No. 825,671. PATENTED JULY 10, 1906.

F. W. MACHLET.

PUMP.

APPLICATION FILED MAR. 30, 1905.

3 SHEETS—SHEET 1.

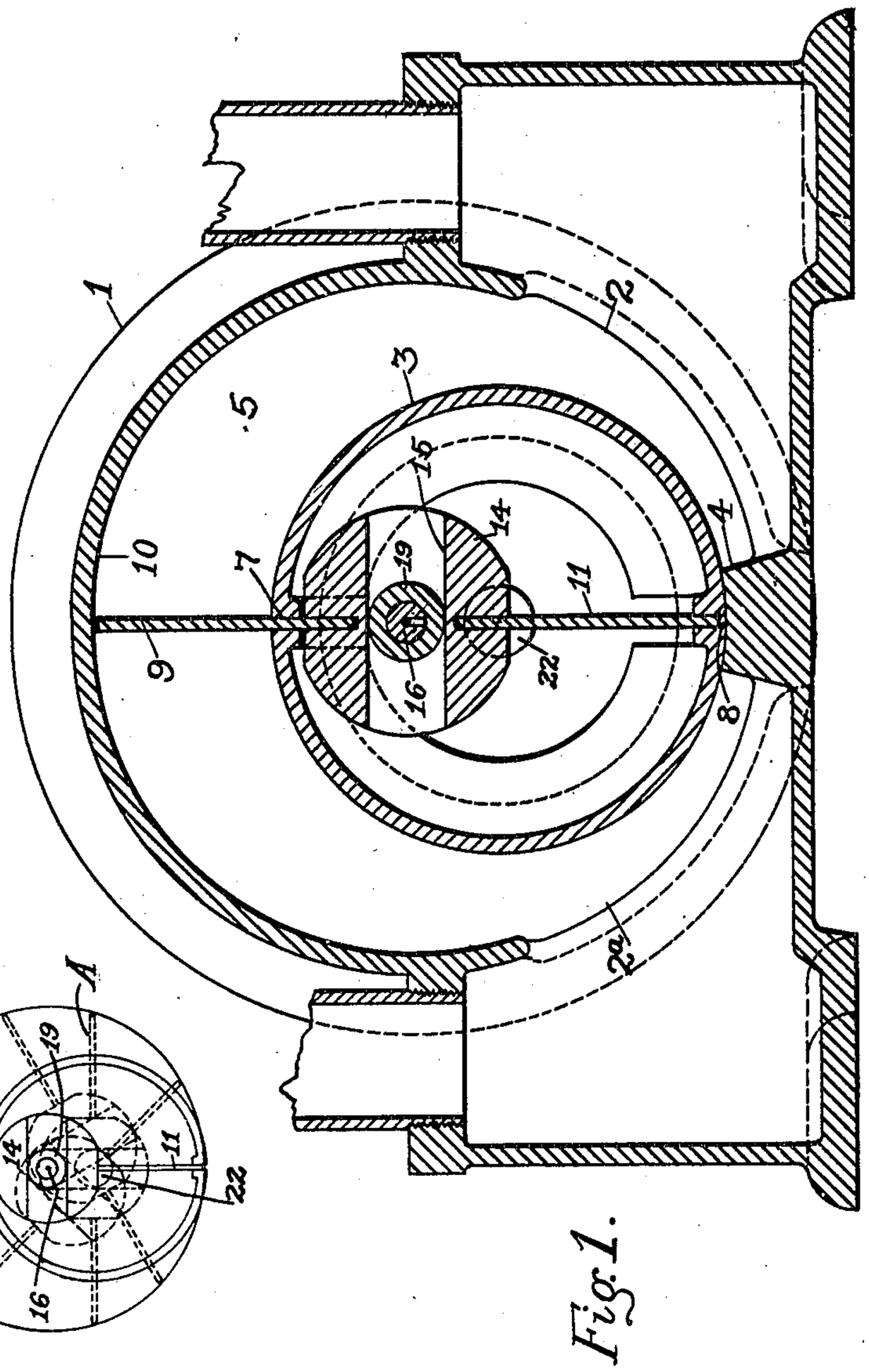

Fig. 1.

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 5.

