No. 815,522. PATENTED MAR. 20, 1906.

E. M. FRASER.

ROTARY PUMP AND MOTOR.

APPLICATION FILED SEPT. 7, 1904.

2 SHEETS—SHEET 1.

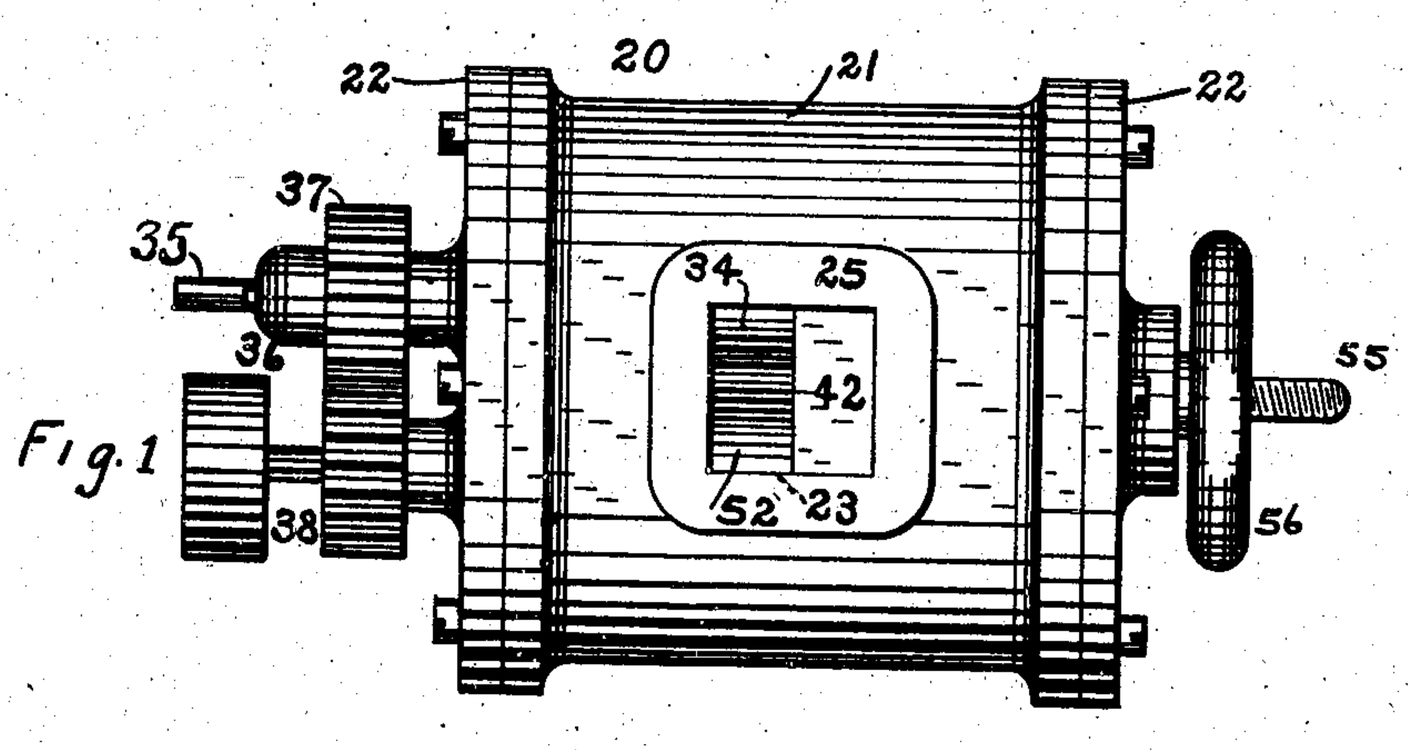

Fig. 1

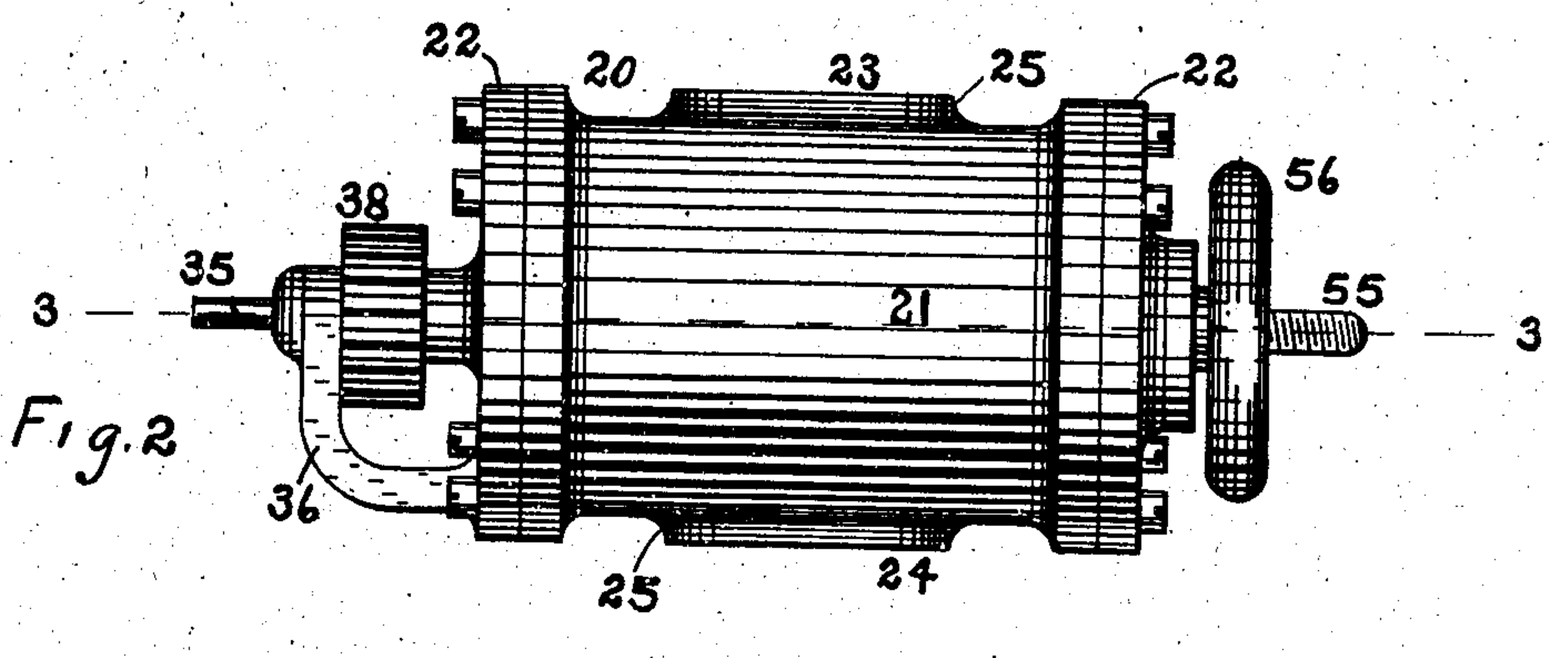

Fig. 2

