March 12, 1929. A. W. GARDES 1,704,938

ROTARY PUMP OR THE LIKE

Filed Nov. 3, 1927 2 Sheets-Sheet 1

Fig. 1

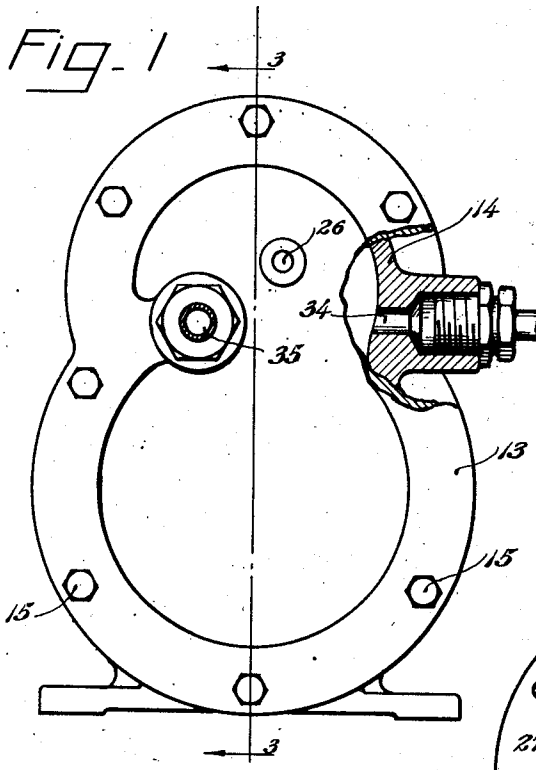


Fig. 4

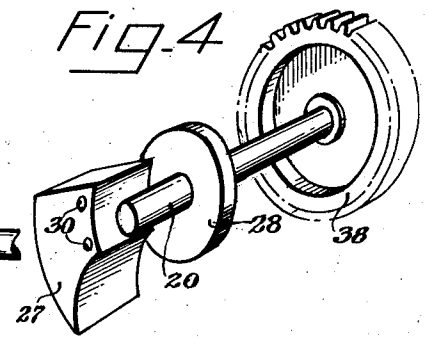


Fig. 2

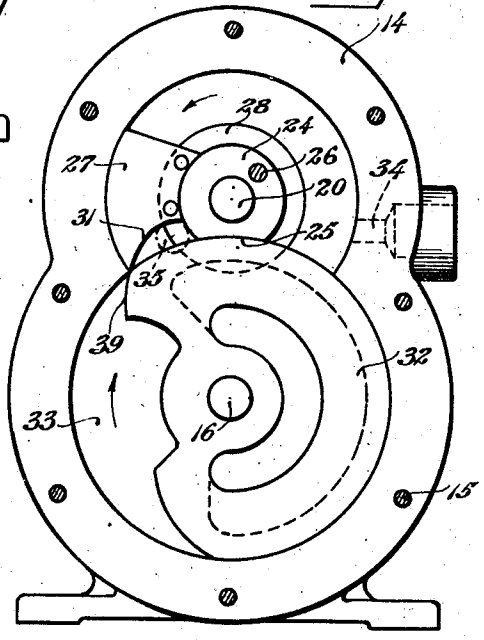
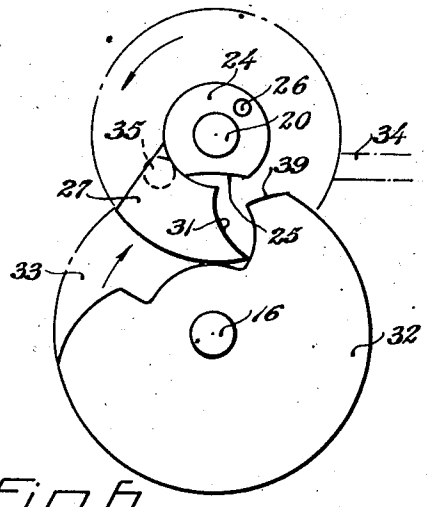


Fig. 6



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Filed Nov. 3, 1927 2 Sheets-Sheet 2

