

Feb. 21, 1928.

1,660,183

A. W. WEEDEN

ROTARY PUMP

Filed Oct. 21, 1926

2 Sheets-Sheet 1

Fig. 1.

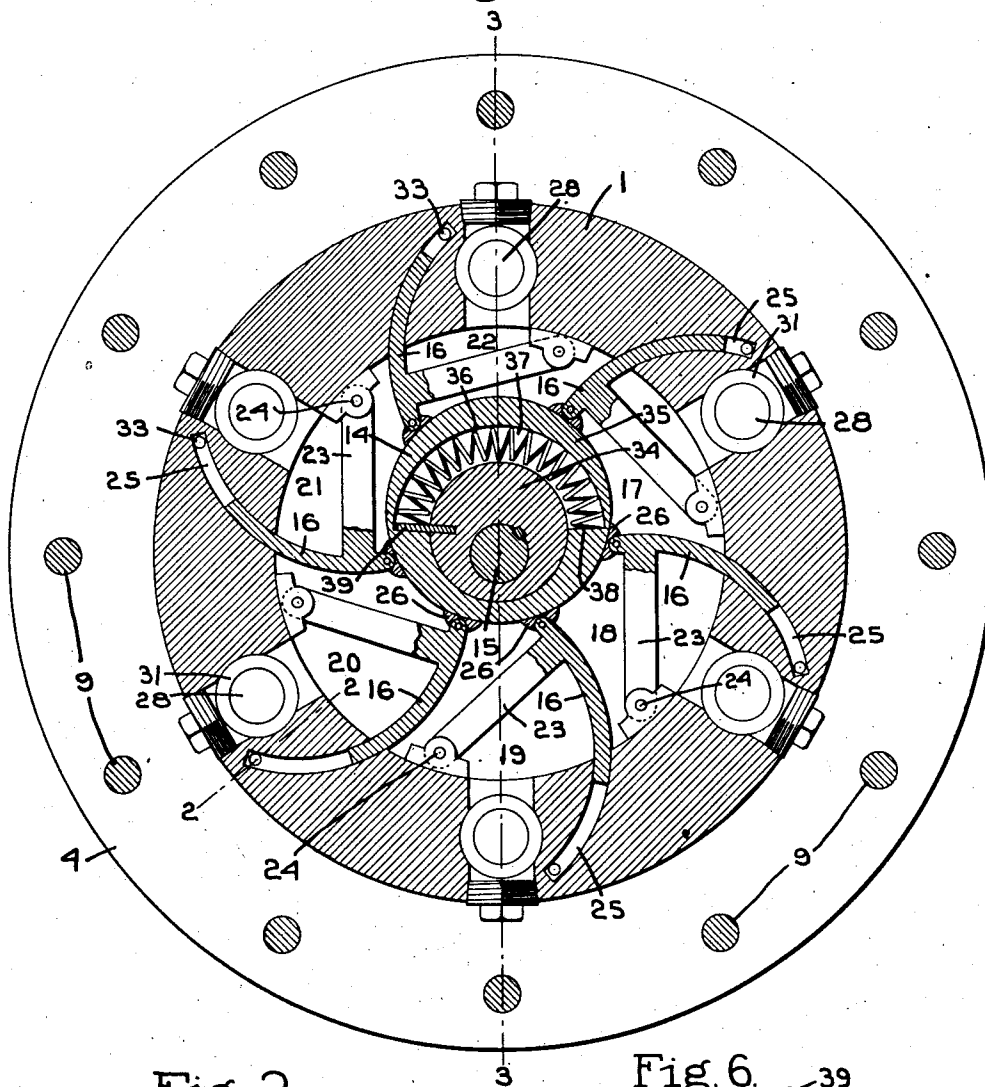


Fig. 2.

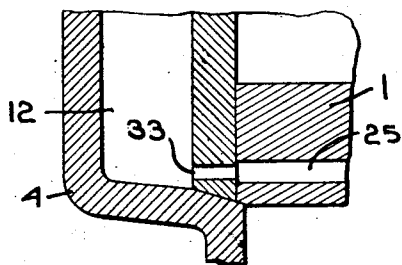
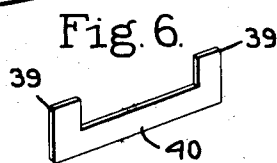


Fig. 6.