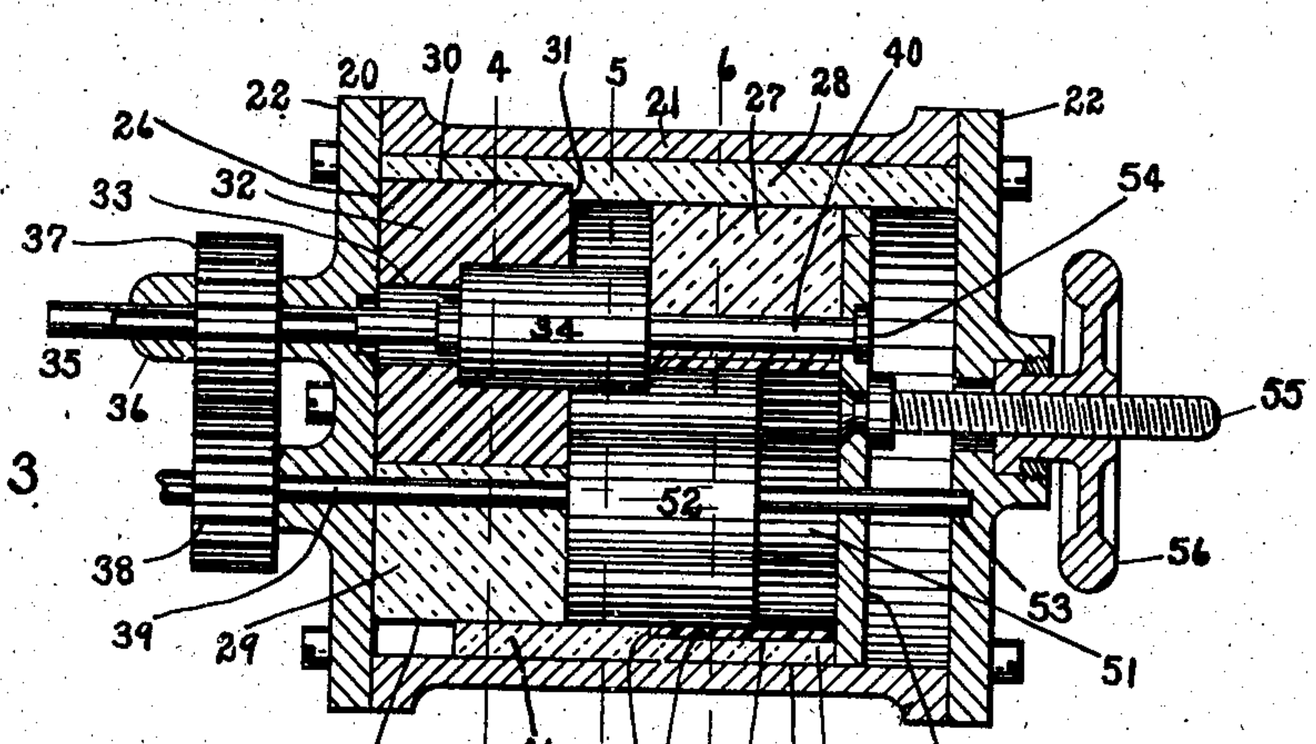

Fig. 3

WITNESSES:

Arthur Marion.

Herman Gustow.

INVENTOR

Ethelbert M. Fraser

BY

Chas. C. Gill

ATTORNEY

No. 815,522. PATENTED MAR. 20, 1906.

E. M. FRASER.

ROTARY PUMP AND MOTOR.

APPLICATION FILED SEPT. 7, 1904.