Fig. 3

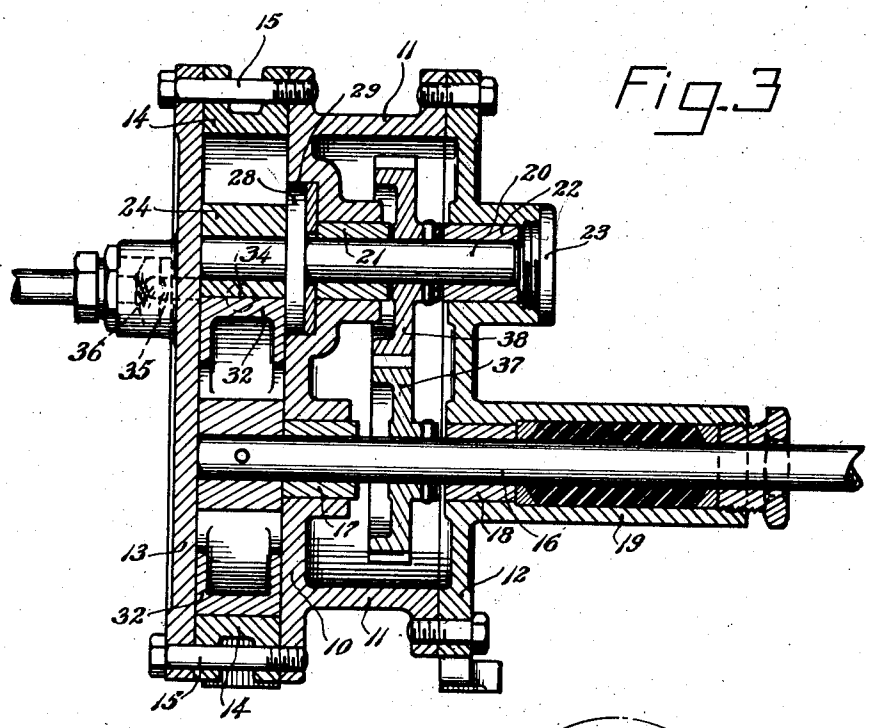


Fig. 5

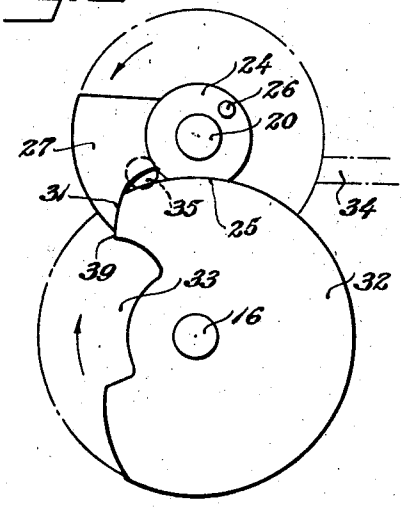
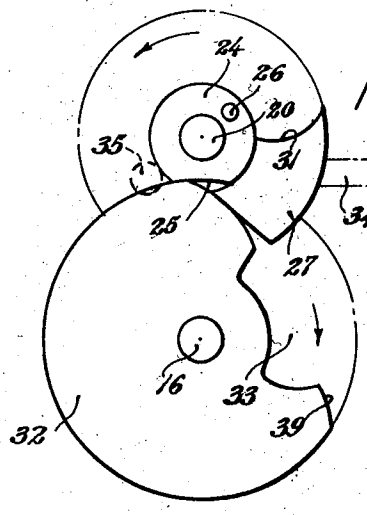


Fig. 7



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Patented Mar. 12, 1929. 1,704,938

UNITED STATES PATENT OFFICE.

ALFRED WILTZ GARDES, OF DAYTON, OHIO.

ROTARY PUMP OR THE LIKE.

Application filed November 3, 1927. Serial No. 230,889.

This invention relates to rotary pumps and other rotary mechanisms of a similar kind.

One object of the invention is to provide a rotary pump which will have a very high degree of efficiency and which will be simple in its construction and operation.

A further object of the invention is to provide such a pump in which the sealing surfaces of the pump member will be subjected to little or no wear, thus preventing decreased efficiency in the operation of the pump after long use.

A further object of the invention is to provide a rotary pump of such a construction that it can be quickly and easily manufactured and assembled.

Other objects of the invention will appear as the device is described in detail.

In the accompanying drawings Fig. 1 is a front elevation of a pump embodying my invention, partly broken away; Fig. 2 is a front elevation of such a pump with the front plate of the casing removed to show the pumping members in elevation; Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1; Fig. 4 is a detail view of the piston and its operating shaft; and Figs. 5, 6 and 7, are detail views showing successive positions of the piston and abutment.

