 of Fig. 3 taken above the discharge door for the dust receptacle; Fig. 10 is a sectional detail showing the manner of attaching the screw-nipple to which a vacuum hose may be coupled, upon removal of the suction-head usually carried by the dust-receptacle; Fig. 11 is an outer face view of the screw-nipple aforesaid; Fig. 12 is a plan of the outer reinforcing ring surrounding the inlet opening into the dust-receptacle; Fig. 13 is a sectional detail on the line 13—13 of Fig. 3 taken above the cover plate or hood of the dust-receptacle; Fig. 14 is a bottom plan of the hood for housing the springs which control the discharge or exhaust valves from the diaphragm chamber; and Fig. 15 is a longitudinal section on line 15—15 of Fig. 14.

The object of my invention is to construct a hand-operated vacuum cleaner which may be conveniently moved about over the floor with one hand, while the vacuum pump mechanism is being actuated with the other hand, the pumping in no wise interfering with the freedom with which the cleaner may be manipulated in other particulars.

The apparatus is so mounted that the suction-head or tool may be made to bear with any degree of pressure against the surface to be cleaned and at the same time be passed back and forth over said surface. The apparatus is inclined to the surface over which it operates at substantially an angle of forty-five degrees, that being found in practice a convenient inclination. On account of this inclination it becomes necessary to provide the dust-receptacle of the cleaner with a filter or dust-arresting bag which, in spite of the inclination it is obliged to assume, will have no pockets or depressions in which the dust may lodge and thus prevent the proper filtering of the air on its way to the vacuum pump. In my present invention therefore, I avail myself of a tapering form of dust-bag, preferably of the form of a truncated cone, the surface of which deflects the impinging dust-laden currents, thereby separating the dust which drops to the bottom of the receptacle whence it is removed from time to time.

A further object is to provide the cleaner with a vacuum pump which will produce a substantially continuous current or draft through the cleaning tool or suction-head, the pump being designed specially with a view of producing a maximum degree of exhaust with the expenditure of a least amount of effort on the part of the operator.

The cleaner presents other features of construction offering advantages better apparent from a detailed description of the invention, which is as follows:—

Referring to the drawings, R, represents a suitable dust-receptacle from the rear wall of which project brackets 1, reinforced by braces 2, for the support of the rollers or wheels W, W. The discharge mouth of the receptacle is closed by a door D which is provided with diametrically disposed claws 3, 3, riding over wedge-shaped blocks or ridges 4, 4, which when the door is turned in one direction, wedge or draw the door to the edge of the receptacle mouth, thus locking it, and when turned far enough in the opposite direction, the claws slip or ride off the wedges and release the door, the latter being provided with a handle H for purposes of manipulation. The construction of the door however is not claimed herein as this is not new, but is illustrated since it constitutes a preferred form of construction for dumping out the contents of the receptacle.

At a convenient point opposite the axis of rotation of the wheels W, the receptacle R is provided with an air intake opening reinforced on the inside by a ring 5, and on the outside by a ring 6, the opening in the latter being surrounded by a circular flange or rim 7 which receives the upper end of the hollow leg or stem 8 of the suction-head 9, said stem being provided with a flange 10 provided with a series of forks 11 (spaced one-hundred and twenty degrees apart), the members of each fork receiving between them one of a series of bolts *b* extending through the rings 5, 6, and the receptacle wall, the outer ends of the bolts being provided with wing nuts *n* by which the leg 8 is clamped to the receptacle. In addition to the securing means just described, the base of the leg 8 is provided with laterally projecting forks 12 between the members of which are received the outer ends of braces 13 riveted to the receptacle, the free ends of the braces being likewise provided with bolts *b'* carrying clamping nuts *n'* by which the parts are clamped together. To uncouple the suction-head, the operator simply unscrews the nuts *n*, *n'* when the leg 8 may be detached from the receptacle.

The suction-head is removed when occasion arises to employ the apparatus for cleaning furniture, curtains, and other articles in the room. When that is done, a screw-nipple 14 is clamped to the receptacle, said nipple being likewise provided with a flange 10' having forks 11' between which the bolts *b* are received, the nuts *n* clamping such screw-nipple to the receptacle. To the nipple any convenient length of vacuum hose (not shown) may be attached, and the free end of the hose be provided with a suction-head or tool available for the cleaning of curtains, furniture, upholstery and the like.

