June 22, 1937. M. R. HUTCHISON, JR 2,084,846

ROTARY PUMP, COMPRESSOR, ENGINE, AND THE LIKE

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Fig. 1.

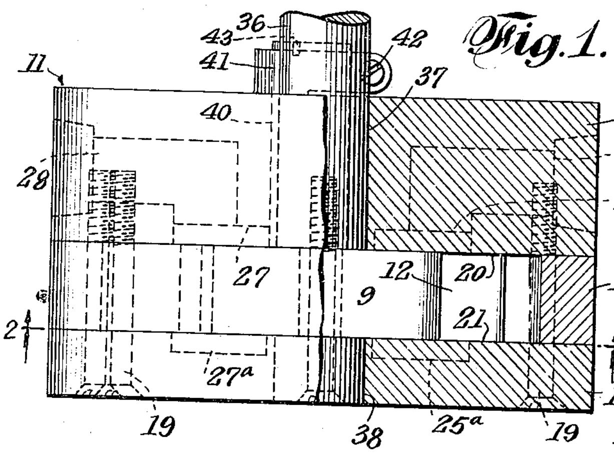

Fig. 2.

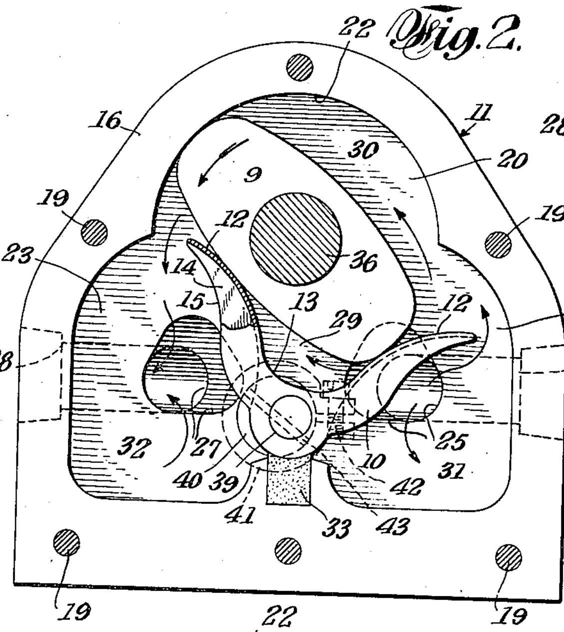

Fig. 3.

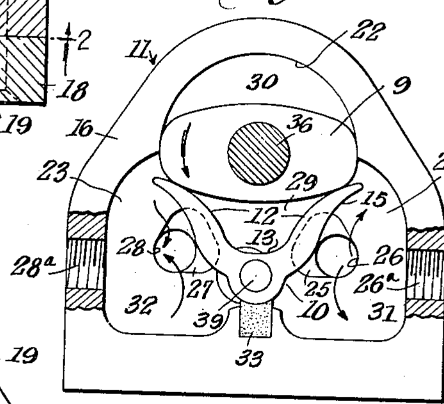

Fig. 4.

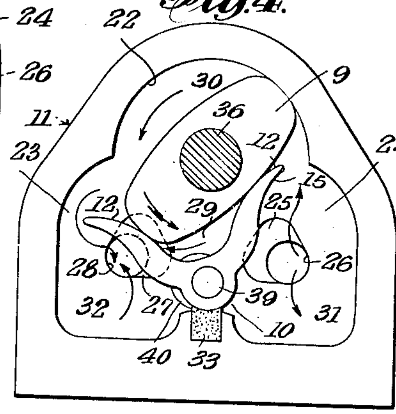

Fig. 5.

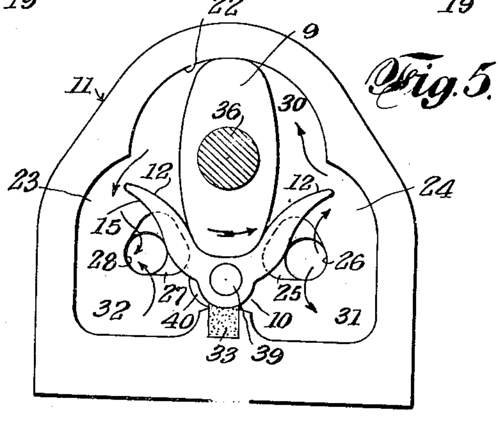

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Fig. 6.