In these drawings I have illustrated one embodiment of my invention but it will be understood that the mechanism may take various forms without departing from the spirit of the invention and that the apparatus may be used as a pump or compressor for fluid or by a proper arrangement of the pipe connections may be used as a suction pump.

In that particular embodiment here illustrated the pump comprises a two-part casing having an intermediate member or wall 10 provided with a rearwardly extending flange or lateral wall 11 to the rear edge of which is secured a back wall 12, thus forming a rear chamber in which is arranged driving gearing as will hereinafter appear. A front wall 13 is spaced from the intermediate wall 10 by a spacing member or side wall 14, the front wall and spacing member being secured to the intermediate wall by bolts 15. It will be noted that the contact surfaces of the several parts of the casing are flat so that they may be easily ground to provide contact surfaces which will produce a perfect seal when secured one to the other. Rotatably mounted in the lower portion of the casing is a drive shaft 16 which is here shown as mounted in bearings 17 and 18 in the intermediate and rear walls of the casing, the front end of which extends into the forward compartment formed between the intermediate wall and the front wall 13. The rear wall is provided with a stuffing box 19 through which the shaft extends. Rotatably mounted in the upper part of the casing is a shaft 20 which is parallel with a shaft 16 and is here shown as journaled in bearings 21 and 22 in the intermediate and rear walls of the casing and as extending into the forward compartment. A cap or screw plug 23 engages the rear end of the shaft to seal the end of the bearing. The lower and upper parts of the casing are curved about the axes of the shafts 16 and 20, respectively, and the radii of the respective chambers are of different length and of such length with relation to the distance between the axes of the two shafts that the walls of the chambers, if extended, would intersect, thus causing the chambers formed in the upper and lower parts of the front compartment of the casing to merge into and have communication with each other. Loosely mounted about the shaft 20 in the upper portion of the forward compartment is a member 24 which is substantially cylindrical in shape but has in its lower portion a curved recess 25. This cylindrical member is held against rotation with the shaft, preferably by means of a pin 26 extending through the front wall 13 of the casing and into the cylindrical member. The diameter of the cylindrical member is considerably less than the diameter of the upper part of the forward compartment, thus forming between the cylindrical member and the wall of the compartment an elongated work chamber which is in the form of a partial annulus and the ends of which open into the lower part of the forward compartment. The side walls of the work chamber being flat it will be apparent that the work chamber is rectangular in cross section. Mounted within the work chamber is a piston 27 which is connected with the shaft 20 for rotation therewith. The piston may be connected with the shaft in any suitable manner and, in the present instance, I have rigidly secured to the shaft 20 a disk 28 which is seated in a recess 29 in the intermediate wall of the casing and which is

of a diameter somewhat greater than the diameter of the cylindrical member 24. The piston is rigidly secured to the outer portion of this disk by means of pins or rivets 30. The piston has flat lateral surfaces to conform to the sides of the work chamber, and has its inner and outer surfaces curved to conform to the curvatures of the inner and outer walls of the chamber, as formed by the cylindrical member 24 and the spacing member 14. The piston rotates through the work chamber in the direction of the arrow in Fig. 2 and its forward face is curved inwardly and rearwardly from the forward outer edge thereof, as shown at 31, so that the forward end of the piston tapers forwardly to its outer surface. Mounted in the lower chamber of the casing, which is cylindrical in shape, is a segmental abutment 32, the peripheral surface of which is preferably of a length somewhat greater than a semi-circle. This peripheral wall fits snugly within the cylindrical chamber and, when the abutment is in one position, will extend into the upper portion of the compartment and have sealing contact with the cylindrical member 24. Because of the curved recess in the lower side of the cylindrical member the sealing contact will be a relatively long one and will effectually prevent the passage of fluid. The abutment is cut away or recessed on one side, as shown at 33, to permit the piston to pass through the upper portion of the cylindrical chamber. The abutment during a portion of its rotation will extend across the two ends of the work chamber, thus closing that chamber both in the rear of and in advance of the piston 27. The work chamber is provided with an inlet, preferably near the rear end thereof, as shown at 34, and is provided with an outlet close to the forward end thereof, as shown at 35. The outlet may, if desired, be provided with a check valve 36. The piston and the abutment are rotated in timed relation one to the other, that is, at speeds which are fixed with relation one to the other, this being accomplished in the present instance by the use of intermeshing gears 37 and 38, secured respectively to the shafts 16 and 20 and arranged in the rear compartment of the casing. In the present arrangement the shaft 16 constitutes a drive shaft and may be driven from any suitable source of power, as by direct connection with an electric motor. The abutment rotates in a direction opposite to that in which the piston rotates and is so arranged with relation to the piston that during the time that the piston is moving from the inlet to the outlet of the work chamber the abutment will be in such a position as to close both ends of the work chamber. Thus the fluid in advance of the piston will be forced through the outlet 35. The piston and the abutment are so shaped and arranged that as the piston approaches the forward end of the work chamber and the rear end of the abutment is about to move across the forward end of the work chamber the piston and abutment will be brought into sealing contact one with the other. As here shown, the rear end of the piston has a transverse contact surface 39 which is so shaped and arranged that it will be brought into contact with the curved front face 31 of the piston, thus producing a sealed joint between the two parts and as these parts continue their rotation the end of the abutment will move over the curved face of the piston to a position in which it will almost entirely eliminate the space between these parts, thus causing substantially all of the fluid which is confined between the piston and the abutment to be forced through the outlet 35, which is so arranged that it will communicate with the space between the piston and the abutment at all times during the compression movement of the piston. As the piston and abutment continue their movements the piston will enter the recess 33, which provides sufficient clearance to permit the passage of the piston, as shown in Fig. 6, the piston then enters the rear end of the work chamber, as shown in Fig. 7, and before it has cleared the inlet 34 the abutment will have closed the forward end. In order to secure the proper cooperation and timing of the piston and abutment it is desirable that the abutment have a radius somewhat greater than the radius of the piston, and I have found that satisfactory results are had when these radii have a ratio of substantially 3 to 3.75.