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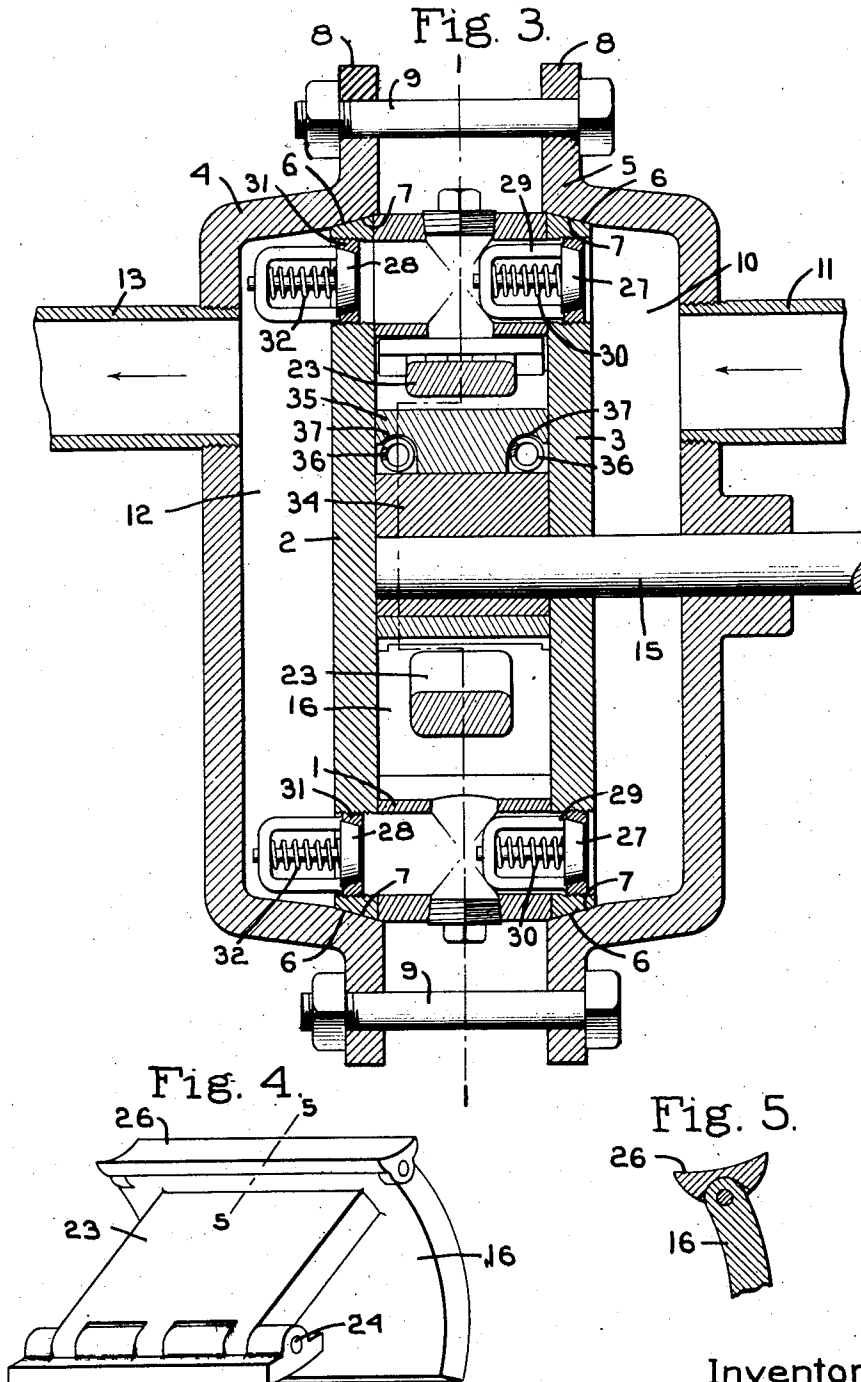
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE.

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## ROTARY PUMP.

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This invention relates to rotary pumps and it has for one of its objects to provide a novel rotary pump which is relatively simple in construction and in which the rotating parts are reduced to a minimum.

A further object of the invention is to provide a rotary pump having means for automatically decreasing the amount of fluid pumped as the pressure increases beyond a predetermined point so as to maintain a constant load on the pump and prevent the latter from becoming stalled by an increase of pressure.

Further objects of the invention are to improve generally rotary pumps in various ways all as will be more fully hereinafter set forth.

In order to give an understanding of the invention I have illustrated in the drawings a selected embodiment thereof which will now be described after which the novel features will be pointed out in the appended claims.

Fig. 1 is a sectional view through a pump embodying my invention taken on substantially the line 1—1, Fig. 3;

Fig. 2 is a fragmentary section on the line 2—2, Fig. 1;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a perspective view of one of the partition members;

Fig. 5 is a fragmentary section on the line 5—5, Fig. 4;

Fig. 6 is a view of the member acting on the spring situated within the cam.