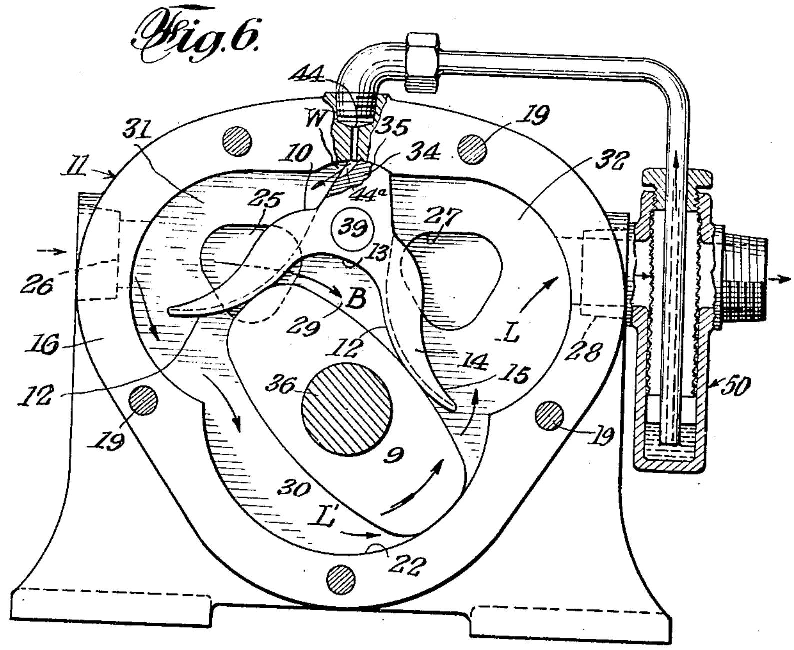
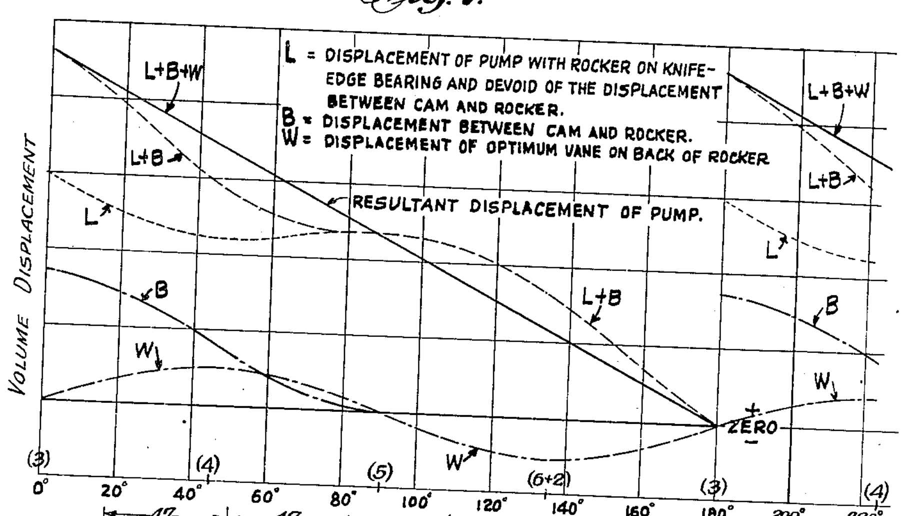


Fig. 7.



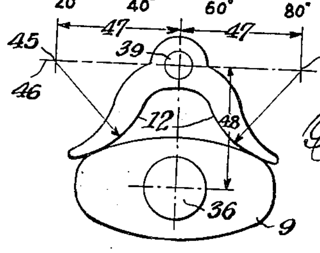


Fig. 8.

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Fig. 9.

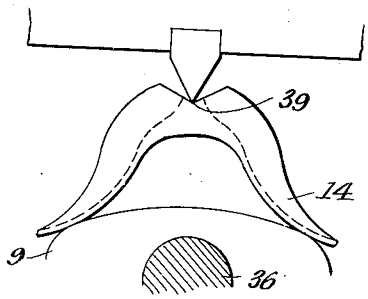


Fig. 10.

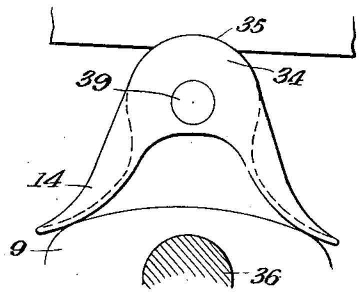


Fig. 11.

