E. ROBERTS.

ROTARY PUMP.

APPLICATION FILED AUG. 26, 1916.

1,279,913.

Patented Sept. 24, 1918.

4 SHEETS—SHEET 1.

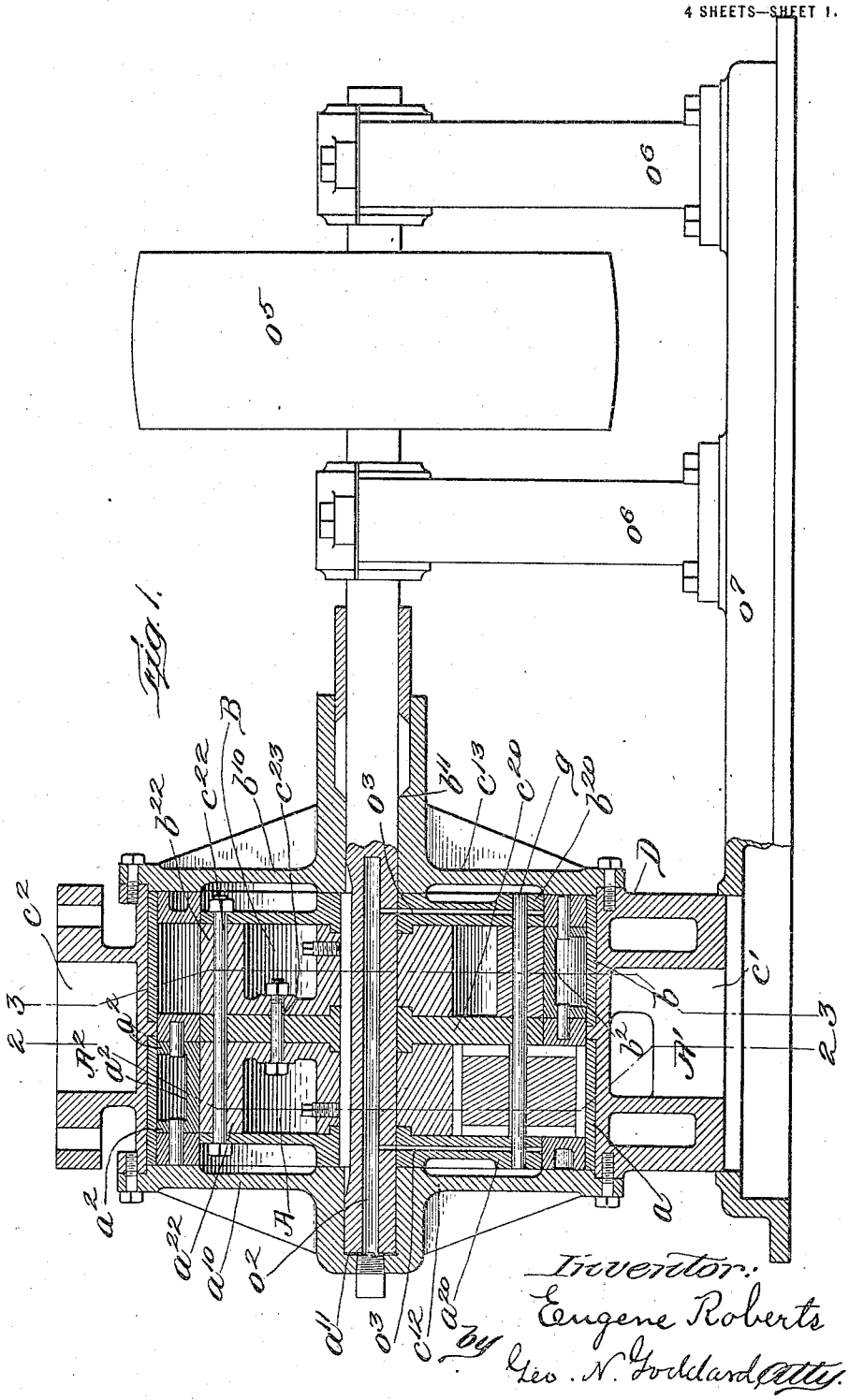


Fig. 1.