When used to operate on the floor F the cleaner occupies an angle substantially forty-five (45) degrees thereto (Fig. 3), so that the dust bag or filter can not conveniently hang vertical. The inclined position necessarily assumed by the bag would tend to form pockets or depressions therein for the lodgment of the dirt unless special means were provided for overcoming this objection. In the present invention any such objections are overcome by the filter or dust bag B herein shown. The bag is made of any available dust-intercepting material of suitable mesh, and is of the form of a truncated cone tapering downward. The upper end of the bag is secured to the circular flange 15 of the cover plate or hood 16 of the dust receptacle, the lower end of the bag being secured to a plate or head 17 which is spaced apart from the plate 16 by a tube 18 which serves as a sleeve or guide for the hollow piston-rod 19 of the pump presently to

be referred to. The spacing tube 18 is provided with elongated openings *o* for the passage of the air into the piston rod, the latter operating through a stuffing box 20 in the cover plate 16. The bag B thus presents a conical surface which deflects the dust impinging against it, the dust thus deflected being precipitated to the bottom of the receptacle, and the filtered air continuing on through the bag walls into the bag, openings *o* and into the hollow piston-rod 19 and thence to the pump as subsequently to be more fully described. The hood 16 is clamped to the walls of the receptacle by means of the wing nuts 21 passed over bolts 22 extending from the angle brackets 23 carried by the receptacle walls, and inserted between the fork-members 24 on the hood.

There are two pairs of forks 24 disposed around the edge of the hood 16, and the outer edges of the latter between each pair of forks are reinforced by curved marginal ribs 25 at the center of each of which is a hollow boss or socket 26, each socket being braced to the hood by a rib 27. These sockets 26 receive and have secured thereto the ends of the U-shaped pipe-frame 28 which serves as a handle for the apparatus, the upper end of the frame having a distinct enlarged formation 28' as shown to be grasped by the hand of the operator. The frame 28 serves to support near its upper portion a suitable cross-brace 29 from the center of which on one side projects upwardly an arm 30 whose free end terminates in a bearing 31 for the support of a crank-shaft 32 one end of the shaft being provided with a crank-arm 33 equipped with a handle 34. The opposite end of the crank-shaft carries a crank-arm 35 to the end of which is pivotally connected the upper end of a connecting rod 36, the lower end of the connecting rod being pivotally connected to the short arm of a bell-crank 37 capable of oscillation about a pin 38 projecting from the cross-brace 29. The free end of the long arm of the bell-crank 37 is pivotally coupled to the upper end of a link 39 whose lower end is pivotally secured to the smooth portion of the stem of a screw-stud 40 carried by a socket 41.

The socket 41 receives and has secured within it the lower end of what constitutes the upper section or extension 42 of the solid piston-rod of the piston of the pump mechanism presently to be referred to, the upper end of said extension 42 operating loosely in a bearing block 43 carried between the ends of the pair of bracket arms 44 depending from the cross-brace 29. The socket 41 likewise receives and has secured thereto the upper end of the lower section 42' of the solid piston-rod, said lower section operating through a stuffing box 45 at the top of the diaphragm-chamber or pump cylinder C.

The section 42' operates almost wholly within the chamber C, being connected at its lower end to the double headed piston of the vacuum pump. This piston has two heads 46, 46' spaced apart by a chamber *a* with which the hollow piston-rod 19 directly communicates. The outer edge of the piston is provided with a ring 47 which serves to secure to the piston the inner edge of a flexible diaphragm 48 (leather or rubber), the outer edge of the diaphragm being secured between the two assembled sections composing the chamber C, the parts being secured together by screws or equivalent manner. The chamber C is secured in proper position to the sockets 49 carried by the frame 28. The diaphragm with the piston 46, 46' thus divide the diaphragm chamber C into two permanent compartments which naturally vary with the reciprocations of the piston.