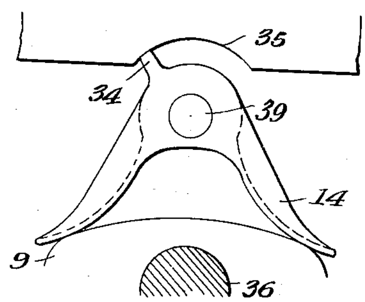


Fig. 12.

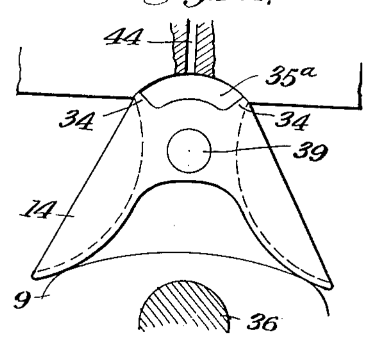
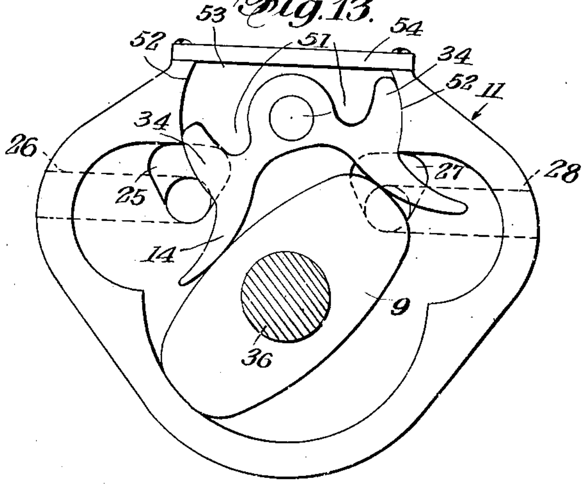


Fig. 13.



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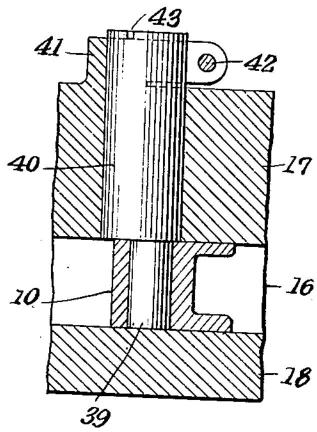
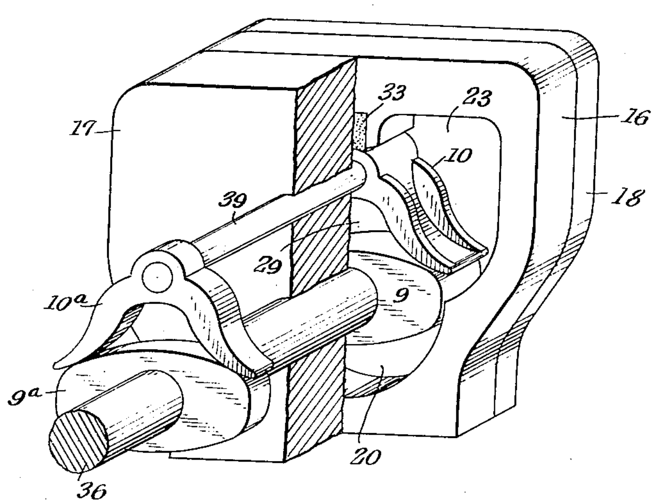


Fig. 14.

Fig. 15.



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Patented June 22, 1937 2,084,846

UNITED STATES PATENT OFFICE

2,084,846

ROTARY PUMP, COMPRESSOR, ENGINE, AND THE LIKE

Miller R. Hutchison, Jr., Madison, N. J., assignor to Multicycol Pump & Engine Corporation, New York, N. Y., a corporation of New York

Application October 26, 1934, Serial No. 750,038

13 Claims. (Cl. 103—124)

This invention relates to machines and apparatus in the nature of rotary pumps, compressors, engines and the like.

Special objects of the invention are to attain high effective useful displacement per revolution, with simple, rugged mechanism of compact design, well balanced and otherwise adapted to be run at high speeds and to operate smoothly and quietly.

A further special object of the invention is to obtain in the case of a pump and particularly for liquids as distinguished from gases, a substantially continuous non-pulsating flow.

