June 26, 1945. E. K. JOHANSEN 2,379,156

PUMP

Filed May 12, 1944 3 Sheets-Sheet 1

Fig. 1

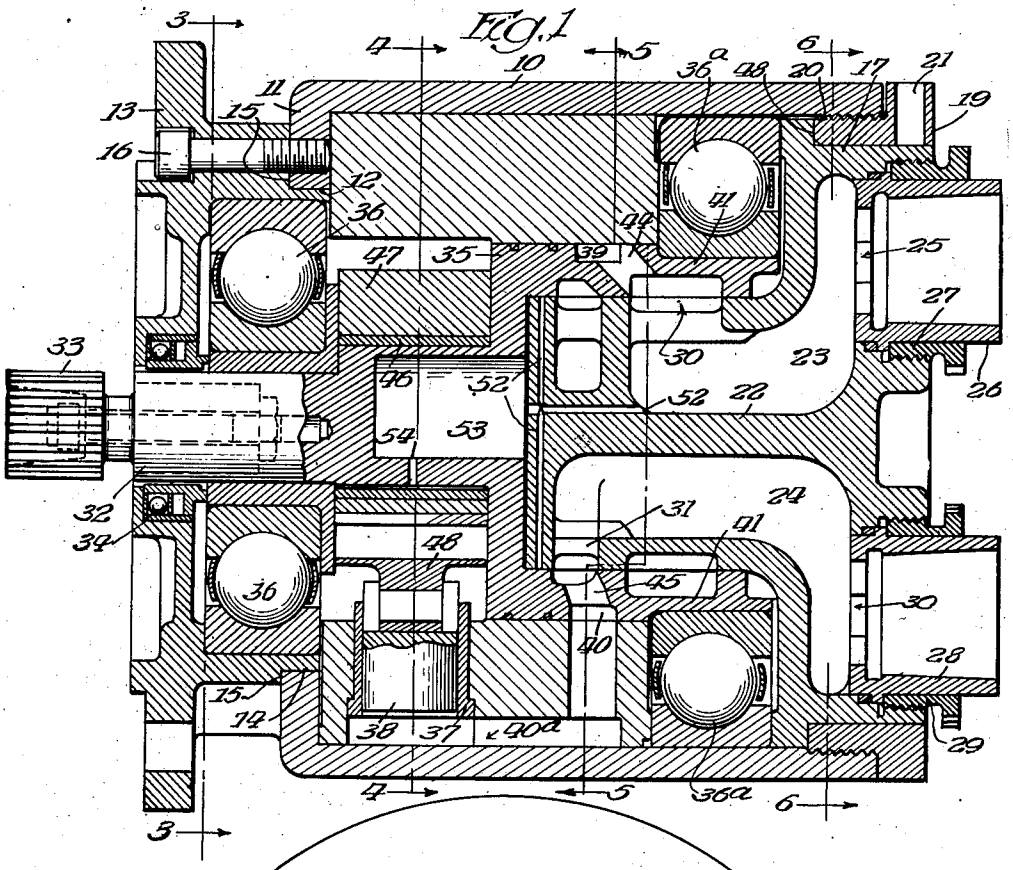
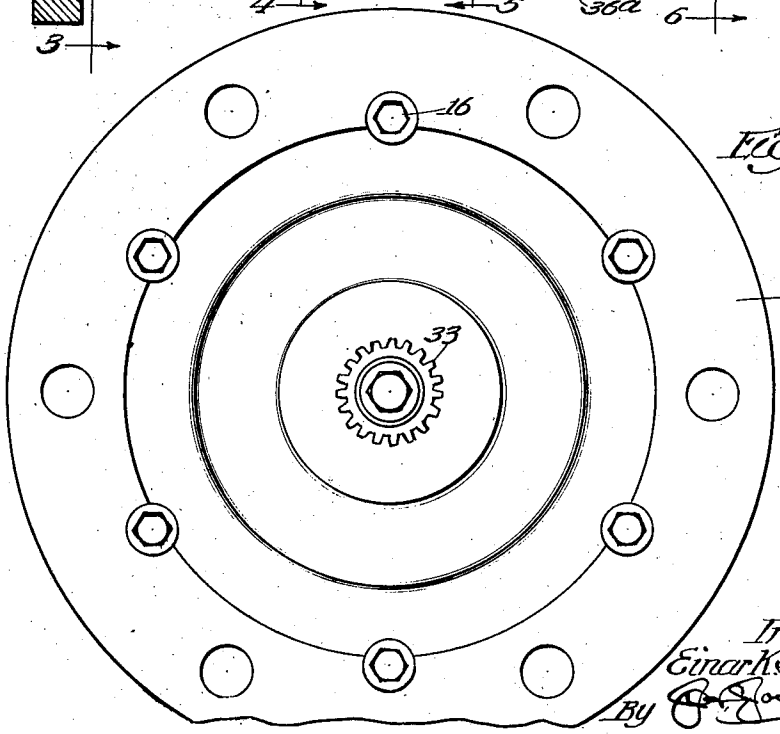