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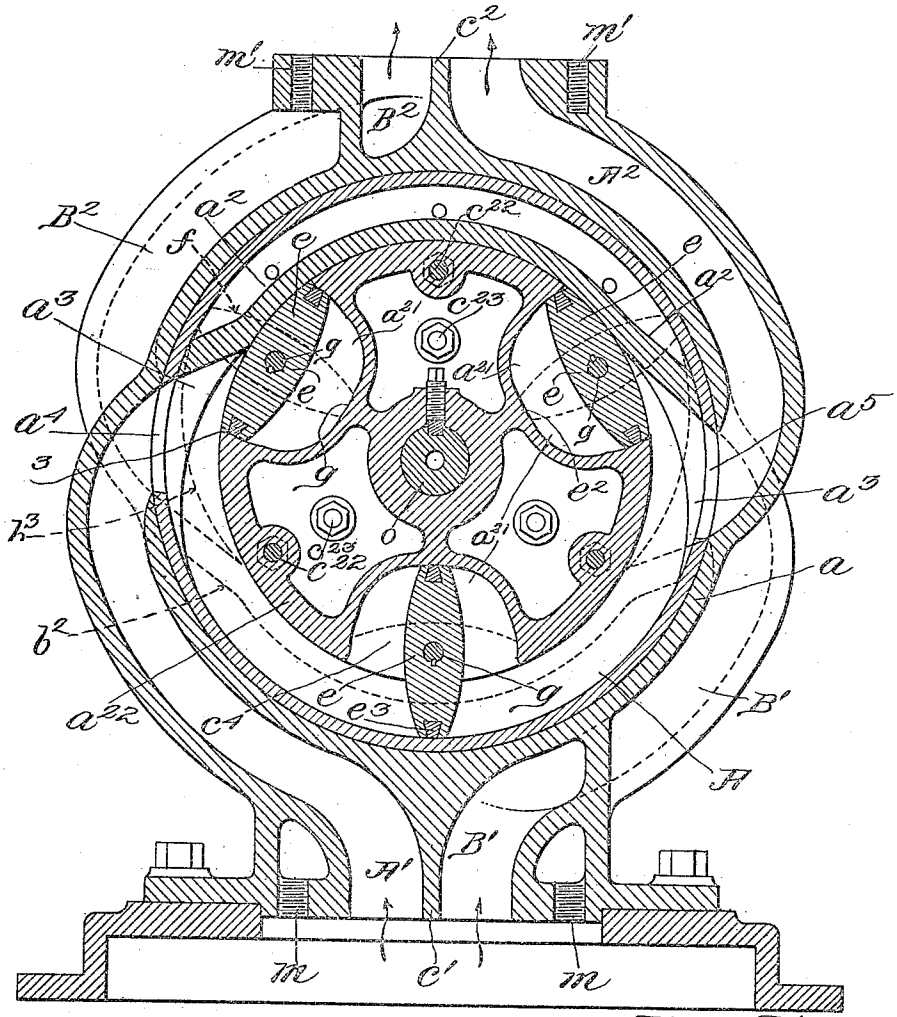
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4 SHEETS—SHEET 2.

Fig. 2.



