

F MARION.
 ROTARY PUMP.
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1,434,716.

Patented Nov. 7, 1922.

2 SHEETS—SHEET 1.

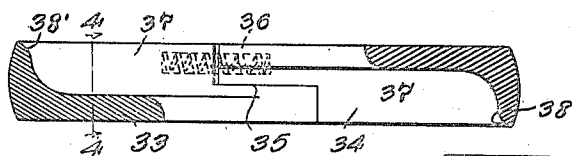


Fig. 3.

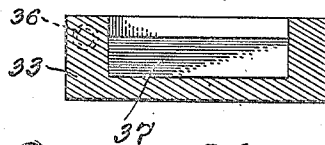


Fig. 4.

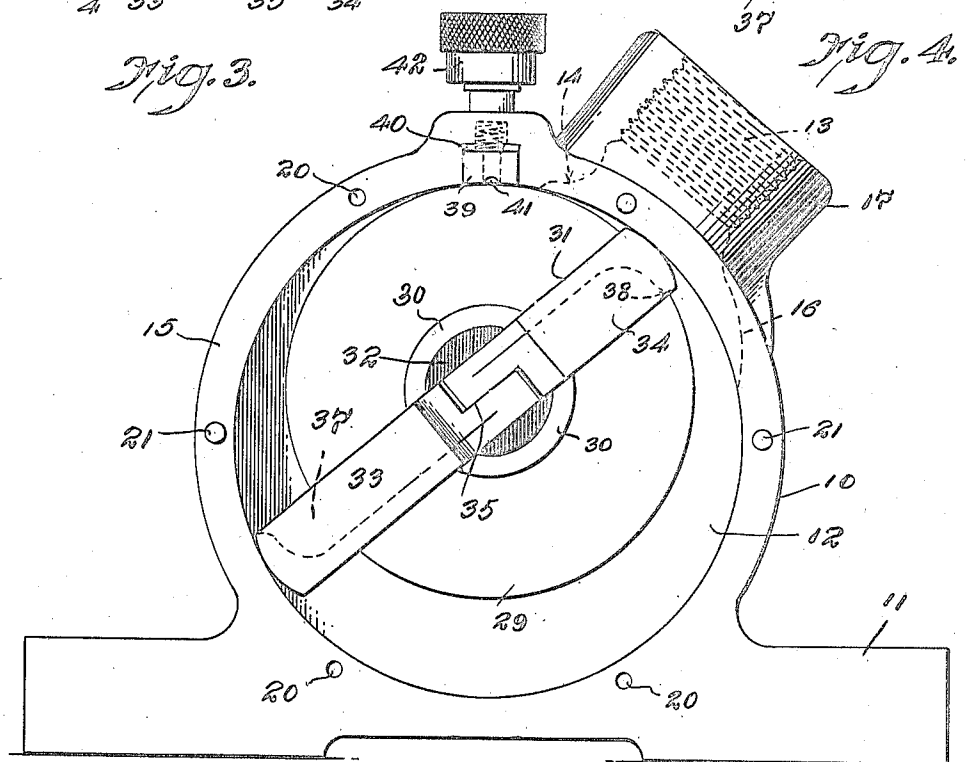


Fig. 1.

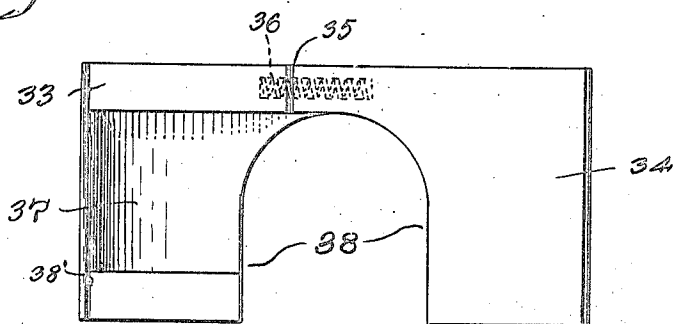


Fig. 2.