Fig. 2



Inventor
Einar K. Johansen
By
Atty.

June 26, 1945. E. K. JOHANSEN 2,379,156

PUMP

Filed May 12, 1944 3 Sheets-Sheet 2

Fig. 3

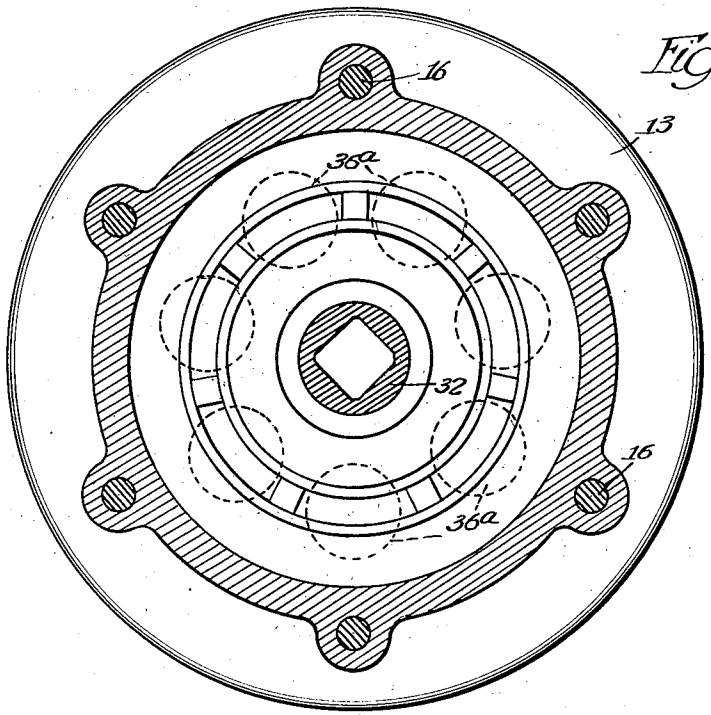
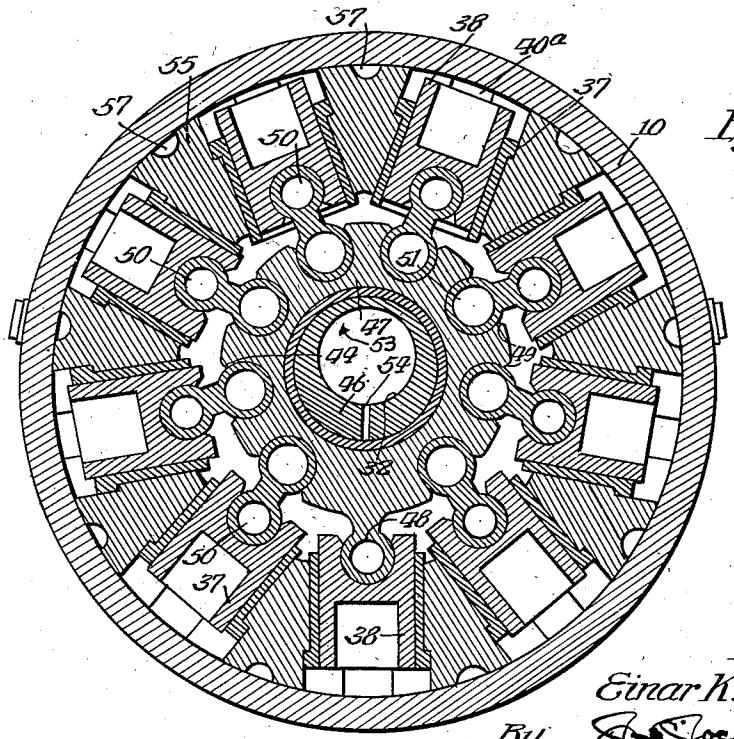