The pump comprises a casing, a rotatable cam member within the casing, and a plurality of partitions engaging the cam member and extending outwardly therefrom in a general radial direction, said partitions dividing the interior of the casing into separate pumping chambers, each having an inlet valve and an outlet valve, the construction being such that as the cam is rotated the chambers are alternately enlarged and contracted, thereby performing the pumping operation.

The casing may be made in various ways without departing from my invention. As herein shown it comprises a body member 1 in the form of an annular ring and two side plates 2 and 3 engaging the ends of the annular member and forming with the latter a central chamber, which, as presently to be

described, is sub-divided by partitions into separate pumping chambers. The side plates 2 and 3 may be secured to the annular member 1 in various ways without departing from the invention. In the construction herein shown, which I regard as a practical one, said plates are retained in position by clamping members 4 and 5, these members having inclined annular faces 6 which engage inclined faces 7 formed on the periphery of the side plates 2 and 3.

The clamping members 4 and 5 are each provided with annular flanges 8 and these flanges are clamped together by clamping bolts 9. By reason of this construction the tightening of the clamping bolts 9 wedges the inclined faces 6 of the clamping members against the inclined faces 7 of the side plates 2 and 3 and also clamps the side plates 2 and 3 firmly against the end walls of the annular member 1.

These clamping members 4 and 5 serve not only as clamping means but they are also shaped to provide the suction and compression chambers for the pump. The clamping member 5 has a shape to form a space between it and the plate 3, which space constitutes a suction or supply chamber for the pump, said space communicating by means of an inlet pipe 11 with any suitable source of supply. Similarly, the clamping member 4 is shaped to form between it and the side plate 2 a compression chamber 12 into which the fluid is pumped under pressure, said compression chamber having an outlet pipe 13 leading therefrom.

Situated within the annular member 1 is a rotary cam device indicated generally by 14. Said cam device is mounted on a shaft 15 which extends through the plate 3 and clamping member 5 and is driven by any suitable driving means, such for instance as a pulley or gears (not shown).

The space within the annular member and the cam 14 is divided into a plurality of pumping chambers by partition members 16, there being as many such pumping chambers as there are partition members. In the construction herein shown there are six such partition members and, therefore, six pumping chambers, the pumping chambers being indicated at 17, 18, 19, 20, 21 and 22 respectively. The partition members have a general radial direction but I will preferably

make each of them of an arcuate shape. Each partition has a radius arm 23 rigid therewith which is pivotally secured within the central chamber of the casing to the inner wall of the member 1 as shown at 24. The arm 23 of each partition extends at right angles to the arcuate curve thereof and each arm is of such a length that the pivotal connection 24 is located at the center of said arcuate curve.

The member 1 is formed with curved slots 25 in which the free or outer ends of the partition members 16 are received.

Each partition has pivoted to its inner edge a shoe 26 which rests on the periphery of the cam member 14. Since the cam is situated eccentrically within the annular member 1 the rotation of the cam will move the partitions outwardly, each partition during its outward movement swinging about its center 24.

The partitions are maintained in engagement with the periphery of the cam 14 by means of pressure introduced into the chambers 25, this pressure acting on the ends of the partitions and holding the shoes 26 in contact with the cam 14.

Each pumping chamber 17, 18, 19, etc. has an inlet valve 27 leading thereto from the suction chamber 10 and an outlet valve 28 leading therefrom to the compression chamber 12. Each suction valve is mounted in a cage 29 which is screwed into an opening into the side plate 3 and each valve is acted on by a spring 30 which yieldingly holds it to its seat. Each valve 27 is an inwardly-opening valve so that it will open when suction is developed in the corresponding chamber.

Each outlet valve 28 is also mounted in a cage 31 which is screwed into an opening in the side plate 2 and each outlet valve is yieldingly held to its seat by a spring 32. The outlet or discharge valves 28 open outwardly into the chamber 13 by a preponderance of pressure in the pumping chamber.

With this arrangement it will be seen from Fig. 1 especially that as the cam 14 rotates clockwise each pumping chamber will be gradually reduced in size between the time that the low point of the cam and the high point of the cam pass said chamber and will be gradually increased in size between the time that the high point of the cam and the low point of the cam pass said chamber.

In Fig. 1 the chamber 22 is at its minimum capacity and the chamber 19 at its maximum capacity. As the cam 14 turns clockwise the chambers 17, 18, 19 will be gradually diminished until the high point of the cam passes each chamber while the other chambers will be gradually increased until the low point of the cam has passed

each chamber. The cam 14 is shown as an eccentric as this gives a smooth vibratory movement to the partitions 16.