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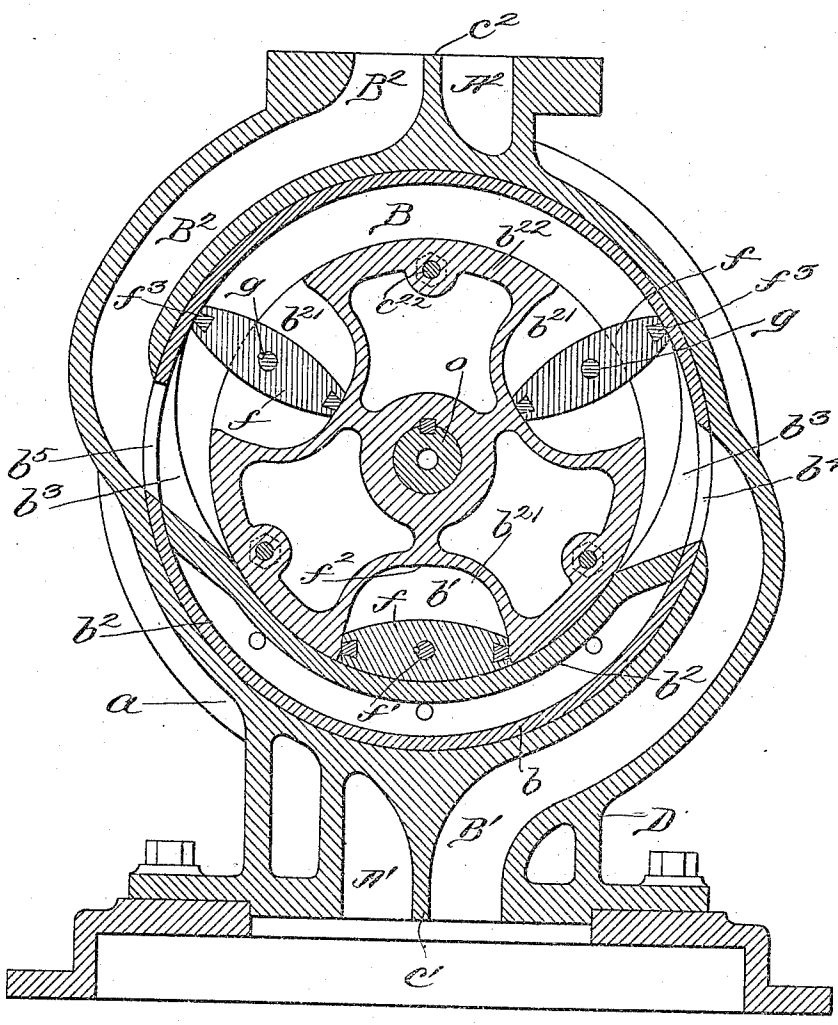
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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 5.

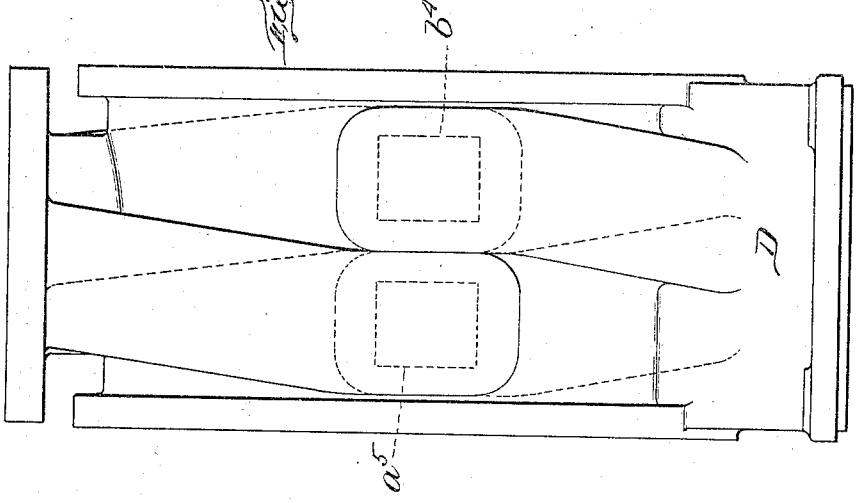
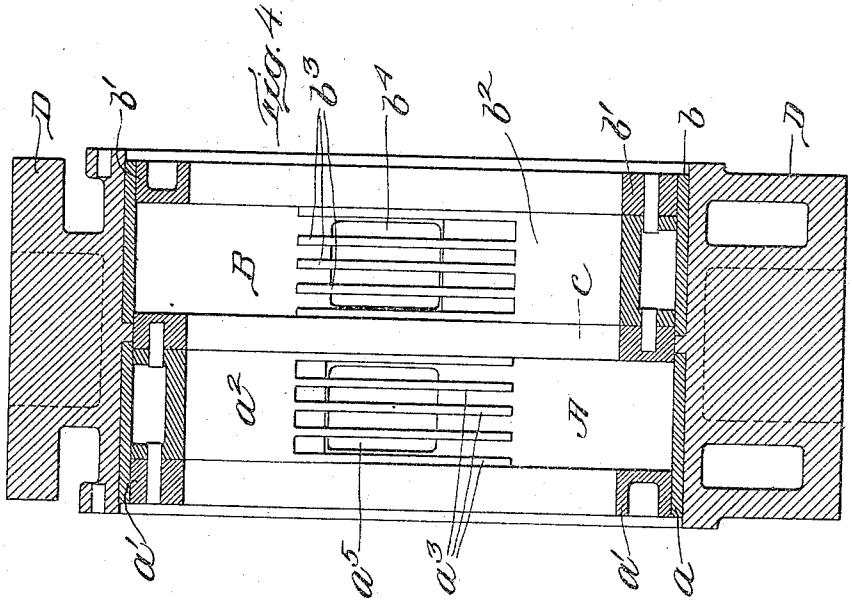