Fig. 4



Inventor
Einar K. Johansen
By

June 26, 1945. E. K. JOHANSEN 2,379,156

PUMP

Filed May 12, 1944 3 Sheets-Sheet 3

Fig. 5

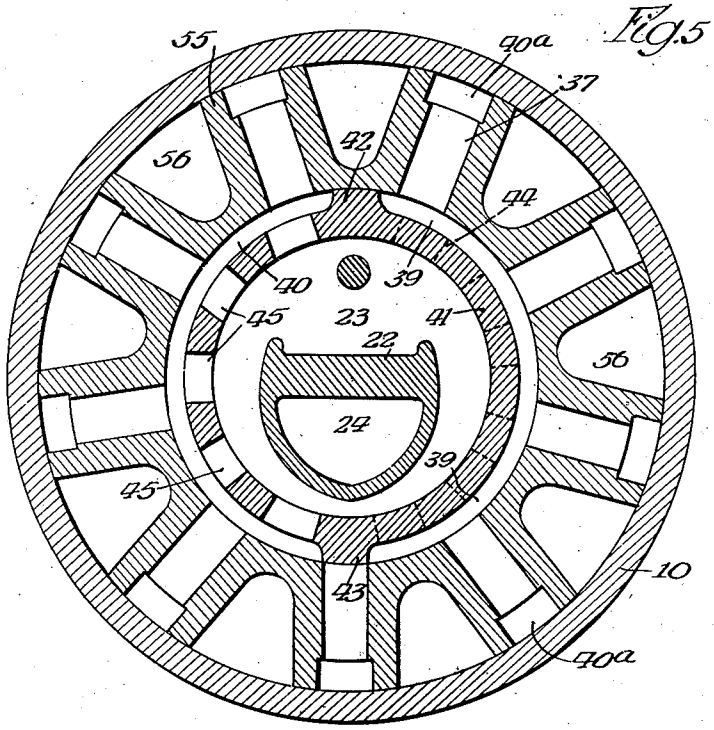
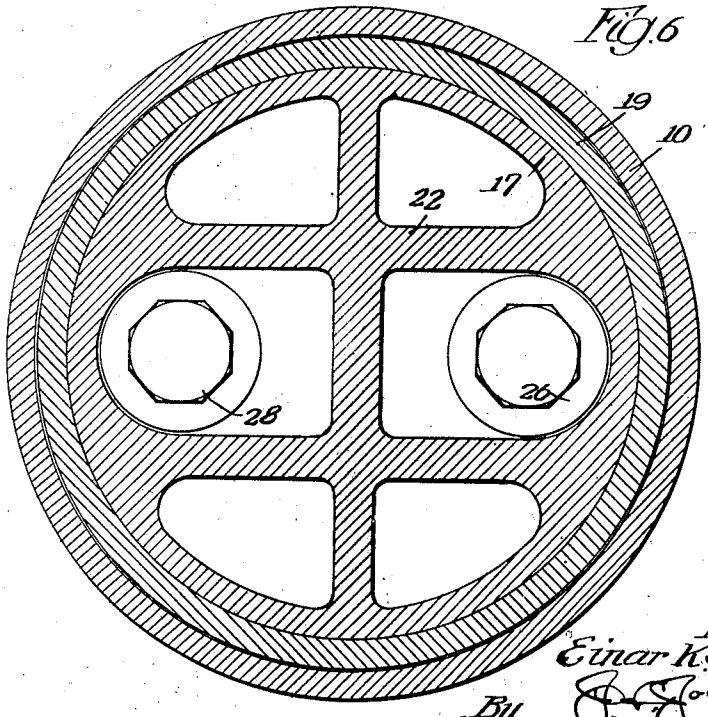