Other objects and the various novel features of construction, combinations and relation of parts comprising the invention will appear in the course of the following specification.

The drawings accompanying and forming part of the specification illustrate certain practical embodiments of the invention, but as such are primarily for purposes of disclosure, it will be appreciated that the structure may be modified and changed as regards these illustrations, all within the true intent and broad scope of the claims hereinafter defining the invention.

Fig. 1 is a broken part sectional and plan view of a simple form of the invention.

Fig. 2 is a sectional view as on line 2—2 of Fig. 1, with the cover plate of the casing removed, showing the cooperating rotor and rocker.

Figs. 3, 4 and 5 are generally similar views illustrating the parts in successively different positions.

Fig. 6 is a view similar to Fig. 2, illustrating a special form of the invention in which the rocker is equipped with a counterbalancing and pulsation eliminating vane and is mounted above instead of below the rotor.

Fig. 7 is a chart showing how by properly combining the displacement between rotor and casing (L), the displacement between rotor and rocker (B) and the displacement by the vane on the back of the rocker (W), a resultant is obtained which is practically a straight line and hence a practically continuous non-pulsating flow is produced. Fig. 8 is a diagram illustrating formation of the rocker. Fig. 9 is a detail of a knife edge bearing rocker. Figs. 10, 11, 12 and 13 are partial sectional views illustrating possible modifications of the rocker.

Fig. 14 is a broken sectional detail showing features of the eccentric mounting of the rocker and by which the parts are initially set and secured so that the rocker will properly cooperate with the rotor. Fig. 15 is a broken and partly sectioned perspective view illustrating a form of monitor rocker construction for operating the pump rocker independently of the cam with which it cooperates.

The machine is particularly simple, consisting in substance of but three parts, a lobed cam, rotor or impeller 9, a rocker 10, and a casing or housing 11.

The rotor in the present disclosure is a two lobed symmetrical quasi-elliptical form of all convex curves joined by tangent planes and hence practical for inexpensive manufacturing purposes.

The rocker is shown as a two armed yoke having smoothly arcuate bearing ends 12, both engaging the cam at all times and a hollow 13, between these arms practically conforming to the lobes of the cam and providing in the completely meshed position, Fig. 5, substantially no volume displacement between cam and rocker.

To lighten the rocker without undesirably weakening it, the backs of the rocker arms may be channelled or hollowed out as indicated at 14, leaving the side faces as flat parallel flanges 15, coextensive with the central back or body portion.

The housing consists in the disclosure of an intermediate chamber defining portion 16, a back wall 17, and a front cover 18, secured in abutting engagement by screws 19. The back and front walls have plane parallel faces 20, 21, with which the ends or side faces of the rotor and rocker have sliding fit. The intermediate chamber member has a partly cylindrical wall, 22, surrounding and concentric with the rotor for sealing contact by the ends of the rotor lobes and chambers 23, 24, at opposite sides of the rocker. In the flat back wall of one of these chambers, there is provided an intake port 25, in register with an intake passage 26, and in the other chamber, an exhaust or discharge port 27, communicating with a discharge passage 28.

The inlet and discharge ports 25 and 27 are swept by the adjacent side faces of the rocker arms in such fashion that the rocker controls the inlet and outlet functions for the variable displacement chamber 29, formed between the rotor and hollow face of the rocker. The space 30 within the cylindrical wall 22, by means of the rotor is in succession connected with one variable displacement chamber 31, back of the rotor as in Fig. 2, then entirely cut off from this first chamber as in Fig. 3 and next opened up to the other variable displacement chamber 32, at the other side of the rocker, as in Fig. 4. Thus the back of the rocker and portions of the rotor outside the rocker cavity are utilized to effect displacement in the side chambers 31, in conjunction with the intermediate chamber 30. At one stage as in Fig. 3, this intermediate chamber is cut off from both side chambers providing momentarily a fourth chamber for transfer of fluid from one side chamber to the other. The side chambers are separated across the back of the rocker in the first form of the invention, by a compressible sealing strip or partition 33, and, in the second form of the invention, Fig. 6, by a vane or blade 34, on the back of the rocker in wiping sealing contact with a concentric wall portion 35 of the housing.

The rocker vane 34 is of special importance in that it is both a counterbalance for the rocker and a displacement blade automatically compensating against pulsations in the flow.