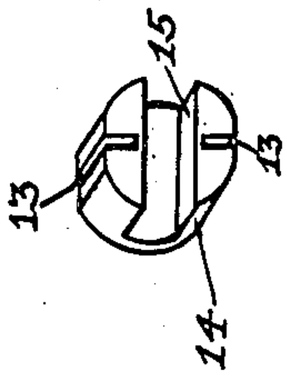


Fig. 6.

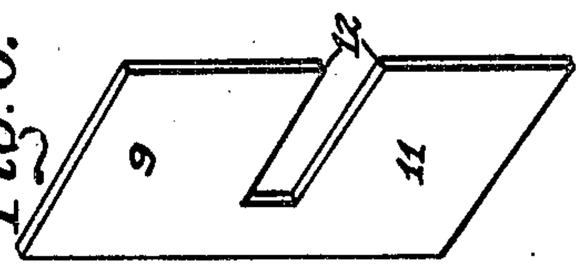


Fig. 3.

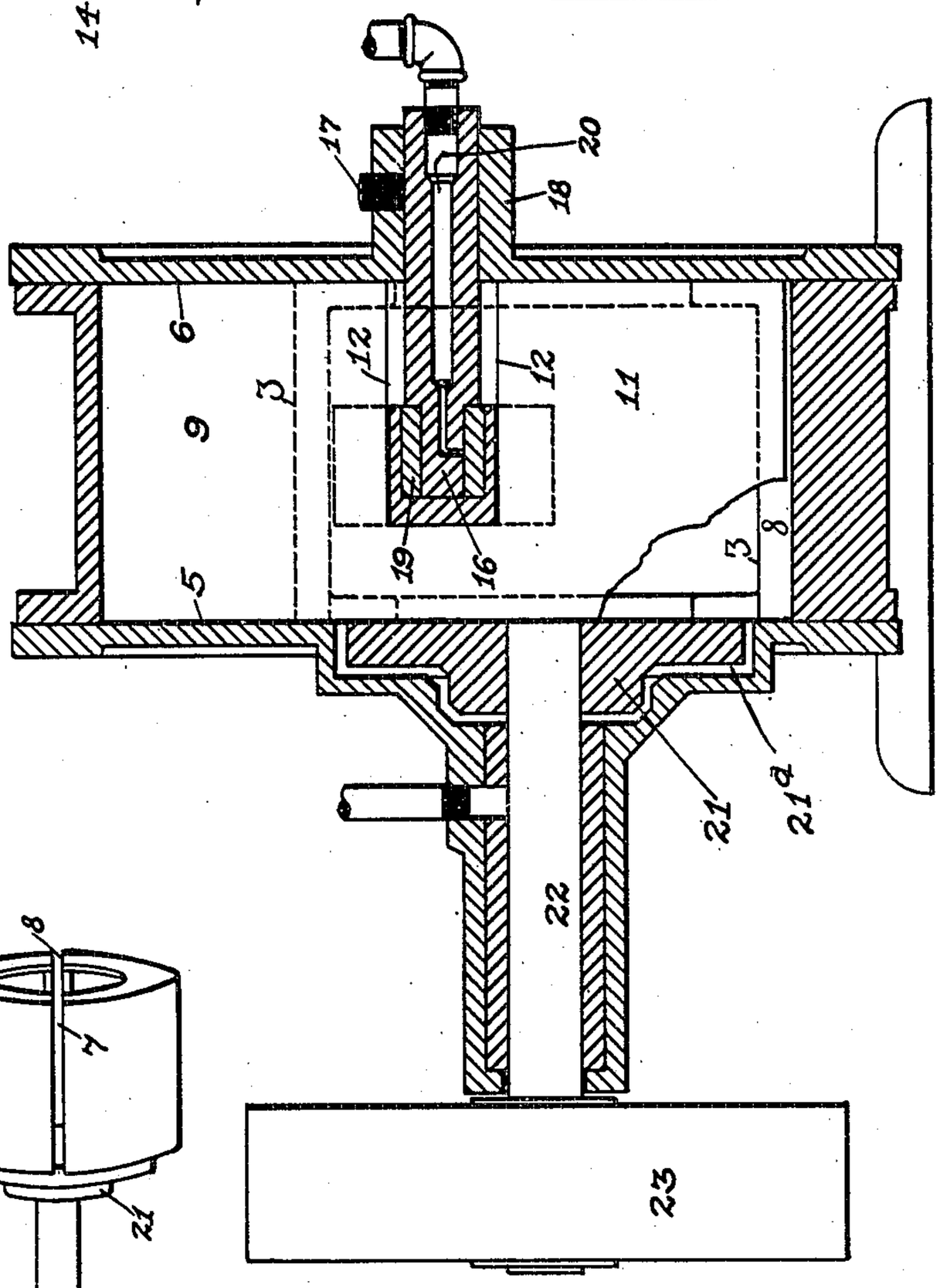
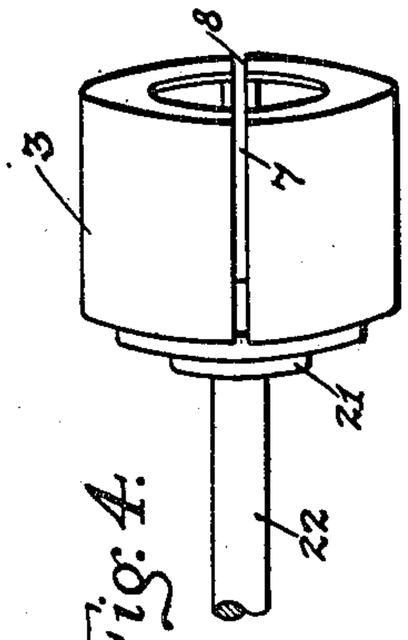


