Aug. 21, 1928. 1,681,392

W. H. D. BROUSE

ROTARY PUMP

Filed March 14, 1927 2 Sheets-Sheet 1

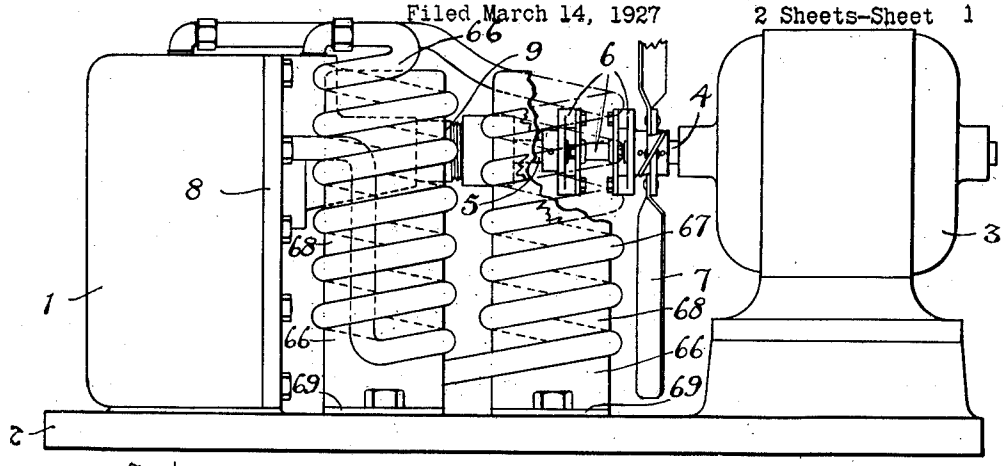


Fig. 1.

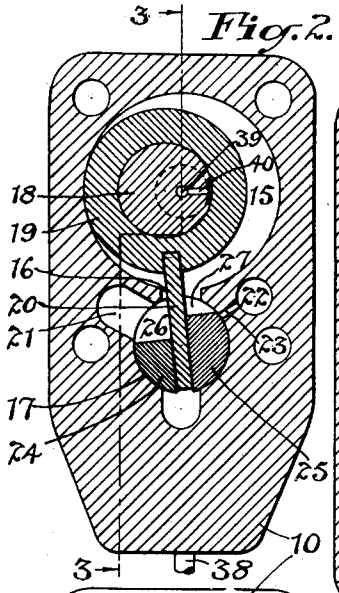


Fig. 2.

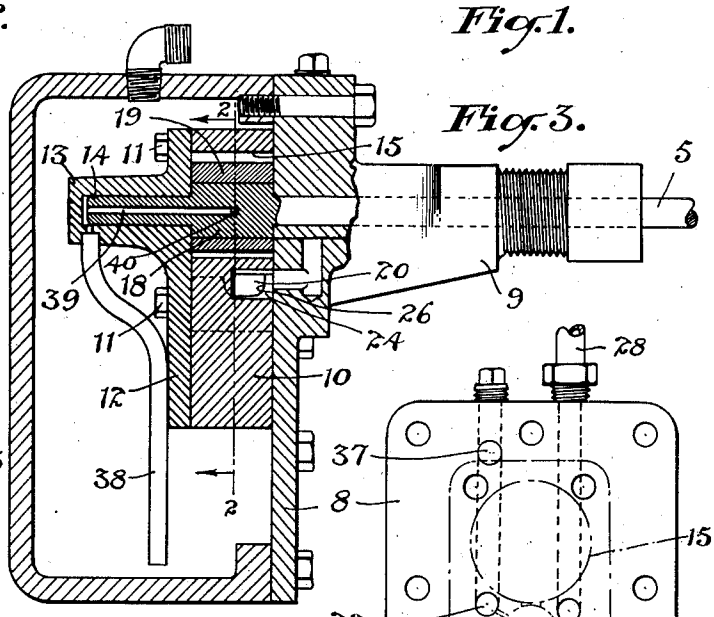


Fig. 3.