Fig. 6



Inventor
Einar K. Johansen
By
Attty

Patented June 26, 1945 2,379,156

UNITED STATES PATENT OFFICE

2,379,156

PUMP

Einar K. Johansen, Chicago, Ill., assignor to Clearing Machine Corporation, Chicago, Ill., a corporation of Illinois

Application May 12, 1944, Serial No. 535,253

12 Claims. (Cl. 103—174)

This invention relates, in general, to pumps or motors, but more particularly to the type of pumps generally known as radial piston pumps, and one of the objects of the invention is to improve and simplify the construction of the pump, whereby the size and weight, as well as the number of rotating parts, will be reduced to a minimum, while, at the same time, the pump will operate at a high speed.

A further object is to provide an improved pump of this character, which will rotate or operate in either direction, and in which the suction and discharge passages will be of substantially the same area or size, to permit of such operations, without the necessity of altering any of the internal parts of the pump to render it operable in the desired direction.

A further object is to provide an improved construction of pump of this character, in which the number of bearings will be reduced to a minimum, rendering it less difficult to maintain the operating parts in alinement.

A further object is to provide a pump of this character, in which the pistons will be operated by an eccentric, and in which the valve that controls the suction and discharge of the pistons at the various operating stages, will be formed integral with, and constitute a part of, the operating shaft.

To the attainment of these ends and the accomplishment of other new and useful results as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts, hereinafter more fully described and claimed, and shown in the accompanying drawings illustrating this invention, in which

Fig. 1 is a longitudinal sectional view of a pump of this character, constructed in accordance with the principles of this invention.

Fig. 2 is a left-hand end elevation of Fig. 1.

Fig. 3 is a detail sectional view taken on line 3—3, Fig. 1.

Fig. 4 is a detail sectional view taken on line 4—4, Fig. 1, and showing the parts 90° from the position shown in Figs. 1 and 5.

Fig. 5 is a detail sectional view taken on line 5—5, Fig. 1.

Fig. 6 is a detail sectional view taken on line 6—6, Fig. 1, and showing the parts 90° from the position shown in Figs. 1 and 5.

The pump consists, essentially, of a casing or housing 10 which may be of any desired size and configuration, and which is provided, at one end, with an inwardly projecting flange 11 having an opening 12 therethrough. The numeral 13 designates a head provided with a reduced portion 14 to form a shoulder 15, and this reduced portion 14 fills the opening 12 in the flange 11, and the shoulder 15 abuts the outer face of the flange. This head is secured in position in any suitable manner, such as by means of fastening bolts 16. The other end of the housing 10 is closed by a head 17 that is inserted into the end of the housing and is provided with a circumferential shoulder 18. A collar 19 is threaded into the housing, as at 20, and engages the shoulder 18 to removably hold the head 17 in position. Suitable openings 21 are provided in the collar to facilitate the adjustment of the same. The inner face of the head 17 is reduced to form a lateral projection 22 that is of an external diameter considerably less than the internal diameter of the housing 10, and the projection 22 is of a length to terminate considerably short of the other end of the housing.

Within this projection 22 there are formed two passages 23—24, which are of substantially the same area, the passage 23 being provided with an opening 25, co-operating with which is a nipple or coupling 26 held in position in any suitable manner, such as by means of a collar 27. A similar nipple 28, held in position by means of a collar 29, communicates with an opening 30 of the passage 24. The passage 23 is provided with a lateral opening 30 leading through the extension 22, and a similar opening or passage 31 also leads from the passage 24. These passages 23—24 constitute an inlet and a discharge outlet for the fluid to be handled by the pump, and as the pump is adapted to operate in both directions, either of the passages will constitute an inlet or an outlet, according to the direction of rotation of the pump.

Projecting through the head 13 is a shaft 32 provided with a coupling member 33 on the end thereof, through the medium of which it may be rotated, and a suitable seal 34 is provided in the head, for the shaft. The inner end of the shaft is preferably enlarged, as at 35, and is recessed to form a chamber, into which the end of the projection 22 on the head 17 extends, and about which projection the wall of the chamber or recess in the end of the shaft, rotates. Ball bearings 36 are provided for the shaft within the head 13, and a similar set of ball bearings 36a is also provided for the shaft between the wall of the recess or chamber in the shaft and the casing or housing 10. These ball bearings constitute a support for the shaft.