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ROTARY PUMP.

1,279,913. Specification of Letters Patent. **Patented Sept. 24, 1918.**

Application filed August 26, 1916. Serial No. 117,015.

To all whom it may concern:

Be it known that I, EUGENE ROBERTS, a citizen of the United States, and resident of Salt Lake City, State of Utah, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to rotary pumps, and is intended to provide a simple and efficient device of this kind utilizing a very small number of working parts, and dispensing with special valve mechanism in order to insure reliability of action and freedom from troubles due to disarrangement or maladjustment of valve mechanism.

One of the leading features of the invention consists in the construction of a casing, a rotor element, and a plurality of series of moving vanes, the corresponding vanes of the respective series being interconnected for mutual control, while at the same time performing their normal function of acting upon or expelling the column of fluid. This and other features of the invention will be particularly described in the following specification and will be defined in the claims annexed hereto.

It will be understood that while the device embodying the principles of this construction is shown and described herein as a rotary pump, the same underlying principles of construction are applicable for use in devices for metering fluids, or in fluid pressure motors, or engines, and therefore that the invention is not to be limited to its use as a pump.

In the accompanying drawings I have shown a simple form of construction illustrating the principles of this invention as applied to a feed pump, in which—

Figure 1 is a side elevation of the complete device, the pump portion being shown in central vertical section.

Fig. 2 is an elevation taken on the plane indicated by sectional line 2 2 of Fig. 1.

Fig. 3 is a similar view on sectional line 3—3 of Fig. 1.

Fig. 4 is a vertical central section similar to Fig. 1 with the rotating drum or member removed to show the construction of the casing.

Fig. 5 is a front elevation of the casing shown in Fig. 4.

The construction shown comprises generally speaking, an approximately cylindrical casing partly sub-divided into concentric side by side cylindrical chambers A and B provided with suitable inlet and outlet ports and passages as will be hereinafter explained, in which casing is mounted a rotatable member or drum carrying near its periphery a series of symmetrically arranged vane shafts parallel to the axis of rotation of the drum and having a plurality of vanes mounted on each vane shaft and disposed at an angular relationship to each other so that one vane acts not only to expel the body of water in advance of it, but also serves to control the action of the companion vane or vanes, and in turn be controlled by said vane so that it alternately folds within the periphery of the drum and is extended beyond said periphery.

Coming now to a detail description of the construction shown in the drawings, I will first describe the casing in which the rotary drum is mounted, with reference more particularly to the views shown in Figs. 4 and 1, as well as in Figs. 2 and 3. The cast metal casing D is formed at its bottom with two, in this case approximately semi-circular inlet ports A′, B′, separated from each other by an intervening partition or web C′ and is provided with a series of bolt holes m to which may be applied the connecting flange of a large inlet or feed pipe. The top of the casing is formed in a similar manner with two side by side outlet ports A^2, B^2, separated from each other by a web or partition C^2, and provided with bolt tapped holes m', m', to permit the bolting of the flange of a common outlet pipe to the top of the casing.

The interior cylindrical bore of the casing is preferably fitted with metallic lining rings a, b, fitted snugly therein. This interior cylindrical chamber is divided at its peripheral portion by a partition ring and into the opposite ends of the cylinder are fitted similar rings a', b', which may for the sake of economy be made in the form of channel rings. This construction provides two parallel peripheral troughs of cylindrical shape, corresponding to the width of the planetary vanes presently to be described.