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 9.

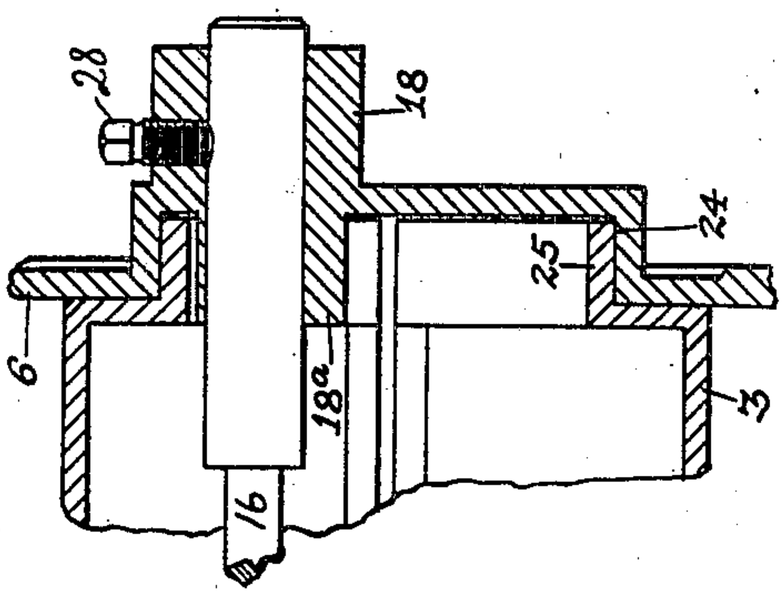

Fig. 7.