The rotor is shown as carried by shafting 36, journalled in bearings 37, 38, Fig. 1, in the back and front walls of the casing. The rocker may have a bearing at one or both sides as indicated at 39. In the form of the invention shown in Figs. 1 to 5 and 14, this is a single elongated bearing at the back carried eccentrically by a plug 40, rotatably seated in the back wall and adjustably secured by a surrounding split clamp 41 on the back wall, the separated arms of which are secured by a clamp screw 42. The rotatable bearing support 40 is indicated as having at the outside a slotted screw head 43, so that it may be readily turned by a screw driver or similar instrument to bodily adjust the rocker with respect to the cam, the compressible backing 33, following the back of the rocker in such adjustments to maintain the seal between inlet and outlet sides of the machine.

Considering the machine operating as a pump, it will be seen that with rotation of the cam in the counter-clockwise direction indicated in Fig. 2, gas or liquid entering through intake 26, will enter both the chamber 29 inside the rocker and the chambers 30, 31, outside the rocker, between the cam and back of the rocker and the surrounding casing. With rotation to the Fig. 3 position, the right hand rocker arm acting as a valve will cut off the internal rocker chamber 29 and the cam will close off the rotor chamber 30. With progression to the Fig. 4 position, the left hand rocker arm will open outlet port 27, relieving the rocker chamber 29, and the rotor chamber 30 will open to outlet chamber 32. In the movement of parts from Fig. 4 to Fig. 5 positions, the rocker chamber 29 will be emptied and contents of chamber 30 to the left of the rotor will be passed on to the outlet. In this same period, the inlet chamber 31 will be filling and as the Fig. 2 position is approached, the rocker cavity will be opened to the inlet port.

It will be apparent that both the rocker cavity and the cam displacement spaces are utilized as well as space in back of the rocker. The device therefore is efficient and of relatively large capacity for its size. Also, with only the two relatively simple symmetrical parts, the machine may be operated at high speed without noise or vibration.

By placing a vane on the back of the rocker as at Fig. 6, additional displacement is effected and the special importance of this is that such displacement is in step or proper phase with the other displacements to effect a substantially continuous non-pulsating flow.

This will be understood by study of Fig. 7, in conjunction with Figs. 6 and 9. In both Figs. 6 and 7, L represents the displacement of cam and a knife edge supported rocker with respect to the enclosing chambered portions of the housing. B represents the displacement between the cam and the rocker. It will be noted that the curvature of first portions of curves L and B are opposite, so that the combination of the two, that is $L+B$ will give a curve more nearly approximating a straight line representing continuous uniform change of volume. The addition of the vane 34 or its equivalent produces a displacement wave W, which complements the curve $L+B$. This gives the resultant or total displacement represented by the substantially straight line $L+B+W$, the form and slope of the line indicating continuous and uniform rate of change of volume, i. e., steady and non-pulsating flow.

The suction volume at the same time varies continuously and uniformly by reason of the fact that the total volume within the housing remains constant, i. e., suction and discharge volumes are complementary and their sum is the total volume within the housing, which does not change. Consequently fluid will enter and flow at uniform velocity, into, through and out of the pump, a great advantage, particularly in the handling of liquids.

The effect of the vane extended from the back of the rocker is to neutralize some of the displacement accomplished by the arms of the rocker externally of the cavity between rocker and cam. The degree of extension or radius of this vane for optimum results may vary with different forms of cams and rockers, but the proportions indicated are suitable for the design shown to accomplish practically uniform and constant resultant flow.

The ports may vary in shape, but the triangular form illustrated has been found practical and desirable. The independence of size of the inlet and outlet chambers enables variations in sizes and shapes of ports as may be required for handling different gases or liquids.

Another special feature of the Fig. 6 construction, is that the machine is constructed and mounted with the rotor chamber 30 at the bottom, to act as a well for lubricant, and the rocker at the top to receive the splash or spray of lubricant from the rotor. More effective sealing between the parts is accomplished by this disposition and arrangement. Also the center of revolution is kept lower.

The cam lobes are shown particularly in Fig. 6, as rounded at the tips in conformity with the surrounding cylindrical wall 22, to provide surface contact between cam and housing. In the arrangement shown however, with the cam dipping down into the well formed by the chamber 30, a simple line contact is sufficient for sealing purposes, a fact which simplifies design and manufacture of the parts, reduces the acceleration of the rocker and increases displacement of the pump.