The fluid inlet passage A′, conducts the water through the port a^4 into one of these annular troughs, while inlet passage B′ conducts the inflowing fluid through port b^4, into the other annular trough. Opposite to the inlet port a^4, is an outlet port a^5 through

which the discharged fluid passes into exit passage A^2, after it has passed around the lower half of the annular passage formed between the casing and the lower side of the revolving drum. Similarly the liquid entering through port b^4 flows around the upper half of the annular passage B and through the outlet port b^5 into the outlet passage B^2.

In order to act upon the vanes and cause them to turn on their axis so as to fold within the peripheral or vane recesses, I provide an approximately semi-circular ring or abutment a^2, preferably of hollow or channel construction, which fills the greater portion of the upper half of the annular trough or passage A between the upper edges of the inlet port a^4 and the outlet port a^5. This abutment ring at either end is provided with crescent shaped projecting ribs a^3 which form a sort of grating or open bridge across the ports a^4, a^5 so as to allow the flow of water through said ports, while at the same time having a cam-like action on the outwardly projecting ends of the vanes as they pass over said ports.

Similarly the annular trough B is provided with a filling or abutment ring b^2 in its lower portion so as to occupy the annular space between the lining ring b and the lower side of the drum periphery, and is provided with crescent shaped extension ribs b^3 forming gratings or bridges across the ports b^4, b^5, so as to engage the outer ends of the projecting vanes at these points.

The abutment rings a^2, b^2, are secured in any suitable manner such as by fastening pins (see Figs. 1 and 4), to the rings a', b', c, to prevent any circumferential displacement or shifting movement.

The rotary element or drum as shown in the drawings comprises a built-up or composite structure because such construction facilitates the machining of the parts, but when assembled together it is in function but a single drum or wheel structure acting precisely as if it were cast integral or in one piece.

As shown the drum comprises two spiders or cylindrical members a^{22}, b^{22}, formed with symmetrically arranged peripheral vane pockets or recesses a^{21}, b^{21}, respectively. For lightening the drum the intermediate portions between the hub, the periphery and the adjacent vane recesses may be cored or cast hollow. These spiders or drum sections are firmly bolted to each other and to an intermediate plate or disk c^{20}, the outside disks or heads a^{20}, b^{20}, by means of bolts c^{22} and supplemental bolts c^{23}.

Near the periphery of the drum and midway between the peripheral edges of the pockets a^{21}, b^{21}, are mounted rotary shafts g on which are secured vanes or blades of a flattened elliptical cross section in the ends of which are inserted bearing strips e^3, f^3, of hard rubber or other suitable material, to form a contact with the inside wall of the surrounding casing. The vanes and shafts are symmetrically arranged with reference to the central axis of rotation, and are dimensioned so that when in folded or closed position their outer sides form a continuation of the periphery of the drum, and their opposite ends are in close contact with the opposed portions of the interior surface of the pockets or recesses. When the vanes are in extended or radial position the inner end of the vane has a close bearing contact against the middle portion or bottom part of the wall of the recess, while the outer end of the vane is in close contact with the inside face of the casing formed, in this case, by one of the lining rings. The curved walls of the recess intermediate of the bottom portion and their outer edge portions, are preferably curved outwardly farther away from the vane axis so that there will be no frictional contact at these intermediate points.

The central shaft o passes through the central bore of the drum and is keyed thereto in any suitable manner. Suitable oil passages o^2, o^3 are provided through the shaft and drum heads to maintain lubrication of the vane shafts g. The shaft o may be driven in any suitable manner as by belt pulley o^5, secured on the outside extension of the shaft which is supported by brackets or standards o^6, carrying suitable shaft bearings. The standards o^6 and the casing of the pump may for convenience be mounted upon a suitable base or bed-plate o^7.