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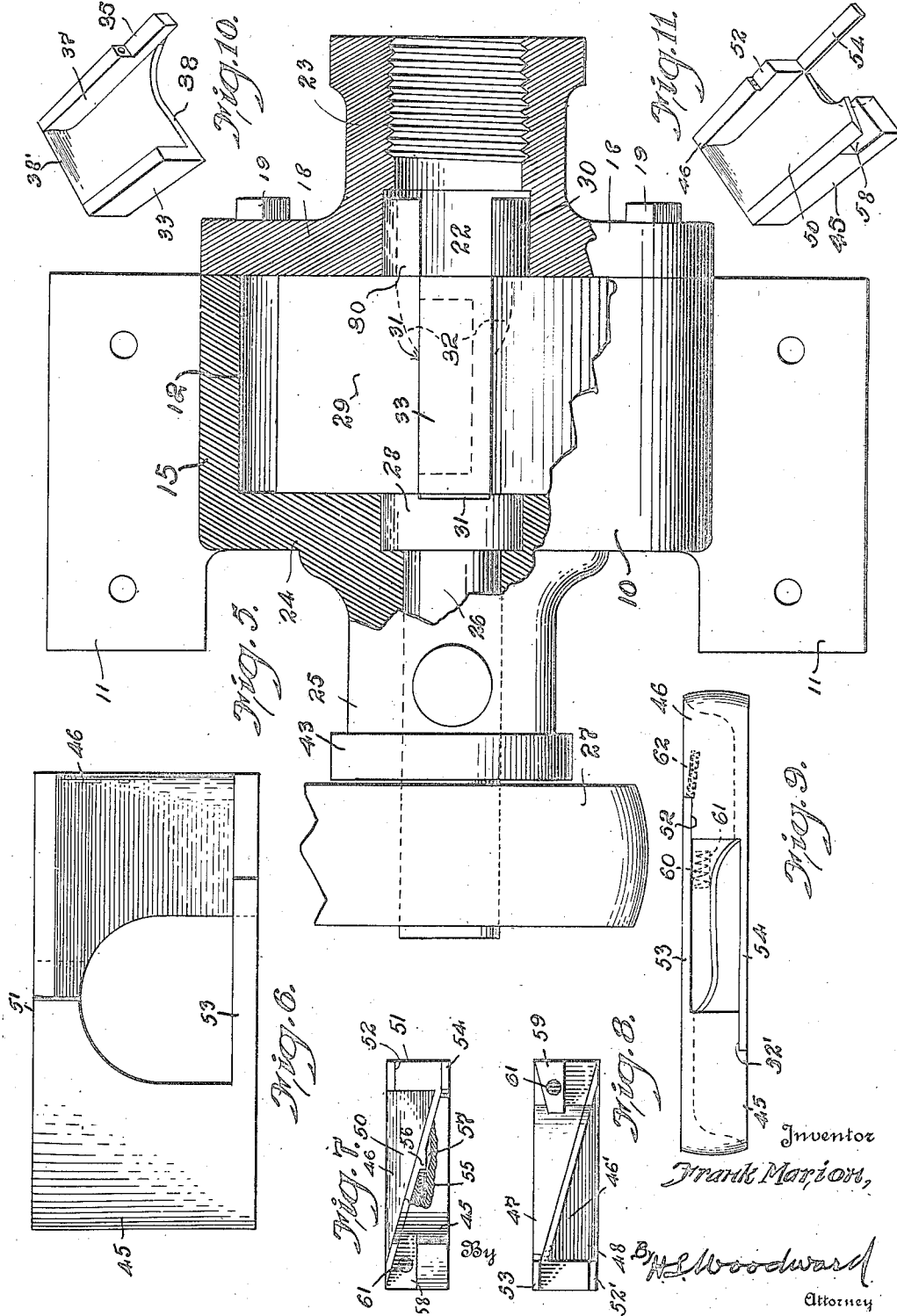
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2 SHEETS—SHEET 2.