2 SHEETS—SHEET 2.

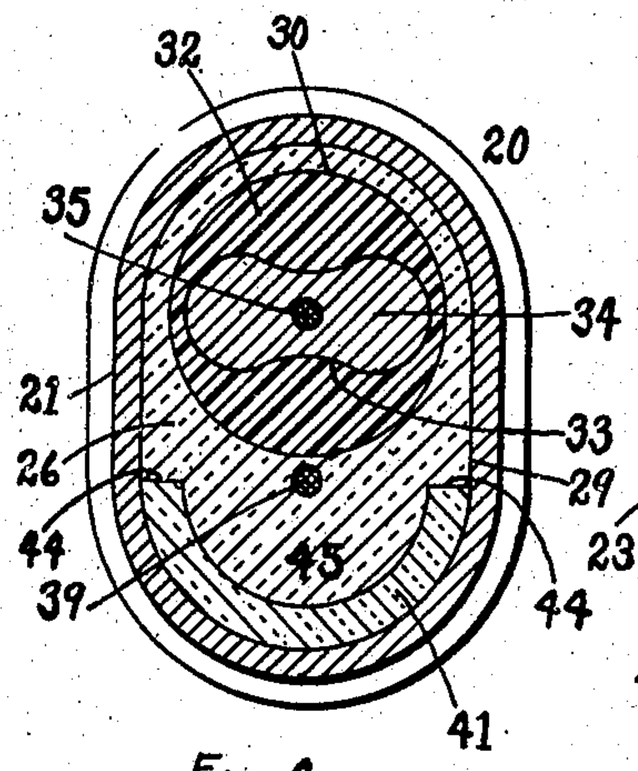

Fig. 4

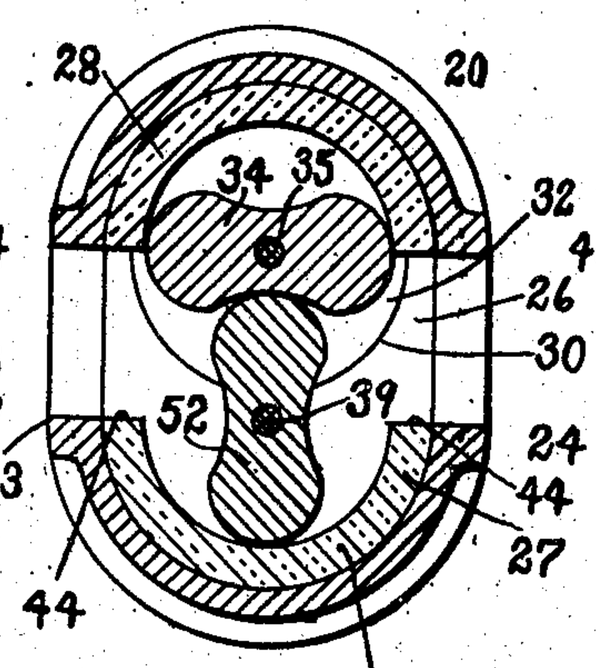

Fig. 5

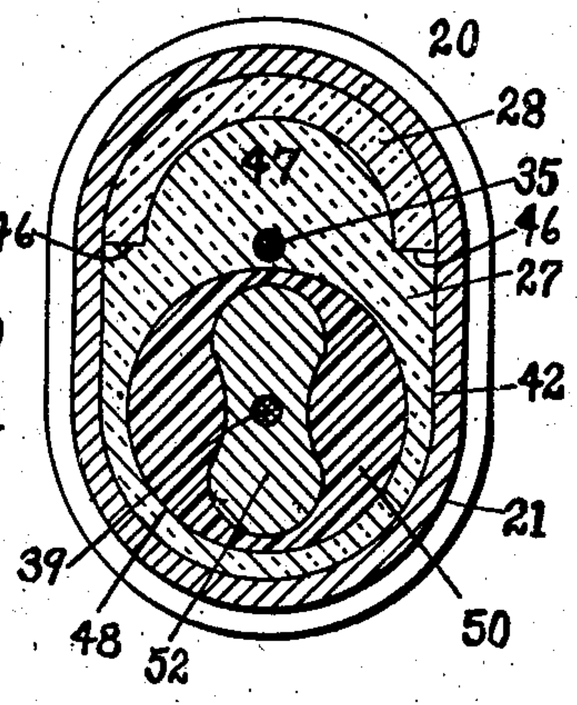

Fig. 6

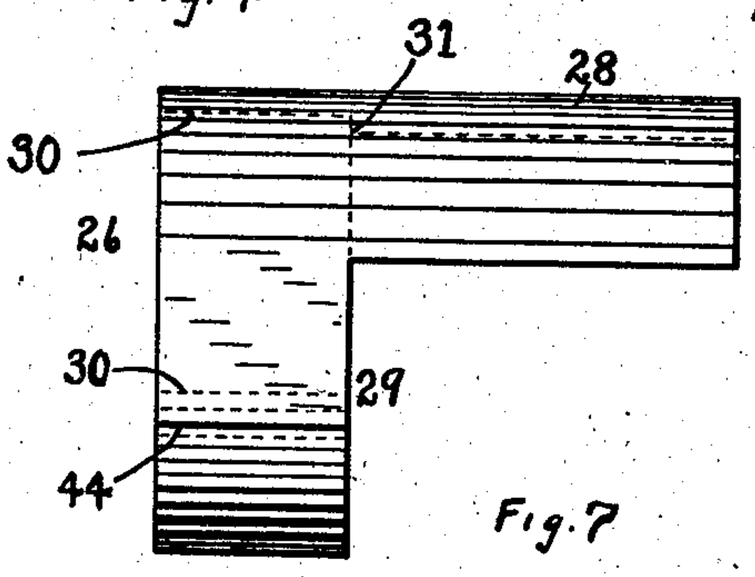

Fig. 7

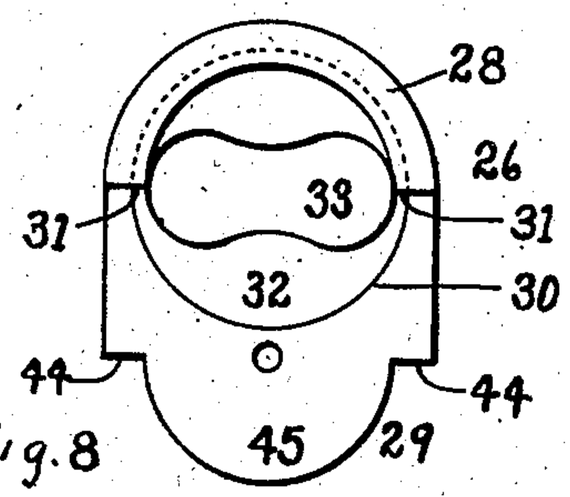

Fig. 8

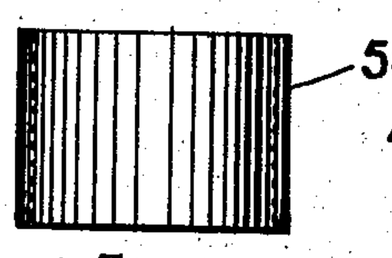

Fig. 12

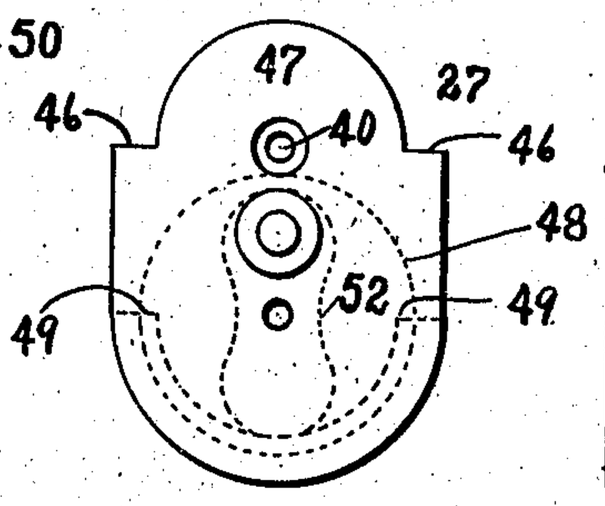

Fig. 10

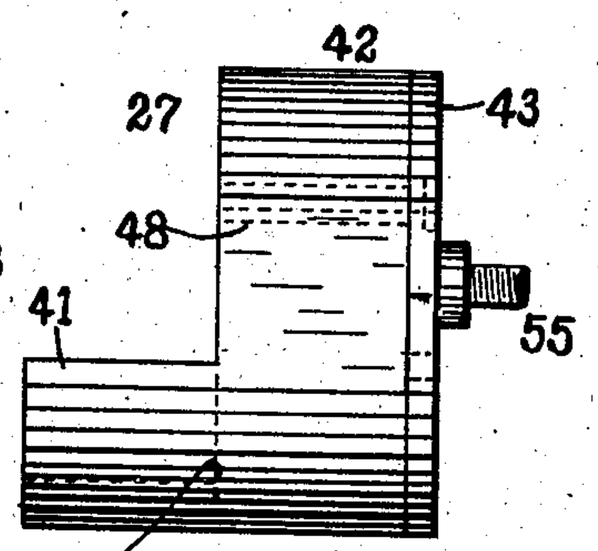

Fig. 9

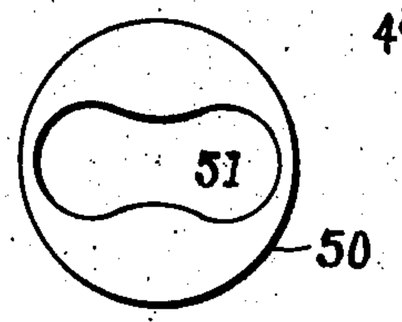

Fig. 11

WITNESSES:

Arthur Marion.

Herman Gustow

INVENTOR

Ethelbert M. Fraser.

BY

Chas. C. Gill

ATTORNEY

UNITED STATES PATENT OFFICE.

ETHELBERT M. FRASER, OF YONKERS, NEW YORK, ASSIGNOR TO FRASER HYDRAULIC COMPENSATOR COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

ROTARY PUMP AND MOTOR.

No. 815,522. Specification of Letters Patent. Patented March 20, 1906.

Application filed September 7, 1904. Serial No. 223,599.

To all whom it may concern:

Be it known that I, ETHELBERT M. FRASER, a citizen of Canada, and a resident of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Rotary Pumps and Motors, of which the following is a specification.