The bearing surfaces 12 of the rocker arms may be plain circular arcs connected by an arch generally conforming to the shape of the cam lobes. Manufacture of these rockers therefore is also a relatively simple matter. The channeling of the backs of the rocker arms leaves these arms light in weight but relatively rigid and connected by a solid part forming the head or bearing portion of the rocker. In addition to its function as a displacement element, the vane 34, projecting from the back of the rocker in the Fig. 6 construction has a counterbalancing effect, which is particularly desirable in high speed operation. Instead of being substantially rigid, the limbs of the rocker may be flexible or springy to automatically adjust themselves to the contour of the cam and take up for wear. The casing as well as the other parts are simple and can be readily and inexpensively produced. Both cam and rocker may be symmetrical individually and the rocker may be light and well balanced with long arcuate smoothly rounded bearings riding the cam. The cam may have simple convexly curved and planer surfaces as shown or, for minimum acceleration of the rocker, may have convex curvatures, but in such case, these curves should be of greater radius than that of the rocker limbs. The action is smooth, acceleration and deceleration of the rocker are gradual rather than abrupt and inertia and friction are kept low. Ample bearing lubrication is provided automatically in the Fig. 6 form of construction by the paddle effect of the cam dipping in the well of the casing and this materially aids the efficiency of the instrument, maintaining a sealing film of oil between all the cooperating parts, that is, between cam and casing, cam and rocker and rocker and casing. This effective lubrication also aids the rocker in its valving functions in cooperation with the valve ports 25, 27. These ports as will be noted particularly in Fig. 3 are of substantially triangular shape with the bases of the triangles generally conforming with the limbs of the rocker. This provides quick opening and closing with ample transfer area since the rocker at such times is moving with its maximum cyclic angular velocity. The apices of these triangles may be the ends of the inlets and outlet passages 26, 28, and these remain open and uncovered in all movements of the rocker with the flow therethrough practically unimpeded by rocker movements. This is particularly so with the valve ports set back or countersunk in the end wall substantially as indicated in Fig. 1. These features conduce to the continuity of pulseless flow effected by the compensating vane on the back of the rocker in conjunction with the cam and rocker displacements in the casing. These characteristics while especially desirable for pumping liquids are also important in the use of the invention as an air pump or the like. The invention may be used as a vacuum pump, as well as pressure pump and by proper port and valve relation may be operated as an air compressor or the like. While shown as driven entirely by the cam, it will be evident that if desired to maintain a small clearance between them at all times, the rocker might be externally operated as in Fig. 15, by extending the rocker shaft 39 outside the casing and mounting a lubricated monitor rocker **10a** thereon corresponding to the internal rocker **10** and riding a cam **9a** similar to the cam **9** within the casing. To automatically compensate for temperature variations, the rocker may be of bi-metallic construction, so that it may contract or expand as necessary to maintain sealing engagement of both arms with the rotor at all times. This continuous contact of both arms eliminates any hammer as between rocker and rotor. The contacting reach of the rocker arms is at all times less than to the center of the cam as will be seen in Figs. 3, 4, 5, the rocker thus in effect cooperating only with the near side face of the cam, leaving the opposite side face clear to cooperate with the surrounding cylindrical wall of the casing. Both faces of the cam or rotor are thus always active and the movements of the rocker are less abrupt than if it were more deeply enmeshed by the cam. The ported chambers 31 and 32, need be only large enough for oscillation of the rocker arms plus clearance for fluid flow around the tips of the rocker arms.

In the Fig. 6 construction, the valve ports are located near the top of the machine, clear of lubricant in the bottom chamber 30. With this disposition, lubricant or liquid in the pump is held from escape by drainage and thus the parts are kept "wet" and the pump will retain its seal, being thus in effect self-priming. The projecting tips of the rocker arms also act in this construction to mask the ports somewhat against escape of lubricant thrown off by the cam.

Suitable sealing packing may be provided if desired, between the blade 34 on the back of the rocker and the cooperating wall 35 of the casing. Also special means of lubrication may be provided at this point, such as an oil lead 44, entered through the top of the casing in position to be briefly uncovered by the blade at the end of the swing in one direction for metering the lubricant.