The arrangement and manner of mounting the piston and the abutment are such that the surfaces of these parts have very light contact one with the other and with the fixed parts of the casing so that they are subjected to very little wear and will maintain the proper sealing contact practically indefinitely. The relation of the abutment to the front face of the piston is such as to discharge substantially all of the fluid from the work chamber, thereby securing a very high efficiency and producing a relatively high compression when the pump is used as a compressor. The pump is capable of operation at a very high speed and a relatively small pump will handle large quantities of fluid. The construction of the several parts of the pump are of such a character that they can be very quickly and easily manufactured. The several parts of the casing can be cast and the flat faces thereof ground, by a very simple operation, to provide the proper contact surfaces. The several working parts can be mounted on the intermediate wall 10 of the casing and the front and rear walls then applied thereto, thereby pro-

viding for a very quick and easy assembly of the mechanism.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a mechanism of the character described, a casing having a work chamber in the form of a partial annulus and having a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, an abutment rotatably mounted in said cylindrical chamber and having a continuous peripheral surface so arranged that during a portion of its rotation it will close both ends of said work chamber, a single piston mounted for movement through said work chamber and through the adjacent portion of said cylindrical chamber, said abutment being recessed to provide clearance for said piston, and means for actuating said piston and said abutment at speeds which are fixed with relation one to the other.

2. In a mechanism of the character described, a casing having a work chamber in the form of a partial annulus and having a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, an abutment rotatably mounted in said cylindrical chamber and so arranged that during a portion of its rotation it will close both ends of said work chamber, a piston mounted for movement through said work chamber and through the adjacent portion of said cylindrical chamber, said abutment being recessed to provide clearance for said piston, said piston and said abutment having parts arranged to be brought into sealing contact when said piston enters said cylindrical chamber, and means for actuating said piston and said abutment at speeds which are fixed with relation one to the other.

3. In a mechanism of the character described, a casing having a work chamber in the form of a partial annulus and having a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, an abutment rotatably mounted in said cylindrical chamber and so arranged that during a portion of its rotation it will close both ends of said work chamber, a piston mounted for movement through said work chamber and through the adjacent portion of said cylindrical chamber, said abutment being recessed to provide clearance for said piston, said piston having curved front face and said abutment having a part arranged to be brought into sealing contact with said curved face as said piston enters said cylindrical chamber and to travel over said curved face as said members continue their movement, said outlet having communication with the space between said piston and said abutment, and means for actuating said piston and said abutment at speeds which are fixed with relation one to the other.

4. In a mechanism of the character described, a casing having a work chamber, a piston mounted in said work chamber for rotation about a fixed axis and having a curved front face, an abutment rotatably mounted in said casing, so arranged that during a portion of its movement it will extend across said work chamber in advance of said piston and having a part arranged to be brought into sealing contact with the curved face of said piston as the latter approaches the forward end of said work chamber and to be moved to such a position with relation to said piston as to substantially eliminate space between said piston and said abutment, said work chamber having an outlet leading from the space between said front face of said piston and said abutment, and means for rotating said piston and said abutment in timed relation one to the other.