Encompassing the shaft 32 are a plurality of radially arranged cylinders 37 in which pistons 38 operate, and these cylinders 37 have communication, through passage 40a, with passages 39—40 (see particularly Fig. 5) in the periphery of the wall 41 of the chamber or recess in the end of the shaft. These passages 39—40 are out of communication with each other, as shown more clearly in Fig. 5, through the medium of the end walls 42—43. The passage 39 has communication with certain of the cylinders, while the passage 40 has communication with the remaining cylinders. The wall 41 is also provided with a series of ports 44—45, the ports 44 having communication, when the parts are in the position shown in Fig. 5, with the passage 39, while the ports 45 have communication with the passage 40. As the shaft is rotated, these ports 44—45 will successively establish communication between certain of the cylinders and certain of the passages 23—24, according to the direction of rotation of the shaft, the ports 44—45 extending through the wall 41 to effect such communication.

The cylinders 37 are disposed laterally with respect to the chamber or recess in the shaft, and in a direction lengthwise of the axis of the shaft. Mounted upon and forming a part of the shaft 32, is an eccentric 46, encompassing which eccentric is a member 47. A master pitman 48 connects the member 47 with one of the pistons 38 to operate the latter, and also serves as a means whereby to prevent rotation of the member 47 with the shaft. The remaining pistons 38 are connected to the member 47 through the medium of pitman rods or links 49 that are pivotally connected, as at 50, with the respective pistons, and as at 51, with the member 47.

With this construction, it will be manifest that when the shaft 32 is rotated, the eccentric 46 will actuate the member 47, and thereby reciprocate the pistons in the respective cylinders 37.

With this construction, when some of the pistons are moving inwardly to draw the fluid into the respective cylinders through one of the passages 23—24, through the openings 30—31, or ports 44—45, through the passages 39 or 40, into the cylinders, the pistons in the other cylinders will be forcing the fluid out of the cylinders through the other of said passages, to be discharged from the pump. As before stated, either of the passages 23—24 will constitute an inlet or an outlet, according to the direction of rotation of the shaft 32, and the respective pistons will correspondingly operate.

The rotating parts of the pump may be lubricated by means of the fluid flowing to the cylinders through one of the passages 23—24, and for that purpose there may be provided a passage 52 communicating with one of the passages 23—24, here shown as communicating with the passage 23, into which the fluid will flow, to be discharged therefrom through the passage 52. Any fluid which finds its way between the parts, that is, between the end of the projection 22 and the wall of the recess in the shaft, will accumulate in a chamber 53 in the shaft, to be discharged therefrom through one or more suitable openings 54, by centrifugal force, to lubricate the adjacent parts. This chamber 53 is also arranged so as to balance the eccentric portion of the shaft 32.

It will be noted that the ports 44—45 are out of alinement with each other, so as to control the direction of flow of the fluid either to or from the cylinders 37. Portions of the cylinder casing member 55 may be removed, as at 56—57 (see particularly Fig. 5), to produce lightness, without interfering with rigidity.

With this construction, it will be manifest that there is produced a radial pump in which the number of rotating parts is materially reduced, thereby rendering it possible to produce a pump comparatively small in size and weight, while the rotating parts may operate at a high speed. Furthermore, the number of bearings for maintaining the parts in alinement will be reduced, thereby reducing the cost of manufacture. At the same time, the parts are readily accessible, and either one of the heads may be removed without interfering with the other.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:

1. A pump having a series of radially arranged cylinders, pistons reciprocable therein, an operating shaft, an eccentric mounted upon the shaft, an eccentric member encompassing the eccentric, a master connection between said eccentric member and one of said pistons, pitman members individual to the remaining pistons and pivotally connected with the eccentric member and the respective pistons, a stationary member having fluid passages therein, one of which passages serves as an inlet to, and another as a discharge from, the cylinders, the said shaft having a recess into which the last said member projects, the wall of said recess having fluid passages out of communication with each other and provided with ports, certain of which ports are individual to the respective last said passages, and means for rotating said shaft to operate the pistons and to cause the said ports to alternately establish communication between certain of said cylinders and certain of the first said fluid passages, through passages from the cylinders to the said passages in the wall of said recess, as the shaft is rotated.