While convenient in many instances to locate both inlet and outlet passages 26, 28, in one end wall, for instance, in the back wall 17 as here shown, it will be apparent that these passages, being always open to chambers 31, 32, may be entered through the intermediate or the front section of the casing. The valve ports 25 and 27, are simply in the nature of bypass ports for establishing communication between these chambers and the chamber 29 between the rocker and rotor. Being simply bypass ports as between the side chambers and the rocker chamber, they may be duplicated in the opposite end walls of the casing as in Fig. 1, where **25a** and **27a** are ports sunk in the face of the front cover 18, directly opposite and corresponding to the ports 25, 27, in the back wall of the casing. In Fig. 3, the inlet and outlet passages are indicated at **26a**, **28a**, entered through the intermediate section 16 of the casing, a construction which may be used where this intermediate section is wide enough to take these passages. This valving and porting avoids adding clearance volume to the displacement chamber in the rocker, conducing to high volumetric efficiency, high vacuum and high pressure development by the pump.

Volumetric operations of the compensating vane 34, will be further understood in considering Fig. 6, by realizing that in any movement toward the left as in this view, the vane will to an extent offset or diminish the pumping action of the rocker and cam in the chamber 32, whereas in the swing in the opposite direction, that is, toward the right in this view, the vane will have the effect of aiding the pumping effect accomplished by the combined action of the rocker and rotor in the then communicating chambers 30 and 32. The timing and rate of these displacements are inherently such as to smooth out the pulsations created by combined action of the rotor and rocker, producing the resultant straight line displacement curve illustrated in Fig. 7.

It will be observed that in two positions of the rotor, Fig. 3 and Fig. 5, the rocker cavity 29 will be segregated from both inlet and outlet and that during such interval of operation, there may be a small change of volume of cavity 29. The "lap" of the rocker arms over the valve ports is provided to prevent communication between suction and discharge lines which might permit reverse flow to occur, particularly when handling gases. In the case of liquids, such trapping of relatively incompressible fluid in a chamber of changing volume would result in development of high pressure within the cavity. Therefore, in a pump handling liquids, this valve lap may be dispensed with by extending the ports 25 and 27, to correspond practically with the inner edges of the rocker arms with the rocker central or by so designing the cam and rocker shapes that no change of volume will occur during the transition periods, Figs. 3 and 5.

Figs. 2, 4 and 6 illustrate another special important feature of this invention, namely that by the combination of rotary displacement member and rocker and rotary displacement member and casing, there is produced a simultaneous flow of fluid in a common direction about both sides of the rotary member and that this flow is completed with slight change of direction. Thus in Figs. 2 and 6, fluid is being taken from the inlet chamber 31, into the rocker chamber 29, at one side of the rotor and into chamber 30, at the opposite side of the rotor and as shown in Fig. 4, such flow is continued on in the same direction at both sides of the rotor from rocker chamber 29 and from rotor chamber 30. The effect therefore is for an entering stream of fluid to split into two streams and pass in the same direction about opposite sides of the rotor from the inlet over to the discharge side of the pump. A comparatively large volume of fluid can thus be handled with small disturbance and without waste of energy from churning or eddy effects.

In the practical design of the machine illustrated, the bearing surfaces of the rocker arms are curved as arcs, preferably drawn from centers 45, on a straight line 46, passing through the rocker center 39, and located a distance 47, equal to the distance 48, of the oscillation center from the cam center 36, all as indicated in Fig. 8. This special relation of rocker bearings and cam assures smooth constant cooperation of the rocker with the cam.

The oscillating motion imparted to the rocker shaft may be utilized to drive external apparatus associated with the utilization, metering or other treatment of the fluid displaced by the pump.

The displacement member on the back of the rocker may be formed in various ways, so long as it effectively separates the chambers 31 and 32. Thus in Fig. 10 it is shown as hemi-cylindrical in form, merging into the limbs of the rocker.

In Fig. 11, the displacement member 34 is shown as disposed off at an angle toward the suction side of the machine. In Fig. 12 a double seal is provided by having two angularly displaced separate vanes 34.

For a high pressure pump, the rocker may be backed up by fluid pressure admitted to the back of the displacement member as at *35a*, Fig. 12, to reduce or modify the rocker bearing load or to more effectively seal the rocker.

In Fig. 13, the vanes are made to lie on the same side of the center of oscillation as the hollow of the rocker. Thus the vane or equivalent may be formed anywhere outside the rocker cavity so long as it is arranged to separate the pressure and the discharge sides of the pump, to consequently improve the suction and discharge flow characteristics. One or more vanes may be used, as necessary, while the rocker support means no longer is influenced by flow considerations, making it possible to use a knife edge bearing, if desired.