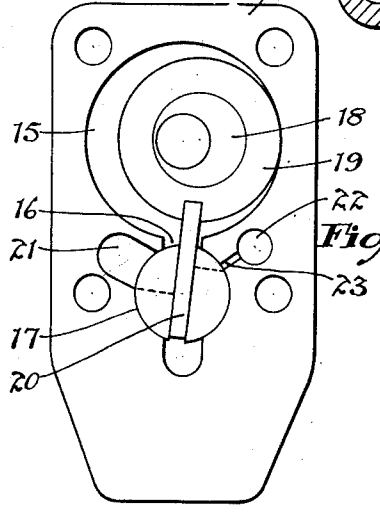


Fig. 4.

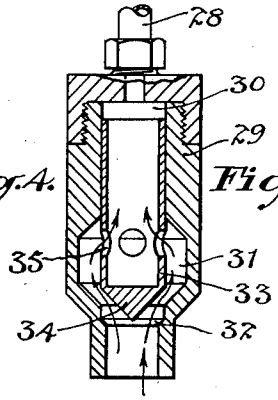


Fig. 5.

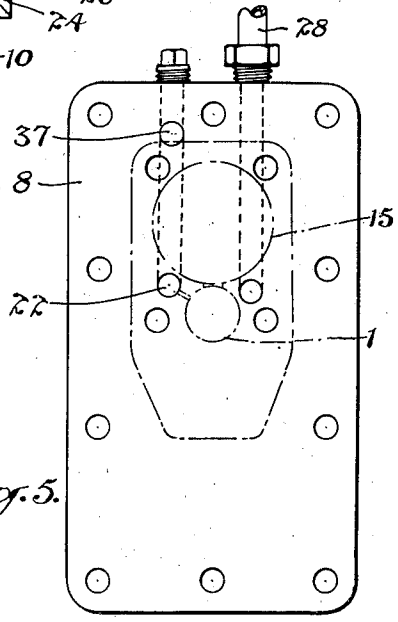


Fig. 6.

Inventor.
William H.D. Brouse.
by H.J. Stevenson
Atty.

Aug. 21, 1928. 1,681,392

W. H. D. BROUSE

ROTARY PUMP

Filed March 14, 1927 2 Sheets-Sheet 2

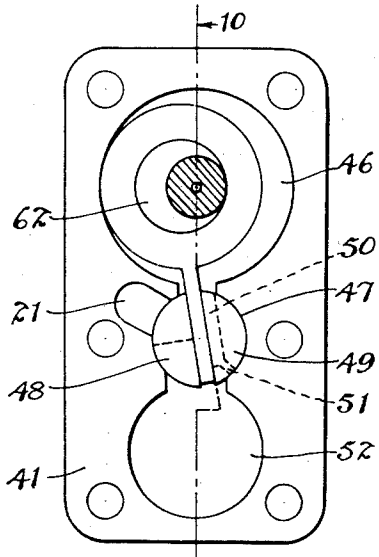


Fig. 7.

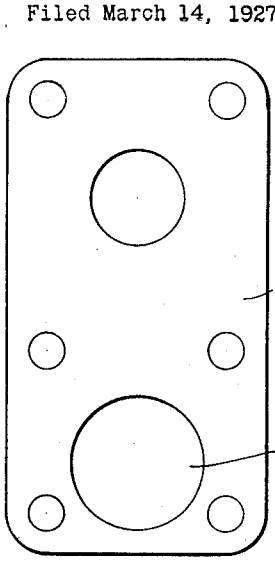


Fig. 8.