Operating as a pump, the drum and shaft, according to the views shown in Figs. 2 and 3, rotate in a contra-clockwise direction. Referring now to the vane e and the vane companion f shown in dotted lines just approaching the inlet port a^4, and the outlet port b^5 it will be seen that this particular vane f begins to ride against the thin end portion of the crescent shaped ribs or grating b^3, which causes it as well as its shaft g and its companion vane e to rotate in a clockwise direction, that is reverse to the direction of rotation of the drum. By the time this vane f reaches the end of the grating at the full thickness of the abutment member b^2, it is folded entirely within its vane recess so that it is in closed circumferential position, while its companion vane e has been turned from the circumferential or closed position to the open or extended position as exemplified in the lowermost vane e of Fig. 2. While the vane f was riding up on the converging ribs b^3 of its grating, the vane e was riding down on the diverging surface s of its ribs a^3 so that after the vane e has cleared its inlet port a^4 it completely bridges across the annular space between the periphery of the drum and the inside sur-

face of the surrounding casing thus acting at the same time to expel or push forward toward the outlet opening a^5 the column of water in advance of itself while drawing in a column of water behind itself through the inlet port a^4 which latter column of water will in turn be expelled through the outlet port a^5 by means of the next following vane.

As each successive vane approaches its own outlet port, it will be engaged by the ribs of its co-acting grating which converge toward the drum and thus it will be folded into closed or circumferential position while at the same time acting through the medium of the common vane shaft to open or extend its companion vane.

The pumping operation is therefore continuous or uninterrupted so long as the drum rotates.

When the device is intended to act as a meter the water under a suitable head presses against the rear face of each successive vane thereby driving the drum forward until the next succeeding vane comes into play on the farther side of the inlet opening and in that case the shaft becomes a driven shaft instead of a drive shaft to which may be applied any suitable indicating mechanism. The ends of the casing are closed by suitable heads c^{12}, c^{13}, each of which are formed with central bearing hubs for supporting the central shaft o.

The built-up construction of the rotary element and of the casing is advantageous not only for the purpose of construction and manufacture, but also because it permits replacement of worn parts at a minimum of expense.

What I claim is:

1. A rotary pump embracing in its construction a rotor, an inclosing casing, plural series of vanes mounted in said rotor and shiftable from operative position to expel fluid from the casing to closed position within the rotor, the individual vanes of one series being connected with corresponding vanes of the other series, whereby said vanes mutually control each other, substantially as described.

2. The combination of a casing, a rotor mounted inside the casing to leave plural piston chambers extending partly around its periphery on opposite sides of the rotor, a corresponding series of vanes operatively mounted in said rotor in offset planes corresponding to said piston chambers, said vanes being interconnected for mutual control and acting to alternately expel the fluid admitted into the respective piston chambers, substantially as described.

3. The combination of a rotor, two sets of vanes pivotally mounted therein, the individual vanes of each set being connected with the corresponding vanes of the other set for mutual control and operation, and a surrounding casing whose peripheral wall forms in connection with said rotor, two relatively offset piston passages whose peripheral walls control the movement of said vanes about their pivotal axes to draw in and expel a supply of fluid, substantially as described.

4. The combination of a casing, a rotor centrally mounted therein, said casing being provided with two peripheral passages disposed on opposite sides of the rotor and in axial offset planes, two series of pivotal vanes mounted to fold within the circumference of said rotor when closed, and to bridge across the peripheral passages when open, the corresponding vanes of each series being secured to a common shaft, the inside walls of said casing being designed to maintain a constant controlling contact with the vanes whereby the vanes are alternately shifted from open to closed position, substantially as described.

5. The combination of a rotary cylindrical member provided with two or more series of vane-containing pockets arranged side by side and separated from each other by an intermediate partition, a series of rotary shafts rotatably mounted to extend in an axial direction through said partition into the adjacent pockets, a plurality of vanes secured to said shafts in pairs, each pair being angularly disposed in relation to each other so that when one vane is folded within its pocket, the companion vane is extended to project beyond the pocket, a surrounding casing provided with inlet and outlet ports and passages, and having also piston passages extending partway around the periphery of the rotary member, and on opposite sides thereof in offset planes, and curved guide ribs arranged over the inlet and outlet ports of the piston passages between the rotary member and the surrounding casing, to coöperate with the vanes in order to shift the vanes alternately from operative to inoperative position, substantially as described.