In the oil metering construction illustrated in Fig. 6, the vane may have an oil metering groove *44a*, in the side of the same, which will open to the oil lead, once per cycle, that is, either to suction or discharge. If open to the suction side, the oil will necessarily lubricate the parts before it can escape and this suction action may be utilized to lift the oil from an external sump 50 or separator, in which it may be assisted by discharge pressure against the top of the oil column as indicated in Fig. 6. The analysis of Fig. 7 may be assisted by considering that the numerals in parenthesis (2), (4), (5), (6 and 2) refer to position of the parts illustrated in the correspondingly numbered figures of the drawings.

In the construction shown in Fig. 13, the back of the rocker may be hollowed out as indicated at 51, to lighten the rocker structure 35. Also, in such a construction as this where the arcuate faces of the vanes engage corresponding arcuate surfaces 52, at opposite sides of the rocker and do not contact immediately back to the rocker, the top of the casing may be left with an opening 53, for access to the rocker, this opening being normally closed by suitable cap or cover plate 54.

What is claimed is:

1. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker and rotor at opposite sides of the rocker center in position to admit flow into and out of the variable displacement chamber formed between the rotor and hollow of the rocker.

2. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing and counterbalancing means for the rocker.

3. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control

by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing and a counterweight on the rocker on the opposite side of the center of oscillation from the hollow faced portion of the same.

4. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing and a displacement member on the back of the rocker on the opposite side of the center of oscillation from the hollow faced portion of the rocker.

5. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing and a vane projecting from the back of the rocker, the surrounding wall of the casing having an arcuate portion opposite and in cooperative relation with said vane.

6. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing, said rocker being pivotally mounted in the upper portion of the housing above the rotor and the cylindrical portion of the casing engaged by the rotor being at the bottom of the housing to hold liquid for distribution by the rotor, the ported portions of the end wall structure of the casing being in the upper portion of the casing above said cylindrical liquid holding portion of the casing with ports above and at opposite sides of the rotor center.

7. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing, the rocker being mounted in the housing above the rotor and having a counterweighing portion on top of the same.

8. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing, the rocker being mounted in the casing above the rotor and having an upstanding vane and the opposite wall of said housing being in cooperative relation with said upstanding vane on the rocker.

9. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing, said ports having edges toward the rotor approximately conforming with the contour of the limbs of the rocker.

10. A machine of the character disclosed, comprising a lobed rotor, a hollow faced rocker having opposite sides in cooperative relation with said lobed rotor, a housing encasing said rotor and rocker and having end walls in cooperative relation with the end surfaces of the rotor and rocker and a cylindrical wall surrounding and in cooperative relation with the lobed rotor and forming thereby in such cooperative relations variable displacement chambers, the end wall structure of the casing being ported opposite the end surfaces of the rocker in position for control by the rocker to afford entrance and exit to the variable displacement chambers formed between the rotor

and hollow of the rocker and between the rotor, the outside of the rocker and surrounding wall portions of the housing, said rocker having a pulsation compensating vane thereon.

11. In a machine of the character disclosed, a substantially symmetrical rotor, a hollow faced rocker having opposite sides of the same in constant cooperative engagement with said substantially symmetrical rotor and a casing enclosing said rotor and rocker having end walls in cooperative engagement with end surfaces of the rotor and rocker to form therewith a variable displacement chamber between rotor and rocker, said casing having a cylindrical portion surrounding and in cooperative engagement with the rotor and separated inlet and outlet chambers outside the rotor alternately in communication with the space between the rotor and cylindrical surrounding wall portion of said end wall structure of the casing having inlet and outlet ports underlying the rocker and alternately opened by said rocker to the variable displacement chamber between the rocker and rotor, said ports being at all times open to said inlet and outlet chambers.

12. In a machine of the character disclosed, the combination of a lobed rotor and a hollow faced rocker cooperating therewith and having curved bearing faces at opposite sides of the cavity therein and formed as arcs drawn from centers on a straight line intersecting the rocker axis and spaced from that axis a distance substantially equal to the distance of that axis from the rotor center.

13. In combination, a casing with opposed end walls having oppositely disposed ports therein, a hollow faced rocker mounted to oscillate in said casing and having arms at opposite sides of the cavity therein in position to control said ports and a lobed rotor journalled in the casing in cooperative relation with said rocker and engaged at all times by both arms of said rocker, said casing including a chambered portion swept by said rotor and inlet and outlet chambers alternately in communication with said rotor chamber in the rotation of said rotor, said rocker controlled ports being in communication with said inlet and outlet chambers.

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