As each pumping chamber increases in size its inlet valve will be opened by the suction created therein and water or other liquid will be admitted from the supply chamber 10, the discharge valve for each chamber at such time being closed, while when each pumping chamber is being reduced in size the liquid which is in the chamber will be forced out through the discharge valve into the compression chamber 12, the inlet valve during such time being closed. The rotation of the cam 14, therefore, causes the chambers to act successively to pump fluid from the supply chamber 10 to the discharge or compression chamber 12.

I have stated above that the chambers 25 had pressure in them to maintain the partitions in contact with the cam 14. This result is secured by connecting each chamber 25 to the compression chamber 12 through a duct 33, (see Fig. 2). Each chamber 25 will thus have in it the full pressure in the chamber 12 which is sufficient to maintain the shoes 26 in engagement with the cam 14.

The amount of liquid which is pumped depends upon the extent to which each pumping chamber is expanded or contracted and this is determined by the eccentricity of the cam 14. I have provided herein means whereby this eccentricity will be varied automatically as the pressure increases so as to prevent the pump from becoming stalled when delivering under a high pressure.

The cam 14 is made sectional, it comprising an inner eccentric 34 which is fast on the shaft 15 and an outer eccentric member 35 which surrounds the eccentric 34. These two eccentric members 34, 35 are yieldingly connected through the medium of springs 36. There are two such springs herein shown and each is received in an arcuate chamber 37 formed in the outer member 35. Each spring bears at one end against the end 38 of its chamber and at the other end against an arm 39 which is rigid with the inner member 34. Since there are two springs 36 each in its own chamber I will employ two arms 39 and these may conveniently be made on a plate 40 (see Fig. 6) which is set into a groove in the eccentric member 34, the arms 39 of the plate operating in the spring-receiving chambers 37.

Normally the two eccentric members will assume the relative position shown in Fig. 1 due to the action of the springs 36 and when in this position the eccentricity of each of the members 34, 35 augments that of the other so that the cam 14 has its maximum throw. If, however, the member 34 is turned clockwise relative to the member 35 the result will be that the total eccentricity

or throw of the cam 14 will be reduced. The eccentricity of the two members 34, 35 is preferably the same so that if these parts were turned into a relative position 180° from that shown in Fig. 1 the eccentricity of one member would neutralize that of the other and the cam would have no throw.

In the operation of the device so long as the pump is working against normal pressure the two eccentric members 34 and 35 will maintain their relative positions shown in Fig. 1 and the cam 14 will have its maximum throw. When, however, the pressure increases beyond a predetermined amount, which amount is determined by the strength of the springs 37, then the resistance which the eccentric meets in reducing the chambers and forcing the water into the discharge chamber 12 will cause the eccentric member 35 to move backwardly relative to the member 34 thus reducing the amount of water which is delivered. If the pressure continues to increase then the resistance which the eccentric meets will cause a still further backward movement of the eccentric member 35 relative to the member 34 thus reducing still further the amount of water which is delivered. The pumping operation, therefore, will automatically adjust itself to the conditions and as the pressure increases the rate at which the water is pumped will be correspondingly lessened thereby maintaining an even load on the pump and obviating any danger that the pump will stall.

While reference has been made above to pumping of liquid and water yet I desire to state that the invention is applicable for pumping any fluid, whether of a liquid or gaseous nature. Furthermore, various changes in the constructional features of the device may be made without departing from the invention.

I claim:

1. In a rotary pump, the combination with a casing having a chamber, of a rotary cam member within the casing, the periphery of said cam member being spaced throughout its entire extent from the inner wall of said chamber, a plurality of partition members bearing against the cam member and extending outwardly therefrom in a general radial direction, said partition members dividing the annular space between the cam member and the casing into a plurality of pumping chambers, a separate inlet valve for each pumping chamber and a separate outlet valve for each pumping chamber, said valves being independent of both the cam member and the partition member.

2. In a rotary pump, the combination with a chamber having a casing, of a rotary cam member situated within said chamber, the periphery of the cam member being spaced throughout its extent from the wall of the chamber, whereby an annular space exists

between the cam member and the wall of the chamber, a plurality of arcuate partition members bearing against the rotary cam member and extending outwardly therefrom in a general radial direction, said partition members dividing said annular space into separate pumping chambers, and a separate inlet valve and a separate outlet valve for each pumping chamber.