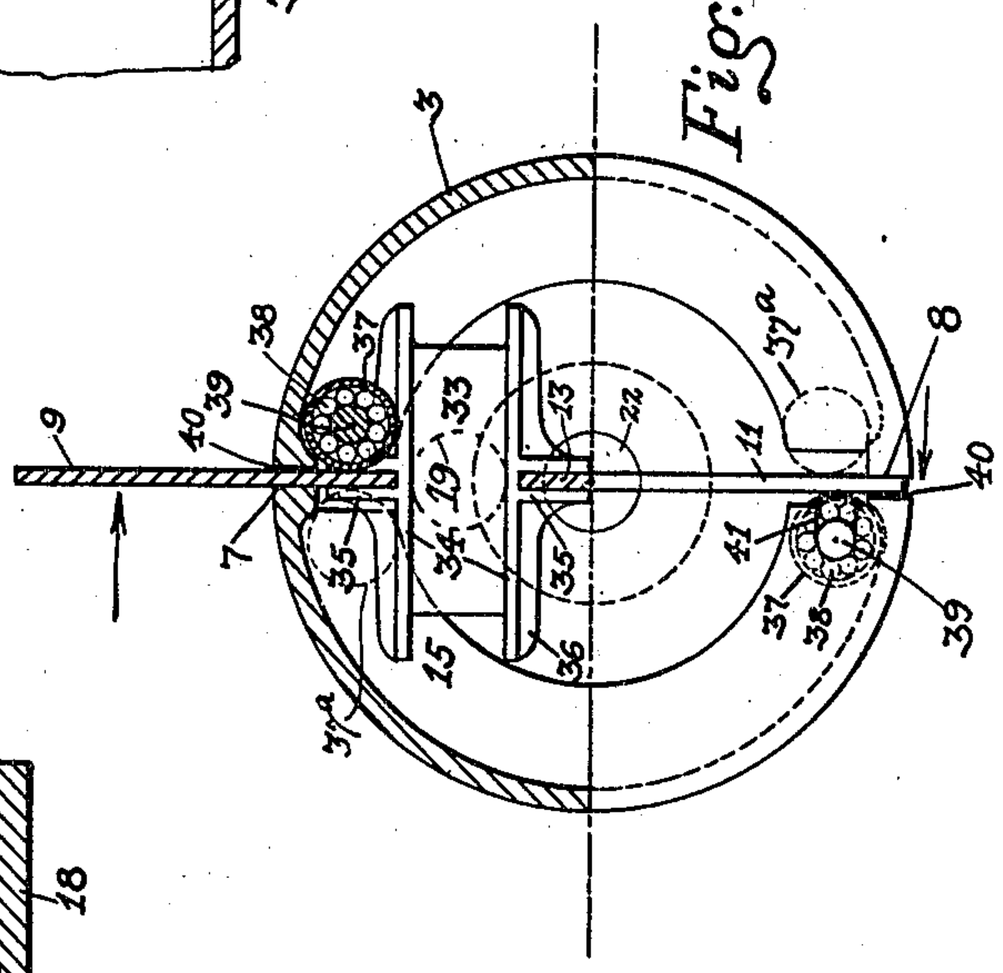

Fig. 8.

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UNITED STATES PATENT OFFICE.

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PUMP.

No. 825,671. Specification of Letters Patent. Patented July 10, 1906.

Application filed March 30, 1905. Serial No. 252,845.

To all whom it may concern:

Be it known that I, FRITZ W. MACHLET, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Pumps, &c., of which the following is a specification.

This invention relates to rotary pumps, blowers, engines, &c., in which a revolving cylinder is mounted eccentrically in a drum and is provided with vanes or pistons, which slide into and out of the cylinder during its revolution.

In the pump or engine illustrated herein there is provided a cylindraceous drum, in which is mounted eccentrically to the drum a cylinder having a pair of vanes or pistons adapted to project alternately from opposite sides of said cylinder during each revolution thereof. A stud projects inwardly from the vertical wall of the drum in such a manner as to control positively all the movements of the vanes relatively to said eccentric cylinder, said stud engaging a hub or shoe provided upon the vanes and having a slot which is perpendicular to the plane of the vanes and which receives said stud. The facewise or revolving movements of the vanes are controlled by said eccentric cylinder, while the radial movements of the vanes relatively to said cylinder, or in and out thereof, are controlled by the slotted hub acting in coöperation with said stud. The inner periphery of the drum is not depended upon to force the vanes inwardly, nor is it necessary to depend upon springs for forcing the vanes outwardly, the radial positions of the vanes being always positively controlled by means within the cylinder and positively connected to the drum. The tips of the vanes may run in light contact or out of contact with the inner periphery of the drum, thus minimizing or avoiding friction at these points. The two vanes being in the form of a single plate or being rigidly connected serve each as bearing for the other—that is to say, the vane-plate extends clear through the cylinder, and sliding bearings, therefore, are provided only at the periphery of the cylinder, and hence the length of the bearing is equal to the diameter of the cylinder. The projection of the vane or vanes from the cylinder may hence be extraordinary in proportion to the diameter of the cylinder, and the machine is rendered exceedingly powerful and efficient for its size. It will be understood that because of the ample depth of bearing within the cylinder the plate may slide freely, notwithstanding the pressure of fluid to which the face of the projecting vane is subjected. The vanes being made in one piece or rigid with each other, it follows that the curve described by their tips is not cylindrical. Still the parts may be so proportioned that the curve described by the vanes is approximately cylindrical, and the drum may readily be shaped to conform to such curve.