The top of the upper compartment and bottom of the lower compartment are each provided with (preferably) two exhaust openings *e* normally closed by an outwardly opening disk-valve 50 held down by a spring 51, the springs being housed in the open housings 52, of a form shown in detail in Figs. 14 and 15. Secured to the head 46 on one side of the center of the piston are the ends of a bent wire-spring 53, the securing means being in the form of a stud 54 provided with an outer head 55 having suitable depressions for receiving the thickness of the wire, the stud being headed over the inner face of said head. The arms of the wire spring thus formed, pass on either side of the piston rod 42' (Fig. 5) the ends of the arms at the bend being secured between pairs of clips or lugs 56 formed on the disk intake-valve 57 which normally closes the intake opening *i*. The head 46' is likewise provided with a stud 54' having a securing head 55' for securing the wire arms 53' of the bottom spring, the arms of the latter being bent sufficiently to straddle or pass around the hollow piston-rod 19, the free end of this spring carrying the disk-valve 57' for controlling the intake *i'* of the lower piston head 46' (Figs. 4, 5, 7). It will thus be seen (Fig. 4) that the valve 57 opens upwardly, and the valve 57' opens downwardly, the respective springs 53, 53' tending to keep them normally in a closed position. It may be stated in passing that since the small openings receiving the securing studs 54, 54' in the respective piston heads are opposite the large openings *i* and *i'*, controlled by the valves 57, 57', that access to the studs for purposes of heading them over the inner faces of the heads 46, 46', in which they are mounted, is possible, so that the assembling of the parts becomes comparatively easy. The hollow piston 19 operates in a suitable stuffing box 58 at the bottom of the diaphragm chamber.

The operation will be readily apparent from the description:—As the operator turns the crank 33, the rotation imparted to the crank-arm 35 will rock the bell-crank 37 about its pivotal pin 38, thereby alternately drawing and pushing on the link 39 and thus reciprocating the piston 46, 46' and its attached diaphragm 48. Of course the parts 46, 46', 48, act as a unit or a single piston. With the upstroke of the piston, any air which is present in the chamber C above the piston will be forced out past the exhaust valves 50, the inlet valve 57 closing. In this upward stroke air is drawn through the head 9, leg 8, receptacle R through the bag B, slots or openings *o* of the sleeve 18, hollow piston-rod 19 thence into chamber *a* between the piston-heads 46, 46', the air thus exhausted opening the valve 57' and rushing into the vacuum formed in the chamber C below the piston. With the downstroke of the piston the air below the piston is expelled through the openings normally covered by the lower set of exhaust valves 50, the valve 57' closing. In this downstroke air is sucked in from the head 9 as before, this time rushing into the vacuum formed above the piston, through the opening normally closed by the valve 57 in the head 46, the inrushing air opening said valve (dotted position Fig. 4) when the piston is ready to make the next upward stroke, and so on, air being taken in and expelled with each stroke. The arrangement of the double-heads 46, 46' with the intervening chamber *a*, allows for the incoming air or current to always enter the chamber C through the same end or head of the chamber, namely through the hollow piston rod 19, whatever may be the direction of the stroke of the piston.

The pump while double-acting yet is so designed as to be operated with a least expenditure of effort on the part of the operator. The operator may thus produce the necessary exhaust with one hand, and with the other he may pass the cleaner over the floor, bringing the slotted intake end of the suction-head 9 with any required degree of pressure against the floor. The head 9 may be readily detached as already described, and a hose (not shown) attached to the nipple 14, which temporarily takes the place of the leg 8 as already described. The dust-laden air as it strikes the sloping walls of the bag B causes a deflection and precipitation of the dust toward the bottom of the receptacle R, the filtered air continuing in the course as already described. The formation of the walls of the bag B is obviously such as to permit of ready cleansing of the latter when occasion therefor arises.

The several parts are readily accessible since the machine is so constructed as to be quickly taken apart.

Having described my invention, what I claim is:—

1. In a vacuum cleaner, a dust-receptacle having an intake opening, a terminal head, 5 a perforated tube extending from said head toward said opening and terminating in a disk or plate, a filter bag stretched between the head and disk, a hollow reciprocating piston-rod operating in, and guided by, the 10 perforated tube aforesaid, and means for connecting the piston-rod to a suitable pump for drafting the air through the bag and through the perforated tube.

2. In a vacuum cleaner, a dust-receptacle 15 having an intake opening, a terminal head, a perforated tube extending from said head toward said opening and terminating in a disk or plate of smaller diameter than the head, a filter bag stretched between the head 20 and disk, a hollow reciprocating piston-rod operating in the perforated tube, and means

for connecting the rod to a pump for drafting the air through the bag and through the perforated tube.

3. In a vacuum cleaner, a dust-receptacle 25 having an intake opening, a terminal head, a perforated tube extending from said head to a point opposite the intake-opening and terminating in a circular disk, a filter bag mounted between the head and disk, a hol- 30 low reciprocating piston-rod operating in, and guided by, the perforated tube aforesaid, and means for connecting the piston rod to a suitable pump for drafting the air through the bag and through the perforated 35 tube.

In testimony whereof I affix my signature, in presence of two witnesses.

JNO. S. THURMAN.

Witnesses:

EMIL STAREK,
FANNIE E. WEBER.