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FRANK MARION, OF HARDWICK, VERMONT, ASSIGNOR OF ONE-HALF TO PHILIP R. HATTON, OF LEBANON, NEW HAMPSHIRE, ONE-SIXTEENTH TO BERT E. CHENARD, OF CHELSEA, MASSACHUSETTS, ONE-SIXTEENTH TO ROMEO E. PAINCHAUD, OF LEBANON, NEW HAMPSHIRE, ONE-FOURTH TO LEON E. WINN AND EDWARD T. WOLLOFF, OF NASHUA, NEW HAMPSHIRE, AND JOHN H. WYLIE, OF GLOVER, VERMONT.

ROTARY PUMP.

Application filed March 22, 1921. Serial No. 454,339.

To all whom it may concern:

Be it known that I, FRANK MARION, a citizen of the United States, residing at Hardwick, in the county of Caledonia and State of Vermont, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

The invention has for an object to effect improvements in rotary pumps and engines, in which a reciprocating piston element is mounted diametrically in an eccentrically mounted rotor in a circular casing, the purpose being to simplify the structure involved in such machine and to improve the function and increase the durability of such devices. It is a particular aim to improve the particular construction of the reciprocating piston device. It is also an aim to develop a new movement of fluid through such devices, and additional objects, advantages and features of invention will appear from the construction, arrangement and combination of parts hereinafter described and shown in the drawings, wherein,

Figure 1 is an elevational view of one embodiment of my invention with front plates removed,

Fig. 2 is a detail plan view of the piston element,

Fig. 3 is a longitudinal sectional view of the piston element,

Fig. 4 is a cross sectional view thereof on the line 4-4 of Fig. 3,

Fig. 5 is a top view of the engine with parts broken away,

Fig. 6 is a plan view of a modified form of piston,

Fig. 7 is an end elevation of one end portion of the piston,

Fig. 8 is a similar view of the opposite end portion,

Fig. 9 is an elevational view of the piston at the discharge side.

Fig. 10 is a detail perspective view of one of the end elements of the piston, as illustrated in Fig. 4.

Fig. 11 is a similar view of the modification shown in Figs. 6 to 9 inclusive.

There is illustrated a machine comprising a cast casing 10, having a suitable integral

foot 11 by which it may be bolted upon a foundation or other support, the footing projecting at opposite sides of the casing in line with its medial plane. The casing is formed with a concentric circular chamber 12, from which there opens a radial port 13 closely adjacent its vertical axis. From the port 13 a short channel 14 extends upwardly in the circumferential wall 15 of the casing, while a similar channel 16 of somewhat greater extent extends downwardly from the port in the same manner and for a greater distance. The port 13 opens through a radial boss 17, which is interiorly threaded to receive a suitable pipe or fitting. One side of the casing body is closed by a cover plate 18 secured by suitable bolts 19 engaging in the threaded bores 20. Dowels may be located at 21 to facilitate positioning of this plate. The plate is formed with an eccentric aperture or port 22 which is extended through an integral nipple 23 formed on the plate and interiorly threaded at its outer part to receive a pipe or fitting. At the opposite side, the casing is closed by an integral head plate 24 having an integrally formed heavy bearing, boss, or neck 25 extended eccentrically therefrom on the same axis as the port 22 and nipple 23. A stud shaft 26 is journaled in this bearing, projected longitudinally outward of the bearing a distance and having a pulley 27 mounted thereon, its inner end being formed with an integral hub 28 journaled in the plate 24, and a cylindrical rotor 29 is formed integrally upon the hub, concentric therewith and with the shaft. At the outer side of the rotor, hub portions 30 are formed of the same size, as the hub portion 28 and concentric therewith, although they may be larger if desired. The rotor 29 is of such radius that its periphery comes into close proximal relation to the inner peripheral face of the casing 10, and a diametrical channel or slot 31 is formed in the rotor, occupying its full width between the head 24 and plate 18, extending also through the hub portion 30. The hub portion 30 may be in the form of two cylindrical tube segments, so that the port 22 therein is slightly larger than the width