The object of my invention is to construct a machine of this class which is highly efficient for its size, to enable the machine to be run at high speed safely and effectively, and generally to produce at low cost a simple type of an engine which shall consist of a few parts, readily and cheaply made, assembled and disassembled, highly durable, and not liable to get out of order.

Other objects and advantages will hereinafter appear.

In the accompanying drawings, Figure 1 is a transverse sectional view of a pump, blower, or engine made in accordance with my invention, one of the vanes being shown fully projected from the eccentric cylinder and the other of said vanes being shown drawn into said cylinder. Fig. 2 is a diagram illustrating different positions assumed by the vanes during a single revolution of the engine. Fig. 3 is a longitudinal central sectional view of the engine. Fig. 4 is a view of the eccentric cylinder, showing the slideway therein for the vane-plate. Fig. 5 is a perspective view of a slotted hub or shoe employed for controlling the radial positions of the vanes. Fig. 6 is a perspective view of a pair of vanes made in one piece. Fig. 7 illustrates the preferred construction of slotted hub or shoe and also shows roller-bearings for receiving the facewise thrust of the vanes or plates that slide in and out of the eccentric cylinder. Fig. 8 is a view of the preferred means of constructing and mounting the eccentric cylinder, the same being shown journaled at both ends to insure steady running and conduce to durability, this form being especially desirable for pumps, blowers, or engines of large dimensions. Fig. 9 illustrates another method of mounting the inner end of the eccentric cylinder.

The drum 1 of the blower or engine is provided with an inlet 2 and an outlet 2^a. Between said inlet and outlet is mounted a revoluble cylinder 3, eccentric to the drum and

serving as a partial partition between the inlet and outlet. Upon its under side it runs in contact with a saddle or other abutment 4, so that movement of fluid between the inlet and outlet can occur only over the top of the cylinder, the latter extending the full length of the drum and fitting closely between the side walls 5 6 thereof.

Mounted in peripheral slots 7 and 8 in the cylinder is a single diametrical plate, one end portion 9 of which is seen at Fig. 1 projecting from the cylinder and extending to the inner periphery 10 of the drum, while the other portion 11 of said plate is drawn into the cylinder, said portions 9 and 11 constituting opposite pistons or vanes, which, however, may be otherwise connected than by forming them in one piece. Said plate of course extends from wall 5 to wall 6 of the drum, as seen at Fig. 3.

The plate is formed with a central rectangular recess 12, the opposite edges of which fits into mortises 13, formed radially in opposite sides of a hub or shoe 14, the construction being such that the hub may be readily slipped onto and off from the plate. Means may be provided for bolting the hub to the plate. The function of the hub is to control the endwise radial position of the vanes, and to this end it is provided with a slot 15, which is perpendicular to the plane of the vanes, as seen clearly at Fig. 1, and extends upon opposite sides of said vanes—that is, said slot is continuous through the recess 12 in the plate 9 11. In engagement with this slot is a stationary stud 16, projecting inwardly from the vertical wall 6 of the drum and preferably secured by a set-screw 17 in a boss 18, formed upon the drum-wall. An antifriction-roller 19 or any other suitable device may be provided between the stud 16 and the member 14. The stud may be provided with a longitudinal feed-opening 20, terminating at said roller, for oil or other lubricant, as seen at Fig. 3. The cylinder 3 has a hub 21, mounted upon a shaft 22, provided with a fly-wheel 23, said hub occupying a cup-like depression or recess 21ª, formed in the head 5.

As the cylinder 3 rotates the vanes 9 11 are carried facewise thereby, while owing to the engagement of the roller-stud 16 with the slotted hub or shoe 14 the tips of the vanes 9 11 are always equidistant from the said stud 16. When the cylinder makes a quarter-turn from the Fig. 1 position, the vanes 9 11 are depressed to a level with the axis 22 of said cylinder, as seen at A, Fig. 2; but the slot 15 is of sufficient length to engage the roller-stud 16 at all times. As the cylinder rotates the vanes move radially in and out relatively thereto, as may be seen at Fig. 2, the radial positions of the vanes relatively to the cylinder being always positively controlled by said stud independently of the inner periphery of the drum 1. The axis or stud 16 is about central of the drum 1; but the latter is cylindraceous, being shaped to conform to the path described by the tips of the vanes 9 11, which path deviates slightly from true circular form.