2. A pump having a series of radially arranged cylinders, pistons reciprocable therein, an operating shaft, an eccentric mounted upon the shaft, an eccentric member encompassing the eccentric, a master connection between said eccentric member and one of said pistons, pitman members individual to the remaining pistons and pivotally connected with the eccentric member and the respective pistons, a stationary member having fluid passages therein, one of which passages serves as an inlet to, and another as a discharge from, the cylinders, the said shaft having a recess into which the last said member projects, the wall of said recess having fluid passages out of communication with each other and provided with ports, certain of which ports are individual to the respective last said passages, means for rotating said shaft to operate the pistons and to cause the said ports to alternately establish communication between certain of said cylinders and certain of the first said fluid passages, through passages from the cylinders to the said passages in the wall of said recess, as the shaft is rotated, and roller bearings adjacent each end of said shaft and between which bearings said cylinders and said eccentric are located.

3. A pump having a series of radially arranged cylinders, pistons reciprocable therein, an operating shaft, an eccentric mounted upon the shaft, an eccentric member encompassing the eccentric,

a master connection between said eccentric member and one of said pistons, pitman members individual to the remaining pistons and pivotally connected with the eccentric member and the respective pistons, a stationary member having fluid passages therein, one of which passages serves as an inlet to, and another as a discharge from, the cylinders, the said shaft having a recess into which the last said member projects, the wall of said recess having fluid passages out of communication with each other and provided with ports, certain of which ports are individual to the respective last said passages, means for rotating said shaft to operate the pistons and to cause the said ports to alternately establish communication between certain of said cylinders and certain of the first said fluid passages, through passages from the cylinders to the said passages in the wall of said recess, as the shaft is rotated, and lubrication passages for the rotating parts, said lubrication passages having communication with one of the first said fluid passages.

4. A pump embodying a casing, a head secured to one end of the casing, a projection on said head extending into the casing and being of an external diameter considerably less than the internal diameter of said casing, said head and extension having fluid passages therethrough, out of communication with each other, a head at the other end of the casing, a shaft extending through the last said head, and with the end of which shaft said projection telescopes, radially disposed cylinders encompassing said shaft, pistons in the cylinders, an eccentric on the shaft, a master connection between one of said pistons and said eccentric, pivotal connections between the eccentric and each of the other pistons, each of said cylinders having an inlet and discharge opening, passages in said shaft out of communication with each other, but alternately movable into and out of communication with the fluid passages in said projection, ports in said shaft for alternately establishing communication between the last said fluid passages and certain of the cylinder passages, as the shaft is rotated, and means for rotating the shaft.

5. A pump embodying a casing, a projection on one wall of, and extending into, the casing, a shaft extending into the casing through the opposite wall, and with which projection said shaft telescopes for rotation with respect thereto, radial cylinders encompassing said shaft, pistons in the cylinders, operative connections between the pistons and said shaft, two fluid passages in said projection, two separate passages in said shaft movable alternately into and out of communication with the first said passages, a series of ports in the shaft individual to the said separate passages in the shaft, and combined inlet and discharge passages in the cylinders, the passages and ports in the shaft operating, as the shaft is rotated, to alternately establish communication between certain of the cylinders and the said passages in the said projection.

6. A pump embodying a casing, a head removably secured to the casing at each end, a projection on one head extending into the casing, a shaft extending into the casing through the other head, said projection telescoping into the shaft, radially arranged cylinders encompassing the shaft, pistons in the cylinders, operative connections between the shaft and pistons for operating the latter, two passages in said projection, each of which is adapted to serve as an inlet or discharge outlet, separate passages in the telescoping portion of the shaft, out of communication with each other and in communication with said cylinders through ports leading from the last said passages to the cylinders, and means to rotate the shaft in either direction for causing the said ports to establish communication with the respective passages in said projection, according to the direction of rotation of said shaft.