of the channel 31, and this recessed part, as indicated at 32 may be continued within the rotor, if desired. In the channel 31, there is reciprocable a piston device formed in two parts, 33, and 34 respectively, which are of a cross sectional dimension to fit snugly in the channel and between the parallel walls of the casing, as shown in the drawings. The piston elements are intended to operate substantially as one element, by the cam action of the peripheral walls of the chamber under rotation of the eccentric rotor. They are mortised at one side, as at 35, for relative sliding movement and are borne apart by a coiled spring 36 set in longitudinal bores formed in alinement in opposed faces of the mortised parts. Each of the piston sections is formed with a longitudinal channel 37 stopping short of the outer end of the section but opening through the sides thereof in the direction of rotation, very close to, if not quite at, the end of the transverse face of the section at the forward side, the outer end face 38' of the channel being curved slightly outward, so that the point of opening is brought close to the end of the section, as described, indicated at 34. The inner end portion of the section is cut away at the side next to the port 22, as shown at 38 whereby there will be ample clearway from the channel 37 to the port.

At the top of the casing, a transverse packing bar 39 is mounted snugly in a rectangular channel 40, the bar being spring-pressed as indicated and formed with a longitudinal channel 41 in its inner face having an oil duct opening therefrom to the outer face of the bar so as to receive oil from the cup 42 mounted upon the casing. A packing device 43 may be provided on the outer end of the bearing 25, if desired, although this has not ordinarily been found essential.

When used in the form described as a pump for liquids such as water, oils, cream, etc., this machine has been found subject to negligible impairment through wear, and has also been used as an air compressor. In order to insure maintenance of a snug fit of the piston between the parallel walls of the casing, however, wear being greatest against the walls, I have provided a construction shown in Figs. 6 to 9 inclusive, and Fig. 11. In this instance, each of the end elements is formed in two parts meeting upon a diagonal plane bisecting the parallelogram formed by the pistons in cross section, at its angles. When the parts are assembled, this diagonal plane of division is inclined one way at one end, and the opposite way at the other, Figs. 7 and 8 showing inner end elevations of these parts, one of which may abut against and interlock with the other when turned away from the observer, as will become apparent.

It is observed that the modified form of piston has been drawn in a shape for use in a rotor turning in a counter-clockwise direction, while in the first described form the piston was suitable for rotation in a clockwise direction, in case it is to be used as a liquid pump. The sections at one end of the piston are numbered 45 and 46 respectively, the latter being the one advanced in the direction of rotation for use as a liquid pump, while the sections at the opposite end of the piston are numbered 47 and 48, the latter being the advanced side when pumping. The advancing member 46 is formed with a channel 50, the bottom of which is parallel to the underside of the section 46, or diagonal, so that the channel is deeper at one side than at the other. The deep side is located next to the port 22, preferably so that liquid entering the outer end of the channel may readily pass to the port through the deeper part of the channel. The section 48 is formed in a similar manner. The side wall 51 of the section 46, at its deeper side is formed with a cut-away portion 52 at the upper part in which there is mortised a scarf 53 formed in the corresponding side of the inner end of the section 48, a similar scarf piece 54 being formed at the lower side of the section 46 to engage in a recess 52' formed in the lower side of the section 48 beside the channel 46' therein. The section 45 upon which the section 46 is laid, has a spring 55 set therein to impinge upon a shoulder 56 formed upon the section 48 and movable laterally in a recess 57 formed in the section 45, whereby the spring may bear the two sections laterally against the walls of the engine casing.

The last named functioning of the device would at first glance appear to work a detriment to the efficiency of the engine, since movement of the sections upon each other as indicated makes the piston of less thickness. But it has been found in practice that the compression of liquid before the open sides of the piston sections tends to bear them against the opposite sides of the channel in the rotor, and the fact that there is play on the compression side merely enlarges the clearway for movement of the fluid through the piston and rotor, in the desired direction.