The invention relates to improvements in rotary motors and pumps; and it consists in the novel features, arrangement, and combinations of parts hereinafter described, and particularly pointed out in the claims.

The object of the invention is to provide a novel construction of rotary pump or motor the capacity of which may be readily varied from nothing to the maximum at will, the special feature of advantage accomplished by my invention being that it does permit in rotary pumps and motors the variation of the capacity of the same in a positive and convenient manner and by means under the control of the attendant.

My invention pertains more particularly to the classes of pumps and motors employing two rotary impellers secured within a casing upon parallel shafts geared together, said casing having supply and discharge ports or connections. The impellers in these classes of pumps and motors, while performing like duties, vary in their form and construction, some of said impellers being, for illustration, of cycloidal outline and others in the form of gear-wheels of comparatively large pitch rotating in close contact within the casing.

The present invention is not limited to the employment of any special outline of impellers, but comprises, with the novel features hereinafter referred to, impellers of any suitable or desirable outline, the main consideration being that there shall be two coöperating impellers capable of rotating in proper relation to each other intermediate the supply and discharge. In presenting my invention herein I illustrate impellers of the cycloidal outline or type, this being the form that I prefer, without in any manner meaning to limit my invention to the employment of any special type of impellers, the term "impellers" being used in this specification in a generic sense.

In rotary pumps it is sometimes necessary and desirable to change the capacity or volume of the pump and also to cease pumping entirely while the pump is running at full speed, and these results are conveniently permitted by my invention. Rotary motors as heretofore constructed require a fixed quantity of water at the normal pressure whether running free or fully loaded and are not efficient unless operated under full load, and in accordance with my invention the fluid consumed by the motor is proportioned to the work done.

I designate my invention as an improvement in rotary pumps and motors, because the apparatus presented as embodying said invention is adapted for use either as a pump or motor at will.