3. In a rotary pump, the combination with a casing having a chamber, of a rotary cam member situated within the casing, the periphery of the cam member being spaced throughout its entire extent from the wall of the casing, whereby an annular space is provided between the cam member and said casing wall, a plurality of arcuate partition members bearing against the cam member and extending outwardly therefrom in a general radial direction, means pivotally connecting each partition member to the casing at a point within said chamber, and coinciding with the center of the arcuate curve of the partition member, said partition members dividing said annular space into a plurality of pumping chambers, a separate inlet valve for each pumping chamber and a separate outlet valve for each pumping chamber.

4. In a rotary pump, the combination with a casing having a chamber, of a rotary cam member within the casing, the periphery of the cam member being spaced from the peripheral wall of the casing throughout its extent, a plurality of arcuate partitions situated within the casing and engaging the cam member, means pivotally connecting each partition to the casing at a point within said chamber and coinciding with the center of the arcuate curve of the partition, said casing having curved passages closed at their outer ends in which the outer ends of the partitions operate, said partitions dividing the annular space between the cam member and the peripheral wall of the casing into a plurality of pumping chambers, a spring-pressed inlet valve and a spring-pressed outlet valve for each pumping chamber.

5. In a rotary pump, the combination with a casing having an interior chamber, of a rotary cam member within said chamber, the periphery of said cam member being spaced throughout its entire extent from the inner wall of said chamber, a plurality of partitions engaging the cam member and extending outwardly therefrom in a general radial direction, said partitions dividing the annular space between the cam member and the wall of the chamber into a plurality of pumping chambers, an inlet valve and an outlet valve for each pumping chamber, rotation of the cam member causing each pumping chamber to alternately expand and contract, and means to maintain each partition in engagement with the cam member

as it rotates by the pressure developed at the discharge end of the pump.

6. In a rotary pump, the combination with a casing having an interior chamber, of a rotary cam member within the casing, the periphery of said cam member being spaced throughout its entire extent from the inner wall of said chamber, a plurality of arcuate partitions situated within the casing and engaging the cam member, means pivotally connecting each partition to the casing within the chamber and at a point coinciding with the center of the arcuate curve of the partition, said casing having curved passages closed at their outer ends in which the outer ends of the partitions operate, said partitions dividing the chamber into a plurality of pumping chambers which are expanded and contracted as the cam member rotates, a separate inlet valve and a separate outlet valve for each pumping chamber, and means to maintain the partition members in engagement with the cam as the latter rotates.

7. In a rotary pump, the combination with a casing, of a rotary cam member within the casing, a plurality of arcuate partitions situated within the casing and engaging the cam member, means pivotally connecting each partition to the casing at a point coinciding with the center of the arcuate curve of the partition, said casing having curved passages in which the outer ends of the partitions operate, said partitions dividing the chamber into a plurality of pumping chambers which are expanded and contracted as the cam member rotates, an inlet valve and an outlet valve for each pumping chamber, and means to supply pressure to said passages thereby to maintain the partition members in engagement with the cam.

8. In a rotary pump, the combination with a casing, of a rotary cam member within the casing, a plurality of arcuate partitions situated within the casing and engaging the cam members, means pivotally connecting each partition to the casing at a point coinciding with the center of the arcuate curve of the partition, said casing having curved passages in which the outer ends of the partitions operate, said partitions dividing the

chamber into a plurality of pumping chambers which are expanded and contracted as the cam member rotates, an inlet valve and an outlet valve for each pumping chamber, a pressure chamber into which the outlet valve is discharged, said casing having a duct establishing a communication between each passage and said pressure chamber, whereby each valve is held against the cam by the pressure of the corresponding passage.

9. In a rotary pump, the combination with a stationary casing, of a rotary cam within the casing, a plurality of partition members pivoted to the casing and engaging said cam and extending outwardly therefrom, said partition members dividing the casing into a plurality of pumping chambers, an inlet valve and an outlet valve for each chamber, and means whereby the throw of the cam will be varied automatically as the load on the pump varies.

10. In a rotary pump, the combination with a stationary casing, of a rotary cam within the casing, a plurality of partition members pivoted to the casing and engaging said cam and extending outwardly therefrom, said partition members dividing the casing into a plurality of pumping chambers, a separate inlet valve and a separate outlet valve for each chamber, and means whereby the throw of the cam will be decreased as the pressure against which the pump is operating increases.

11. In a rotary pump, the combination with a casing, of a rotary cam within the casing, a plurality of partition members engaging said cam and extending outwardly therefrom, said partition members dividing the casing into a plurality of pumping chambers, an inlet valve and an outlet valve for each chamber, said cam comprising two eccentric members, and a spring yieldingly connecting said members, whereby the eccentricity of the cam will vary as the pressure against which the pump is operating increases.

In testimony whereof, I have signed my name to this specification.

ARTHUR W. WEEDEN.