It will be seen that a very deep bearing for the vane-plate 9 11 is provided, said bearing being about equal in depth to the diameter of the eccentric cylinder 3, and hence binding and undue wear and leakage are avoided. At the same time it is practicable for each vane to project at an extraordinary extent from the cylinder, as seen at Fig. 1, in proportion to the diameter in the latter, the result being that a machine is produced of very great power or efficiency in proportion to its size and cost of construction and operation. The tips of the vanes 9 11 may clear the inner periphery 10 of the drum by a few thousandths of an inch, so that friction at this point may be eliminated without liability of undue leakage, particularly when the machine is used as a blower.

The few parts of which the machine is composed may be cheaply made and readily assembled and disassembled and may run at unusually high speed, owing to the minimizing of friction, while at each revolution there is a gain in the amount of work done, owing to the proportionally large pressure area or projecting portion of the vane.

At Fig. 9 the inner vertical wall 6 of the drum is formed with a bearing 24, upon which rotates a large hub 25, formed upon this end of the cylinder 3, said hub being hollow or open at its end and of sufficient internal diameter to clear a stud-supporting boss 18ª within the drum and forming a continuation of the boss 18. Thus the cylinder is supported at both ends, this being a desirable feature, especially in large sizes of blowers or engines.

At Fig. 8 the stud 16 is fixed upon a radial arm 26, the latter carried by a shaft 27, fixed upon a set-screw 28 in hub 18. The shaft 27 is concentric with the shaft 22 of the cylinder 3, and the latter has a head 29, secured by screws 30 and provided with a hub 31 to turn upon the inner end of said fixed shaft 27. Said head 29 incloses said arm 26 and is provided with a recess 32 to receive the latter.

At Fig. 7 another form of hub or shoe for the vane-plate is shown, and it is substantially the same as that at Fig. 5 except that superfluous metal is cut away. This form of hub or shoe comprises a main plate-like member 33, having a pair of flanges 34, which form the walls of the slot 15. Said flanges are formed with angled members 35, having mortises 13 to receive the edges of the vane-plate 9 11. Ribs 36 extend from the flanges 34 to the angled members 35 to stiffen the shoe, which, it will be seen, is very light and strong.

At Fig. 7 the direction of the thrust or fluid pressure upon the faces of the vanes is indi-

cated by arrows, and it will be seen that said thrust is taken by roller-bearings consisting of cylinders 37, mounted upon rolls 38, the latter running upon shafts 39, extending longitudinally of the cylinder. Slight clearances 40 are formed in the slots 7 8 in the cylinder upon the sides adjoining the roller-bearings, so that the pressure of the vanes may be taken by rollers and not by the wall of the slots. This provision of roller-bearings enables the movement of the plate relatively to the cylinder to be almost without friction. This not only increases the power and reduces wear, but also enables the machine to run at considerably higher speed than if the rollers were omitted, particularly in the case of large blowers. The shafts 39 each extend from end of the cylinder and are detachably mounted in opposite slots or bearings 41, formed in the ends of the cylinder. Opposing cylinders 37ª may also be provided for the vanes, so that the pump may run either forwardly or backwardly.

Variations may be resorted to within the scope of my invention, and portions of my improvements may be used without others.

Having thus described my invention, I claim—

1. A pump or engine comprising a cylindraceous drum provided with heads and having an inlet and an outlet, a cylinder having a head and revoluble within said drum and eccentric thereto and fitting closely between the heads thereof and mounted between said inlet and outlet, said cylinder having opposite radial slots in its periphery and in its head, vanes or pistons rigid with each other and mounted to slide in said slots in and out of opposite sides of the periphery of said cylinder, a guiding-shoe fixed to said vanes within said cylinder and having a slot transverse to the plane of said vanes, and a stationary bearing eccentric to said cylinder and within the slot of said shoe, said drum shaped to conform to the curve described by said vanes; the side edges of said vanes flush with the exterior surfaces of the ends of said cylinder and fitting closely between said drumheads one of the latter having a depression, and said cylinder-head having a hub portion occupying said depression.