7. A pump embodying a casing, a head removably secured to the casing at each end, a projection on one head extending into the casing, a shaft extending into the casing through the other head, said projection telescoping into the shaft, radially arranged cylinders encompassing the shaft, pistons in the cylinders, operative connections between the shaft and pistons for operating the latter, two passages in said projection, each of which is adapted to serve as an inlet or discharge outlet, separate passages in the telescoping portion of the shaft, out of communication with each other and in communication with said cylinders through ports leading from the last said passages, to the cylinder, means to rotate the shaft in either direction for causing the said ports to establish communication with the respective passages in said projection, according to the direction of rotation of said shaft, and spaced roller bearings within the casing, for the shaft, and between which bearings said cylinders are located.

8. A pump embodying a casing, a head removably secured to the casing at each end, a projection on one head extending into the casing, a shaft extending into the casing through the other head, said projection telescoping into the shaft, radially arranged cylinders encompassing the shaft, pistons in the cylinders, operative connections between the shaft and pistons for operating the latter, two passages in said projection, each of which is adapted to serve as an inlet or discharge outlet, separate passages in the telescoping portion of the shaft, out of communication with each other and in communication with said cylinders through ports leading from the last said passages to said cylinders, means to rotate the shaft in either direction for causing the said ports to establish communication with the respective passages in said projection, according to the direction of rotation of said shaft, and means whereby a portion of the fluid from one of the first said passages will be delivered by centrifugal force, through said shaft to lubricate the adjacent parts.

9. A pump embodying a rotatable shaft having an open chamber at one end, a stationary member extending into said chamber and having two separate passages opening laterally therethrough, one of which serves as an inlet and the other as a discharge outlet, two separate passages in the wall of said chamber, ports individual to, and adapted to establish commmunication between, the last said passages and the respective first said passages, as the shaft is rotated, radial cylinders encompassing the shaft, and with which cylinders the said ports respectively establish communication through passages to said cylinders, as the shaft rotates, pistons in the cylinders, and operative connections between the shaft and the respective pistons for operating them.

10. A pump embodying a rotatable shaft having an open chamber at one end, a stationary member extending into said chamber and having two separate passages opening laterally therethrough, one of which serves as an inlet and the other as a discharge outlet, two separate passages

in the wall of said chamber, ports individual to, and adapted to establish communication between, the last said passages and the respective first said passages, as the shaft is rotated, radial cylinders encompassing the shaft, and with which cylinders the said ports respectively establish communication through passages to said cylinders as the shaft rotates, pistons in the cylinders, a master connection between one of the pistons and said shaft, and separate connections between the remaining pistons and said shaft, said separate connections embodying pitman rods pivotally connected with the shaft and the respective pistons.

11. A pump embodying a rotatable shaft having an open chamber, a stationary pintle member extending into the chamber and having two separate passages opening laterally therethrough, one of which serves as an inlet and the other as a discharge outlet, two separate passages in the wall of said chamber out of communication with each other, ports individual to, and adapted to establish communication between, the last said passages and the respective first said passages, as the shaft is rotated, radial cylinders encompassing the shaft, with which cylinders the said ports successively establish communication through passages to said cylinders, as the shaft rotates, pistons in the cylinders, and connections between the pistons and said shaft, said connections embodying pitman rods connecting them with the shaft, whereby the said pistons will be positively moved in both directions.

12. A pump embodying a rotatable shaft having an open chamber, a stationary pintle member extending into the chamber and having two separate passages opening laterally therethrough, one of which serves as an inlet and the other as a discharge outlet, two separate passages in the wall of said chamber out of communication with each other, ports individual to, and adapted to establish communication between, the last said passages and the respective first said passages, as the shaft is rotated, radial cylinders encompassing the shaft, with which cylinders the said ports successively establish communication through passages to said cylinders as the shaft rotates, pistons in the cylinders, and connections between the pistons and said shaft, said connections embodying pitman rods connecting them with the shaft, whereby the said pistons will be positively moved in both directions, one of said pitmans constituting a master pitman rigidly connected to an eccentric member carried by the shaft.

EINAR K. JOHANSEN.