5. In a mechanism of the character described, a casing having a work chamber, a piston mounted in said work chamber for rotation about a fixed axis and having a curved front face, an abutment rotatably mounted in said casing on an axis parallel with the axis of said piston and having a part curved about its axis and arranged to extend across said work chamber in advance of said piston and also having a recess to permit said piston to pass the same, the rear end of said curved part having a relatively wide contact surface arranged to be brought into sealing contact with the curved face of said piston as the latter approaches the forward end of said work chamber and to move over said face of said piston as said members continue their movement, said work chamber having an outlet leading from the space between the front face of said piston and said abutment, and means for rotating said piston and said abutment in timed relation one to the other.

6. In a mechanism of the character described, a casing, parallel shafts mounted in said casing and spaced one from the other, the end portions of said casing being curved about the respective shafts on radii of different lengths, a substantially cylindrical member mounted about the axis of the smaller portion of said casing and spaced from the wall thereof to form an elongated work chamber, a piston mounted in said work chamber and connected with the shaft therein, a segmental abutment secured to the shaft in the larger portion of said casing and

having its periphery arranged to have sealing contact with said cylindrical member in the smaller portion of said casing and to close both ends of said work chamber, the rear end of said abutment and the front face of said piston being arranged to have sealing contact one with the other as the rear end of said abutment moves across the front end of said work chamber, said work chamber having an inlet near the rear end thereof and an outlet near the front end thereof, and means for rotating said piston and said abutment at speeds fixed with relation one to the other.

7. In a mechanism of the character described, a casing, parallel shafts mounted in said casing and spaced one from the other, the end portions of said casing being curved about the respective shafts on radii of different lengths, a substantially cylindrical member mounted about the axis of the smaller portion of said casing and spaced from the wall thereof to form an elongated work chamber, a piston mounted in said work chamber, connected with the shaft therein and having its front face curved inwardly and rearwardly from the outer surface thereof, a segmental abutment secured to the shaft in the larger portion of said casing and having its periphery arranged to have sealing contact with the cylindrical member in the smaller portion of said casing and to close both ends of said work chamber, said abutment having a curved portion at the rear end thereof arranged to have sealing contact with the curved face of said piston as the rear end of said abutment moves across the front end of said work chamber, said work chamber having an inlet near the rear end thereof and an outlet near the front end thereof, and means for rotating said piston and said abutment at speeds fixed with relation one to the other.

8. In a mechanism of the character described, a casing, parallel shafts mounted in said casing and spaced one from the other, the end portions of said casing being curved about the respective shafts on radii of different lengths, a substantially cylindrical member mounted about the axis of the smaller portion of said casing and spaced from the wall thereof to form an elongated work chamber, a disk rigidly secured to the shaft in the smaller portion of said casing and of a diameter greater than the diameter of said cylindrical member, the rear wall of said casing being recessed to receive said disk, a piston mounted in said work chamber and rigidly secured to said disk, a segmental abutment secured to the shaft in the larger portion of said casing and having its periphery arranged to have sealing contact with said cylindrical member in the smaller portion of said casing and to close both ends of said work chamber, the rear end of said abutment and the front face of said piston being arranged to have sealing contact one with the other as the rear end of said abutment moves across the front end of said work chamber, said work chamber having an inlet near the rear end thereof, and an outlet near the front end thereof, and means for rotating said piston and said abutment at speeds fixed with relation one to the other.

9. In a mechanism of the character described, a casing, parallel shafts mounted in said casing and spaced one from the other, the end portions of said casing being curved about the respective shafts on radii of different lengths, a substantially cylindrical member mounted about the axis of the smaller portion of said casing and spaced from the wall thereof to form an elongated work chamber, a piston mounted in said work chamber and connected with the shaft therein, a segmental abutment secured to the shaft in the larger portion of said casing and having its periphery arranged to have sealing contact with said cylindrical member in the smaller portion of said casing and to close both ends of said work chamber, said cylindrical member having a curved recess to provide a relatively large contact surface for said abutment, the rear end of said abutment and the front face of said piston being arranged to have sealing contact one with the other as the rear end of said abutment moves across the front end of said work chamber, said work chamber having an inlet near the rear end thereof and an outlet near the front end thereof, and means for rotating said piston and said abutment at speeds fixed with relation one to the other.