In carrying out my invention I provide within the exterior casing having the parallel shafts and impellers thereon a stationary frame containing a rotary cylindrical envelop for one of the impellers to slide into and from to such extent as may be desired and a movable frame containing a rotary cylindrical envelop for the other impeller and to slide upon and from the same to such extent as may be desired, said movable frame being provided with means for causing it to travel directly toward and from the said stationary frame and the shaft of the impeller engaged by the cylindrical envelop of the stationary frame being connected with the movable frame and capable of sliding through its gear-wheel, while the shaft of the other impeller has no sliding movement, but permits the said movable frame to carry its cylindrical envelop upon and from said impeller to such extent as may be requisite. When the said movable frame is moved toward the said stationary frame, its cylindrical envelop will slide upon and cover a portion (or all, if desired) of its impeller, and at the same time and in the same proportion the impeller of the stationary frame will be pushed into and covered by its cylindrical envelop, it being my purpose that only so much of said impellers shall be exposed beyond their respective envelops as may be necessary for the volume of water to be pumped or the work to be performed. When the movable frame is moved inwardly to its full extent, its envelop will entirely cover its impeller, and it will push the other impeller fully into the envelop for the latter, and then while the parts of the apparatus may be run at full speed the impellers

will not, though rotating with their envelops, perform any duty, no liquid at such time entering or leaving the apparatus. When the said movable frame is drawn outwardly, it will gradually withdraw the impeller of the stationary frame from its cylindrical envelop and in the same proportion cause the other impeller to be uncovered, whereby the impellers are brought into coöperative relation to each other and only so much of their extent is exposed as may be required in the performance of the duty demanded of them—that is to say, only so much of said impellers is exposed as may be requisite for pumping or consuming, as the case may be, the required volume of water.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a plan veiw of a pump or motor embodying my invention. Fig. 2 is a side view of same. Fig. 3 is a horizontal section of same on the dotted line 3 3 of Fig. 2. Fig. 4 is a vertical transverse section of same on the dotted line 4 4 of Fig. 3. Fig. 5 is a like section of same on the dotted line 5 5 of Fig. 3. Fig. 6 is a like section of same on the dotted line 6 6 of Fig. 3. Fig. 7 is a detached side elevation of the aforesaid stationary frame. Fig. 8 is an end view of same, taken from the right-hand end of Fig. 7. Fig. 9 is a detached side elevation of the aforesaid movable frame. Fig. 10 is an end view of same, taken from the right-hand end of Fig. 9. Fig. 11 is a detached end view of one of the rotary cylindrical envelops for the impellers, and Fig. 12 is a top view of same.

In the drawings, 20 designates the exterior casing, comprising, preferably, an approximately elliptical body 21 and heads 22, said body 21 having ports or openings 23 24 at opposite sides for the supply and discharge of the liquid, said openings being surrounded by flanges 25, Figs. 1 and 2, for the convenient application to said body of the usual pipe connections.

Within the casing 20 are applied the stationary frame 26, Figs. 3, 7, and 8, and movable frame 27, as shown in Figs. 3, 9, and 10. The stationary frame 26, looking at Fig. 3, is applied within the left-hand end of the casing 20 and comprises a semicircular longitudinal portion 28 and a stationary elliptical transverse portion 29, (shown in detail in Figs. 7 and 8,) the said portion 28 extending the full distance between the heads 22, as shown in Fig. 3, and the transverse portion 29 abutting against the left-hand head 22 and containing a longitudinal circular opening or aperture 30, which at one edge extends outwardly beyond the inner wall of the semicircular portion 28, whereby the shoulder 31 is formed at the inner edge of about one-half of the circumference of said aperture, as indicated more clearly in Fig. 6. Within the opening or aperture 30 is placed the rotary envelop 32, which is in the form of a cylinder freely filling the said opening or aperture 30 and at its inner edge abutting against the said shoulder 31, which prevents said envelop from being moved outwardly toward the right, looking at Fig. 3, from said aperture. The rotary cylindrical envelop 32 contains the longitudinal opening 33, Figs. 3, 4, and 8, which snugly receives the movable impeller 34, the latter conforming in outline to said opening 33 and being capable of having a longitudinal sliding movement therein. The opening 33 in the envelop 32 will preferably be of sufficient length to fully inclose the said impeller 34, so that when desired the entire impeller 34 may be concealed within the rotary cylindrical envelop 32. The envelop 32 is adapted to rotate within the aperture or opening 30 in the stationary frame 26, but has no sliding movement therein, and the said envelop 32 has its rotary motion imparted to it by the impeller 34. The impeller 34 is secured upon a shaft 35, whose left-hand portion extends through the left-hand head 22, Fig. 3, and has feathered upon it between said head 22 and a supporting-arm 36 a gear-wheel 37, which is in constant mesh with the corresponding gear-wheel 38, secured upon the shaft 39, said shafts 35 39 being parallel with each other, as shown.