6. The combination of a central shaft, a rotor having series of symmetrically arranged cylindrical pockets arranged side by side, corresponding series of planetary vanes mounted in said pockets so as to lie entirely within said pockets when in closed position and partly extending beyond said pockets when in extended or radial position, an encircling casing of larger diameter than said rotary member, so as to leave an annular clearance space between the casing and said member which is bridged across by the vanes when in radial or extended position, vane-engaging members disposed inside the casing and outside the periphery of the rotary member to rotate the successive vanes from extended to closed position, and means for interconnecting the vanes of one series with

the corresponding vanes of the other series, so as to transmit a rotary movement of each vane to its companion vane, the casing being provided with plural series of inlet and outlet passages whereby each set of vanes acts upon a different body of fluid passing through the casing, substantially as described.

7. The combination of a hollow casing provided with a removable cylindrical lining and with end closing heads and having its peripheral portion sub-divided into annular trough-like passages or channels, segmental abutment members located in the respective channels on opposite sides of the center, and provided with tapered extension ribs forming an open grating over inlet and outlet passages, a rotatable drum provided with two or more series of planetary vanes dimensioned and located to alternately fold within the periphery of the drum, and to extend beyond said periphery to the encircling wall of said peripheral channels, substantially as described.

8. A rotor element for a pump or meter, embracing in its construction a cylindrical drum provided with two or more sets of peripheral pockets or recesses arranged respectively side by side, and separated by an intermediate diaphragm or partition, plural series of planetary vanes mounted in said peripheral recesses, the individual vanes of one series being interconnected with the individual vanes of the other series, and being disposed respectively at right angles thereto, substantially as described.

9. A rotor element for a device of the class described, made in sections comprising a central circular plate or diaphragm, a pair of cylindrical drums provided with symmetrically arranged peripheral recesses or pockets, circular end heads, and means for securing together the end heads, the central plate and the recessed drums with the recesses in each drum in alinement with the recesses of the other drum, a series of parallel shafts rotatably mounted in the central plate or diaphragm, each having secured to its opposite ends, vanes or blades disposed at right angles to each other, substantially as described.

10. A casing for a rotatable drum carrying planetary vanes, embracing in its construction an outer cylindrical casing provided with a removable lining, said casing being formed with plural series of inlet and outlet ports and passages, a pair of segmental abutments arranged inside said casing in its peripheral portion on opposite sides of the center, and in offset planes, and tapered rib members forming continuations of said abutments, projecting across the inlet and outlet ports, substantially as described.

11. The combination of a hollow casing provided with a cylindrical lining, a rotary member centrally mounted therein to leave an annular clearance between its periphery and said lining, a plurality of vanes or blades mounted in peripheral recesses formed in said rotary member, a segmental abutment disposed to close the annular space on one side of the center between the inlet and outlet ports of said casing, and tapered vane-engaging members extending from the ends of said abutment across the inlet and outlet ports of the casing in order to turn the vanes successively on their axes, while allowing the liquid to pass through said inlet and outlet ports, substantially as described.

12. The combination of a hollow casing formed with a plurality of interior piston chambers arranged side by side and with individual adjacent inlet passages and similar outlet passages for the inflow and outflow of fluid to the several piston chambers, a plurality of rotary members mounted in the respective piston chambers to leave an annular clearance space forming a piston passage around one side of each rotary member, and planetary vanes mounted in each rotary member and acting alternately to bridge across the annular piston passages and fold within the respective rotary members, the corresponding vanes of each member operating in alternation, substantially as described.

13. The combination of a hollow casing provided with a pair of approximately cylindrical chambers disposed side by side, inlet passages for the respective chambers to admit fluid upon opposite sides of the center, outlet passages for the respective chambers for taking off fluid from the opposite sides of respective chambers, and a rotary member centrally mounted in said chambers, and sets of coacting planetary vanes carried by said rotary member, and means for successively shifting said vanes in alternation from operative to inoperative position.

In witness whereof, I have subscribed the above specification.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."