The section 45 is recessed at 58 upon the upper side, to receive a scarf piece 59 formed upon the section 47 at the opposite end of the piston, and a spring 60 is provided in a suitable bore 61 in each of the elements to bear them longitudinally apart. A spring 62 is also mounted in one of the upper elements of Figures 7 and 8 to bear each scarf and the member in which it is mortised apart.

This construction of pump has an advantage over that type of pump in which a

simple piston is used adapted to force a liquid around the casing and through an outlet port in a corresponding location but at the opposite side of the casing from the inlet port, in that when the first or familiar form of device is used as a pump, the piston has an extremely binding action in the rotor and requires a much greater amount of power for the operation of the pump, while in my pump, owing to the pressure of the water being applied equally to the inner part of the piston sections they are held flatly against the side of the channel and binding action minimized. There are other advantages peculiar to my invention, among which may be noted the fact that at one part of the movement of the device, there is communication between the port 13 and the space at both sides of the piston, this position being indicated in Fig. 1, there being direct communications with the port and space at the lower side of the piston, while communication is formed between the face of the upper side of the piston and the port 13 through the piston. It is also to be noted that at this time there would be open communication between the port 13 and the port 22, inlet and outlet, when used as a pump. In case the device is used for a pump, especially acting upon non-compressible liquids, these facts involve peculiar advantages in the pump.

The construction and relation of the parts last mentioned has the effect of making this pump a combined solid piston and fluid momentum pump. While this device does not utilize centrifugal force, and the movement of liquid depends upon positive movement of the piston in a closed way to impart movement to the liquid, still there are periods in its action when the piston positively imparts to the liquid a movement of an accelerated character at the end of which period, slightly before the position indicated in Fig. 1, the movement of the piston within the casing will be such that the pressure at the maximum acceleration could not be sustained. My construction is such that at this point, communication is open through the pump so that the momentum imparted to the liquid will cause it to function as a liquid piston drawing in liquid through the pump until the piston and other parts come to position where the movement of the liquid and the piston will coincide, or the piston will tend to produce a pressure upon the liquid in the direction of the intended flow. The foregoing will be understood by noting that when one end of the piston passes below

the channeled extension 16 of the port 13, there is an accelerated movement of the liquid until the piston approaches near to the position shown in Fig. 1, at which time the movement of the piston in the rapidly convergent space at the far side of the casing from the intake, limits the amount of fluid which may be propelled, and due to the fact that the opposite end of the piston entering the compression stage is passing the port 13, it displaces little if any liquid. If, at that stage, there were no communication between the outlet and inlet of the pump, the rapid motion previously imparted to the discharged liquid would be checked, and its momentum overcome, after which the inertia of the whole column of liquid would have to be overcome again by the pump, using a considerable amount of energy which is saved in my device by allowing the moving column of water to draw liquid from the supply source.

When it is desired to use this engine as an air compressor it has been found necessary to run it in a direction opposite that in which it is turned for pumping water, and snugly fitted piston elements are desirable for the highest efficiency.

What is claimed:—

1. In a rotary pump of the character described, a rotor open at one side, a casing having an outer port, a piston reciprocable through the rotor comprising two sections relatively movable longitudinally, having respective channels in opposite faces and having their inner end portions cut away at one side adjacent the open side of the rotor, and a spring confined between the sections, said casing having an inner port in communication with said open side of the rotor.

2. In a rotary pump of the character described, a piston formed in two main parts each in two sections meeting on a diagonal plane bisecting said parts longitudinally at an acute angle to the medial plane of the piston, the sections of each main part having sliding mortised connections with opposed sections of the other main part, resilient means confined between the said parts tending to thrust them longitudinally apart, and resilient means confined between the sections of each part, whereby compensation for wear in all directions and for variation of length in the chord of the arc of a casing wall subtended by the piston is attained.

In testimony whereof I have affixed my signature.

FRANK MARION.