The right-hand end of the shaft 35 is connected with the movable frame 27 and while capable of rotation within an aperture 40 in said frame is compelled to follow said frame 27 in the movement of the latter, as hereinafter explained, while the shaft 39 is capable of rotation, but at no time has any longitudinal movement imparted to it.

The frame 27 comprises a longitudinal semicircular portion 41 and a transverse substantially elliptical portion 42, the outer end of the latter having a cap-plate 43 applied thereto. The inner longitudinal edges of the semicircular portion 41 are adapted to the shoulders 44, formed on the stationary frame 26, and slide against and guide upon said shoulders, that portion of the said stationary frame 26 located between the shoulders 44 and designated by the numeral 45, Fig. 8, fitting within the said semicircular portion 41 of the movable frame 27. The inner longitudinal edges of the semicircular portion 28 of the stationary frame 26 are adapted to the shoulders 46, formed on the movable frame 27, and that portion of said frame 27 intermediate said shoulders 46 and designated by the numeral 47, Fig. 10, fits within and guides upon the inner surfaces of the said semicircular portion 28 of the stationary frame 26. It will thus be seen that the frames 26 27 coöperate with each other and that the movable frame 27 during its longitudinal movement guides upon said stationary frame 26.

Within the transverse portion 42 of the movable frame is provided an opening or aperture 48, corresponding with the opening or aperture 30 in the frame 26, and the said aperture 48 extends outwardly at one edge beyond the inner surfaces of the semicircular portion 41, whereby the shoulder 49 is formed along about one-half of the circumference of said opening or aperture 48, as indicated by the dotted lines in Fig. 10. Within the opening 48 is placed prior to the application of the cap-plate 43 the rotary cylindrical envelop 50, corresponding with the envelop 32 in the aforesaid opening 30 of the frame 26. The envelop 50 is confined at one end by the plate 43 and at the other end by the shoulder 49, and the said envelop 50 contains a longitudinal opening 51, Fig. 11, for the impeller 52, which is secured upon the shaft 39 and conforms in outline to the interior outlines of the said opening 51. The impeller 52 corresponds also in outline with the impeller 34 and coöperates therewith, as illustrated in Figs. 3 and 5. The impeller 54 may rotate with the shaft 39, but is otherwise stationary, the movement of the frame 27 having no effect upon it except to expose more or less of its inner end correspondingly with the exposure of the inner end of the impeller 34. The shaft 39 extends through a bearing-aperture in the plate 43 and is seated within a bearing 53, formed in the right-hand head 22, as shown in Fig. 3.

The shaft 35 at its right-hand end, looking at Fig. 3, is provided with a head 54, which is seated within a recess in the plate 43 and by reason of which the said shaft 35 is compelled to follow any outward movement toward the right of the movable frame 27, and at its left-hand edge the transverse portion 42 of said frame 27 is in close relation to the right-hand end of the impeller 34, by reason whereof said impeller and shaft 35 will be compelled to move correspondingly with the said frame 27 during any inward movement of the latter toward the left.

The frame 27 has secured to its outer end a screw 55, which extends through the right-hand head 22 and has applied upon it a hand-wheel 56, the latter being swiveled to the said head 22, so as to be capable of rotation upon the screw 55 without losing its relation to the said head. The screw 55 and wheel 56 comprise the means for moving the frame 27 longitudinally, and it is obvious that by the rotation of the wheel 56 in one direction the screw 55 and frame 27 will be caused to approach the stationary frame 26 and that when the said wheel is turned in the opposite direction the said screw and frame 27 will be caused to recede outwardly from the said stationary frame 26. I do not, of course, limit the invention to any special means for moving the frame 27 toward and from the frame 26, since it is obvious that various mechanical appliances well known in the arts may be employed in lieu of the said screw and wheel.