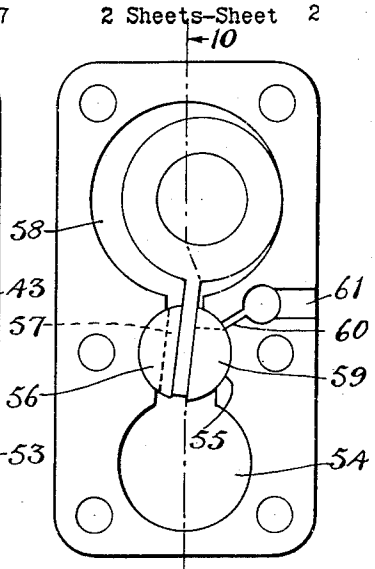


Fig. 9.

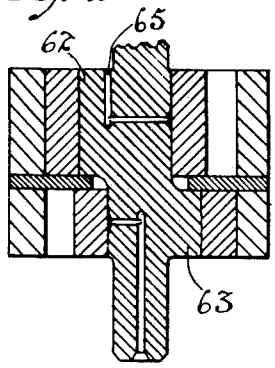


Fig. 11.

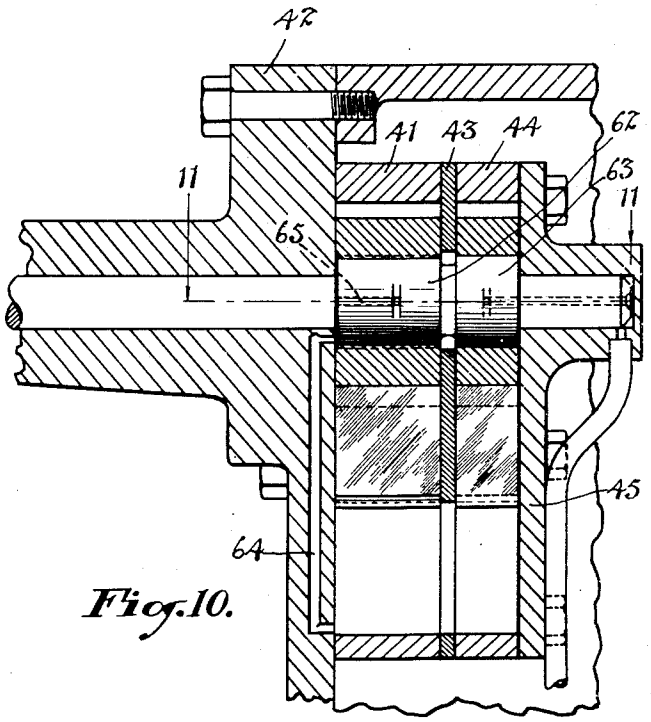


Fig. 10.

Inventor.
William H. D. Brouse
by H. J. & D. Denison
atty.

Patented Aug. 21, 1928. 1,681,392

UNITED STATES PATENT OFFICE.

WILLIAM HENRY DAVENPORT BROUSE, OF TORONTO, ONTARIO, CANADA.

ROTARY PUMP.

Application filed March 14, 1927. Serial No. 175,378.

The principal objects of the invention are, to provide a small, high speed pump capable of producing high pressure which will be particularly adaptable for use in small refrigerating plants but may be used for numerous purposes.

A further important object is to devise a structure which will operate at high speeds without noise.

The principal feature of the invention consists in the novel construction and arrangement of parts, whereby the discharge passage from the compressor chamber is automatically controlled by a valving member operated by the compressor rotor.

A further important feature consists in the novel manner of lubricating the working parts, ensuring a constant supply of lubrication to the engaging surfaces.

A still further important feature consists in the novel construction and arrangement of parts, whereby the operation of the pump is balanced and whereby stage pumping is effected.

In the drawings, Figure 1 is a side elevational view showing the arrangement of the pump and the direct connected motor for driving same, together with the cooling coils for dissipating the heat of compression.

Figure 2 is an enlarged vertical sectional view on the line 2—2 of Figure 3.

Figure 3 is a vertical section through the complete pump casing taken on the line 3—3 of Figure 2.

Figure 4 is an enlarged elevational view of the face of the cylinder block and rotor.

Figure 5 is an elevational view of the inward face of the plate to which the compressor cylinder is attached, showing the arrangement of the compressor cylinder block in dotted lines and also illustrating the arrangement of ports.