10. In a mechanism of the character described, a casing, parallel shafts mounted in said casing and spaced one from the other, the end portions of said casing being curved about the respective shafts on radii of different lengths, a substantially cylindrical member mounted about the axis of the smaller portion of said casing and spaced from the wall thereof to form an elongated work chamber, the lateral walls of said work chamber being flat and the inner and outer walls thereof being curved about the axis of said shaft, a piston shaped to fit within said work chamber and connected with said shaft, a segmental abutment secured to said shaft in the larger portion of said casing and having its periphery arranged to have sealing contact with said cylindrical member in the smaller portion of said casing and to close both ends of said work chamber, the rear end of said abutment and the front face of said piston being arranged to have sealing contact one with the other as the rear end of said abutment moves across the front end of said work chamber, said work

chamber having an inlet near the rear end thereof and an outlet near the front end thereof, and means for rotating said piston and said abutment at speeds fixed with relation one to the other.

11. In a mechanism of the character described, a casing comprising an intermediate wall having a laterally extending flange, a rear wall secured to the edge of said flange, a spacing member secured to that side of said intermediate wall opposite said flange and a front wall secured to said spacing member, parallel shafts journaled in said casing, gears connecting said shafts one with the other, a part mounted in the space between said intermediate wall and said front wall about the axis of one of said shafts, held against rotation with said shaft and spaced from said spacing member to form a work chamber, a piston mounted in said work chamber and connected with said shaft, an abutment also mounted in the space between said intermediate wall and said front wall having a peripheral portion arranged to close the ends of said work chamber and having a recess to permit said piston to pass the same, said abutment and said piston having cooperating parts arranged to be brought into sealing contact as said piston approaches the front end of said work chamber, said work chamber having an inlet near the rear end thereof, and an outlet near the front end thereof.

12. In a mechanism of the character described, a casing comprising an intermediate wall having a laterally extending flange, a rear wall secured to the edge of said flange, a spacing member secured to that side of said intermediate wall opposite said flange and a front wall secured to said spacing member, the several parts of said casing having flat surfaces to form tight joints between the same when said parts are secured one to the other, parallel shafts journaled in said casing, gears connecting said shafts one with the other, a part mounted in the space between said intermediate wall and said front wall about the axis of one of said shafts, held against rotation with said shaft and spaced from said spacing member to form a work chamber, a piston mounted in said work chamber and connected with said shaft, an abutment also mounted in the space between said intermediate wall and said front wall having a peripheral portion arranged to close the ends of said work chamber and having a recess to permit said piston to pass the same, said abutment and said piston having cooperating parts arranged to be brought into sealing contact as said piston approaches the front end of said work chamber, said work chamber having an inlet near the rear end thereof, and an outlet near the front end thereof.

13. In a mechanism of the character described, a casing having a work chamber and a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, a single piston mounted in said work chamber for rotation about an axis arranged centrally thereof, an abutment rotatably mounted in said cylindrical chamber and so arranged that during a portion of its movement it will close said work chamber in advance of said piston, said abutment being recessed to provide clearance for said piston, and means for rotating said piston and said abutment.

14. In a mechanism of the character described, a casing having a work chamber and a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, a single piston mounted in said work chamber for rotation about an axis arranged centrally thereof, an abutment rotatably mounted in said cylindrical chamber and so arranged that during a portion of its movement it will close said work chamber in advance of said piston, said abutment being recessed to provide clearance for said piston, and having at its rear end a part arranged to have a sealing contact with the face of said piston as said end of said abutment moves across the front end of the work chamber, and means for rotating said piston and said abutment.

15. In a mechanism of the character described, a casing having a work chamber in the form of a partial annulus and having a cylindrical chamber at one side of and communicating with said work chamber, said work chamber having an inlet and an outlet, a single piston mounted for movement through said work chamber and acting on the entire body of fluid contained in said work chamber in advance of said piston, an abutment rotatably mounted in said cylindrical chamber and arranged to close the front end of said work chamber during the movement of said piston through said work chamber and having a recess to permit said piston to pass from the front end of said work chamber to the rear end thereof, said abutment having at its rear end a part arranged to have sealing contact with the face of said piston as said rear end of said abutment moves across the front end of said work chamber, and means for rotating said piston in said abutment.

In testimony whereof, I affix my signature hereto.

ALFRED W. GARDES.