The purpose of the movable frame 27 is to expose more or less of the inner end of the impeller 52 and cause the exposure of more or less of the inner end of the impeller 34. When the movable frame 27 is in the position in which it is shown in Fig. 3, about one-half of the impellers 34 52 are exposed for coöperative action, and when the frame 27 is in its extreme outer position toward the right the maximum surfaces of the impellers 34 52 will be exposed, while when the frame 27 is at its extreme inward position in close relation to the frame 26 the impeller 34 will be concealed within its rotary cylindrical envelop 32 and the impeller 52 will be concealed within its rotary cylindrical envelop 50, and at such time the shafts 35 39 may continue in motion with the impellers and their rotary cylindrical envelops; but no work will be performed, because the impellers will then be concealed and the opposite sides of the portion 42 of the movable frame 27 will close the openings 23 24 against the passage of the liquid through the casing 20, said portion 42 then acting as a valve to entirely close said openings 23 24. In other positions of the frame 27 during its movement toward and from the frame 26 the said frame 27 acts as a valve to more or less open or close the said openings 23 24. During the movement of the frame 27 from the frame 26 it withdraws the impeller 34 toward the right from the envelop 32, and at the same time the said frame 27 withdraws its envelop 50 off from the impeller 52 in the same proportion that it withdraws the impeller 34 from the envelop 32, thus correspondingly exposing the inner end portions of the impellers and placing the exposed portion of the impeller 34 into coöperation with the exposed portion of the impeller 52. When the apparatus described is to be used as a pump, it is obvious that the capacity or volume of the pump may be changed at will by simply varying the position of the movable frame 27 in relation to the stationary frame 26 and also that the operation of pumping may be stopped entirely by the movement of the frame 27 close up to the frame 26 without checking the movement of the gear-wheels 37 38 and shafts 35 39.

When the apparatus described is to be used as a motor, the liquid consumed may be proportioned to the work to be done by simply adjusting the position of the movable frame 27 with relation to the frame 26, whereby more or less of the impellers 34 52 are exposed and brought into coöperative action for duty.

I have illustrated the rotary envelops 32 50 as sufficiently thick to completely house within them the impellers 34 52; but I desire it understood that my invention is not limited to envelops of this particular thickness,

since it is the facing walls of said envelops that define the passage through the pump or motor, and it is obviously immaterial whether there is solid metal or simply space outwardly beyond these walls so long as the openings in the walls permit the impellers to be more or less concealed by passing into or from them.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus of the character described, the impellers, and the parallel shafts for said impellers, combined with a rotary envelop having an opening to receive more or less of one of said impellers, a rotary envelop having an opening to receive more or less of the other one of said impellers, and means for effecting the exposure to a greater or less extent of the inner ends of said impellers and of placing said ends of said impellers into coöperative relation to each other; substantially as set forth.

2. In an apparatus of the character described, the impellers, and the parallel shafts for said impellers, combined with a frame having an opening therein, a rotary envelop fitting said opening in said frame and containing an opening to receive more or less of one of said impellers, a movable frame containing an opening, a rotary envelop fitting the opening in said movable frame and having an opening in it to receive more or less of the other one of said impellers, means connecting said movable frame to the shaft of the impeller of the first-mentioned frame, and means for moving said movable frame toward and from the other frame, whereby one of said impellers may be more or less forced into or withdrawn from its rotary envelop and the envelop carried by said movable frame is caused to more or less conceal or expose its impeller and the adjacent ends of said impellers are brought into coöperative relation to each other; substantially as set forth.

3. In an apparatus of the character described, the impellers, and the parallel shafts for said impellers, combined with a stationary frame having an opening therein, a rotary envelop fitting said opening in said frame and containing an opening to receive more or less of one of said impellers, a movable frame containing an opening, a rotary envelop fitting the opening in said movable frame and having an opening in it to receive more or less of the other of said impellers, means connecting said movable frame to the shaft of the impeller of the stationary frame, and means for moving said movable frame toward and from said stationary frame, whereby one of said impellers may be more or less forced into or withdrawn from its rotary envelop and the envelop carried by said movable frame is caused to more or less conceal or expose its impeller and the adjacent ends of said impellers are brought into cooperative relation to each other; substantially as set forth.

4. In an apparatus of the character described, the impellers, and the parallel shafts for said impellers, combined with a frame 26 having the longitudinal semicircular portion 28 and transverse portion 29 containing the opening 30 and having guide-shoulders 44, the rotary envelop within said opening 30 and containing an opening to receive one of said impellers, the frame 27 having the longitudinal semicircular portion 41 and transverse portion 42 containing the opening 48 and having the guide-shoulders 46, the rotary envelop within said opening 48 and having an opening 51 to receive the other one of said impellers, means connecting said frame 27 with the shaft of the impeller of the frame 26, and means for moving said frame 27 toward and from said frame 26, whereby one of said impellers may be more or less forced into or withdrawn from the envelop of the frame 26 and the envelop carried by said frame 27 may be caused to more or less conceal or expose its impeller and the adjacent ends of said impellers brought into coöperative relation to each other, the edges of the longitudinal portion 41 of the frame 27 guiding on the shoulders 44 of the frame 26 and the shoulders 46 of the frame 27 being adapted to guide on the edges of the longitudinal portion 28 of the frame 26; substantially as set forth.

Signed at New York city, in the county of New York and State of New York, this 6th day of September, A. D. 1904.

ETHELBERT M. FRASER.

Witnesses:

CHAS. C. GILL,

ARTHUR MARION.