Figure 6 is an enlarged longitudinal sectional view of the valve used in the inlet.

Figure 7 is an elevational view of the face of the cylinder block, compressor member and valve of the low pressure element of a compound pump.

Figure 8 is an elevational view of the separating plate arranged between the low pressure and high pressure cylinders.

Figure 9 is an elevational view of the high pressure block, compressor element and valve.

Figure 10 is a vertical sectional view of a portion of the casing of a pump of the compound type, the section being taken on the line 10—10 of Figure 7.

Figure 11 is a horizontal sectional view through the eccentric shaft and cylinders, taken on the line 11—11 of Figure 10.

Referring to the drawings, 1 is the pump casing mounted between a pair of angle bars 2 which form the base support.

An electric motor 3 is mounted upon the bars 2 and its shaft 4 is coupled with the pump shaft 5 through the flexible coupling 6 upon which are mounted the fan arms 7.

The pump casing is provided with a head 8 on one side which has a journal 9 extending therefrom in which the pump shaft 5 is supported.

The cylinder block 10 is secured against the inner face of the head 8 by the bolts 11 which extend through the inner face plate 12 and said inner face plate is formed with a journal bearing 13 which supports the inner end 14 of the pump shaft.

The cylinder block 10 is formed with a cylinder chamber 15 which is arranged in central alignment with the axis of the shaft 5 and has an opening 16 at the bottom.

A cylindrical chamber 17 parallel with the chamber 15 and arranged immediately therebelow communicates with the opening 16.

The shaft 5 is provided with an eccentric 18 within the cylinder chamber 15 and mounted on said eccentric is a rotor member 19 of cylindrical form, the periphery of which progressively engages the surface of the cylinder as the eccentric rotates.

The rotor 19 is provided with a rigid radial vane 20 which extends from its underside through the opening 16 into the chamber 17.

An inlet passage 21 is arranged at one side of the chamber 17 and opens thereinto close to the opening 16 and a discharge passage 22 arranged in the block 10 at the opposite side from the inlet is connected by a slot 23 with the chamber 17.

A pair of semi-cylindrical members 24 and 25 are arranged in the chamber 17 engaging the flat faces of the radial vane 20 of the rotor so that the rotor vane has a sliding contact therebetween and the said members 24 and 25 will operate with an oscillating movement.

The member 24 is formed with a notch 26 in the upper half which remains constantly open to the inlet 21.

The member 25 closes the slot 23 during a

portion of the movement of the rotor and it is provided with a notch 27 which opens the entrance to the discharge passage when the rotor passes a predetermined point in the circumference of the cylinder and has raised the pressure within the compression side of the cylinder to approximately equal to the pressure in the discharge chamber to avoid the backing up of the high pressure of discharge into the cylinder and thereby maintaining efficiency in the operation of the pump.

This constructive arrangement is very clearly illustrated in Figures 2 and 4.

In Figure 2 a valve 25 is shown closing the discharge slot 23. This slot remains closed while the rotor moves upwardly to increase the volume on the inlet side of the cylinder, decreasing the volume on the compression side until a predetermined point is reached when the oscillating movement of the rotor operates the valve 25 so that the notch 27 in the upper part thereof opens the slot 23, allowing the discharge of the fluid pressure from the cylinder.

It will be seen that as the rotor is moved around within the cylinder with an oscillating movement, the intake side is opened to the maximum just prior to the closing of the bottom surface of the rotor against the cylinder wall adjacent to the opening 16 when the valve 25 closes the discharge port 23. The progressive movement of the rotor engages the cylinder wall on the inlet side of the opening 16 and thus encloses the contents and commences to compress the same. The compression continues until the port 23 is opened as described. This action is extremely simple and is very positive.

The opening and closing of the valve is effected entirely through the oscillating movement of the rotor, dispensing with the use of springs or pressure operated valves which create both noise and mechanical difficulties at high speeds.