2. A pump or engine comprising a cylindraceous drum provided with heads and having an inlet and an outlet, a cylinder revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, a pair of vanes mounted to slide radially in and out of opposite sides of said cylinder, a guiding-shoe fixed to said vanes within said cylinder and having a slot vertical to the plane of said vanes, and a stationary stud or bearing member eccentric to said cylinder and extending within said slot; said drum shaped to conform to the curve described by said vanes, both said vanes and the ends of said cylinder fitting closely between said drumheads; said cylinder having peripheral slots each open at both ends of the cylinder to receive said vanes and the latter projecting about equally at each end from said shoe.

3. A pump or engine comprising a cylindraceous drum provided with heads and having an inlet and an outlet, a cylinder having a pair of heads and revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, the heads of said cylinder fitting closely between the heads of said drum, one of said cylinder-heads provided with a hub of relatively small diameter, a head of said drum recessed to receive said hub, a pair of connected vanes mounted to slide in and out of the periphery of said cylinder, radial slots for said vanes in both the periphery and the heads of said cylinder, a guiding-shoe fixed to said vanes within said head and having a slot transverse to the plane of said vanes, and a stationary bearing member eccentric to said cylinder and extending within said slot; said drum shaped to conform to the curve described by said vanes, and the side edges of said vanes flush with the exterior surfaces of the heads of said cylinder and fitting closely between said drumheads; the drumhead opposite said hub being centrally recessed to clear said eccentric stationary bearing member.

4. A pump or engine comprising a drum having an inlet and an outlet, a cylinder revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, vanes rigid with each other and mounted to slide in and out of opposite sides of the periphery of said cylinder, a guiding-shoe fixed to said vanes within said cylinder and having a slot transverse to the plane of said vanes, an inwardly-extending stud engaging said slot about centrally of said drum, a supporting-arm rigid with said stud, and a shaft carrying said arm and rigid therewith and fixed in said drum concentrically with said cylinder, the latter having a bearing upon said fixed shaft outside of said arm.

5. A pump or engine comprising a drum having an inlet and an outlet, a cylinder revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, vanes in the form of a single plate and mounted to slide in and out of opposite sides of the periphery of said cylinder, a guiding-shoe fixed to said vanes within said cylinder and having a slot perpendicular to the plane of said plate, an inwardly-extending stud engaging said slot about centrally of said drum, a supporting-arm rigid with said stud, a shaft carrying said arm and rigid therewith and fixed in said drum concentrically with said cylinder, and a head secured to the end of said cylinder and having a hub journaled on said fixed

shaft, and also having a recess to receive said arm; said drum shaped to conform to the curve described by the tips of said vanes.

6. A pump or engine comprising a cylindraceous drum having end walls and also having an inlet and an outlet, a hollow cylinder revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, a hub for said cylinder, one of said end walls having a recess to receive said hub, and the face of the latter being flush with said end wall, a shaft fixed to said hub, a pair of vanes in the form of a single rectangular plate fitting in said drum and mounted to slide radially in and out of opposite sides of said cylinder, the latter having openings extending from end to end and from side to side to receive said plate, and having peripheral bearings for said plate, the latter having a central recess in one side edge, a shoe having slots which fit upon the opposite edges of said plate at said recess, said shoe also having within said recess a slot perpendicular to the plane of the plate and extending upon opposite sides thereof, and a stud projecting inwardly from the other end wall of said drum about centrally thereof and having means to engage said perpendicular slot; said drum shaped to conform to the curve described by the tips of said plate.

7. A pump or engine comprising a cylindraceous drum having an inlet and an outlet, a cylinder revoluble within said drum and eccentric thereto and mounted between said inlet and outlet, a vane-plate carried by said cylinder and mounted to slide diametrically thereof and having a central recess in one side edge a hub or shoe upon said plate and having within said recess a slot perpendicular to the plate and extending upon opposite sides thereof, and a stationary bearing projecting inwardly from the wall of said drum about centrally thereof and engaging said slot; said drum shaped to conform to the curve described by the tips of said plate; and said hub or shoe comprising a main plate-like member having a pair of flanges which form the walls of said slot, said flanges formed with angle members having mortises to receive the edges of said vane-plate at said recess.

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PHILIP C. OSTERMAN.