The intake chamber 21 is connected by a vertical passage cut in the head 8 to an inlet pipe 28 and said inlet pipe has connected thereto a valve casing 29 which is shown in detail in Figure 6.

The interior of the valve casing is formed with a cylindrical chamber 30 which is provided with an enlarged portion 31 adjacent to the lower end and the bottom of the chamber is provided with a tapered valve seat 32.

A cylindrical valve 33 provided with a tapered lower end 34 slides in the cylindrical chamber 30 and is provided with openings 35 in the side wall.

The top of the valve 33 is open and air or other fluid flowing into the valve chamber from the bottom lifts the valve from its seat, flows through the openings 35 and out through the open top to the inlet pipe 28. This valve prevents the escape of any possible back pressure from the pump when the pump is at rest and ensures a smooth, even flow in operation as it is not affected by the pulsations.

The casing 1 is filled to a point above the bottom of the block 10 with a lubricating oil and the pressure of discharge which communicates with the interior of the casing through the opening 37 connecting the discharge passage 22, fills the casing and forces the oil up through the tube 38 to the end of the journal 13 in the face plate 12.

The end 14 of the pump shaft is provided with a central passageway 39 communicating with the closed end of the journal and oil flows thereinto and through a cross passage 40 to the surface of the eccentric, from whence it is distributed over the entire inner surface of the eccentric, thoroughly lubricating same under pressure. This pressure forces the oil outwardly at the ends of the eccentric and outwardly at the ends of the rotor, thus creating an oil seal between all the working surfaces. The oil thus flows into the cylinder and is driven ahead of the point of contact between the rotor and the cylinder wall, thereby sealing the compression chamber from the inlet. This arrangement is very effective and obviates the necessity of minute oil ducts and control valves which create a great deal of trouble through becoming clogged.

It may be found desirable to produce a staging of the pressure to obtain the desired pressure result and also to produce a balancing effect in the pump. When such a structure is desired two cylinder blocks are used as illustrated in Figures 10 and 11.

The block 41 for the low pressure stage is secured to the head 42 of the casing and a separating plate 43 is arranged at the outward side of the block 42 and the high pressure block 44 is secured between the plate 43 and the outer face plate 45.

In this construction the cylinder block 41 is formed with a cylinder chamber 46 which communicates with the valve chamber 47 in which the semi-cylindrical valves 48 and 49 are oscillated by the rotor vane.

The inlet valve 48 communicates with the inlet chamber 21 and directs the inflowing fluid into the cylinder chamber.

The discharge valve 49 is formed with a passage 50 intermediate of its width which extends through to the bottom side and opens through a slot 51. This slot in the oscillatory movement of the valve is opened and closed by the wall of the valve chamber 47 and when open the fluid compressed in the cylinder chamber flows through said passage in the valve into a chamber 52.

The plate 43 separating the block 41 from the high pressure block 44 is provided with an opening 53 which registers with the chamber 52 and also with the chamber 54 in the block 44.

The block 44 has a valve chamber 55 com-

municating with the inlet chamber 54 and the semi-cylindrical valve 56 is provided with a channel 57 which allows the inflowing pressure fluid from the first compression stage to flow into the inlet side of the cylinder chamber 58 in the high pressure block.

The discharge valve 59 in the valve chamber 55 directs the finally compressed fluid into a slot 60 communicating with the discharge passage 61.

The oscillation of the valve 59 closes the discharge passage until the pressure in the cylinder is raised to the desired point as described.

It will be noted that the eccentrics 62 and 63 of the low and high pressure cylinders respectively are arranged in diametrically opposed relation, consequently the pump will be balanced and vibration will be reduced to the minimum.

In the lubrication of the two cylinder pump, the oil is fed under the maximum pressure to the eccentric of the high pressure cylinder and a certain quantity of this lubricant flows past the end surfaces engaging the plate 43 and enters the other cylinder. The oil discharged from the low pressure cylinder into the chamber 52 is forced by the pressure therein through a duct 64 in the pump casing head to the duct 65 in the eccentric in the low pressure cylinder.

It will be readily understood from this description that a balanced pump may be devised by a construction similar to that described, without having the pumping elements formed for staging the pressure, that is to say, the two cylinder chambers can be of the same volumetric capacity and each could be provided with a common intake and discharge passage.

With pumps such as described producing high pressures it is desirable to provide means for cooling the discharge and also for cooling the lubricant. In the form of device illustrated, the oil and air or gas is first discharged direct from the cylinders through a cooling coil 66 from whence it is returned to the pump casing. The oil is retained in the bottom of the casing and the separated compressed gas is then taken from the top of the casing and further cooled or condensed in the coil 67. These coils are supported by notched plates 68 which are formed with flanges 69 at the bottom secured to the base, formed by the angle bars 2. The plates thus arranged form effective heat conductors in absorbing heat from the coils and present extensive cooling areas.

The flow of air created by the fan 7 which is used to effect a cooling of the pump, is directed through the coils and effectively reduces the temperature of discharge.

What I claim as my invention is:

1. A pump, comprising a pair of blocks having cylinder chambers therein arranged in axial alignment, a plate arranged between said blocks having an opening in alignment with the cylinders and an opening therebelow, a passage in each of said blocks extending radially from each of said cylinders, chambers in each of said blocks connecting with said passages and connected by the lower opening in said plate, oscillating valves interposed in said passages, and separated by said plate, a shaft having a pair of eccentrics thereon spaced to operate each side of said plate within said cylinder chambers, and a rotor member mounted on each of said eccentrics and each having a vane rigidly extending into the adjacent passage and operatively engaging the valve therein and adapted to oscillate the same to control the passage of fluid to and from said cylinders and the lower chambers connected therewith.

2. A pump, comprising a casing, a head closing said casing, a shaft journalled at one end in said head and having the other end extending into the interior of said casing, said shaft having an eccentric intermediate of its length, a block arranged within said casing having a cylinder chamber arranged concentric with said shaft and housing said eccentric, a face plate secured to said cylinder block and having a capped journal arranged in axial alignment with the journal in the casing head and supporting the end of the shaft within the casing, a rotor mounted on the eccentric and operating in said cylinder casing, a valve operated by said rotor and controlling the discharge from the cylinder chamber, an oil duct leading from the inner end of the shaft into the eccentric portion and discharging to the periphery thereof to lubricate the eccentric and rotor, and an oil duct leading from the bottom of said casing to the interior of the capped journal in said face plate and conducting oil thereto to flow through said shaft duct to the eccentric.

3. A pump, comprising, a cylinder, a shaft extending through said cylinder and having an eccentric operating therein, a rotor journalled on said eccentric and engaging the cylinder wall, a casing enclosing said cylinder and connected with the discharge therefrom, a cap enclosing one end of the shaft, a duct leading from the casing and conducting oil under pressure to said cap, and a duct in said shaft leading from the capped end to the surface of the eccentric.

4. A pump, comprising a low pressure cylinder, a receiver connected with the discharge from said cylinder, a high pressure cylinder having its inlet connected with said receiver, a receiver connected with the discharge from the high pressure cylinder, means for directing oil from the high pressure receiver to the high pressure cylinder, and means for directing oil from the low pressure receiver to the low pressure cylinder.

5. In a pump, a cylinder, a compressing ele-

ment in said cylinder, a cooling coil connected directly with the discharge from said cylinder, a receiver separator connected with and receiving the discharge from said coil, and a cooling coil connected with the top of said receiver and conducting the compressed medium therefrom.

6. In a pump, a casing, a cylinder enclosed in said casing, a compressing element operating in said cylinder, a cooling coil connected directly to the discharge from said cylinder and discharging into said casing, and cooling coils connected with the top of said pump casing and conducting the compressed medium therefrom.

WILLIAM HENRY DAVENPORT BROUSE.