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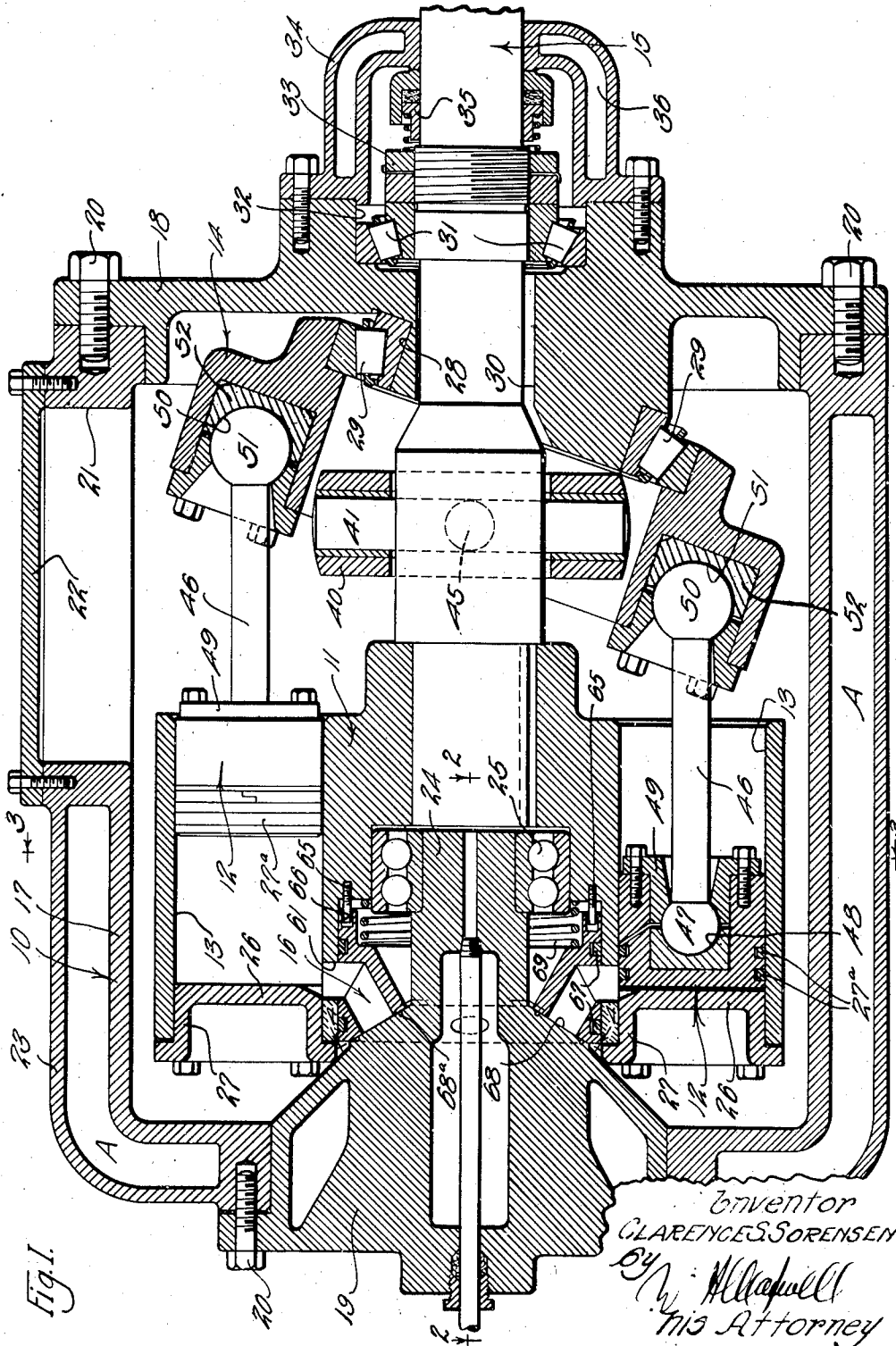
C. S. SORENSEN

1,822,064

COMPRESSOR

Filed June 23, 1930

2 Sheets-Sheet 1



Sept. 8, 1931.

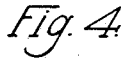
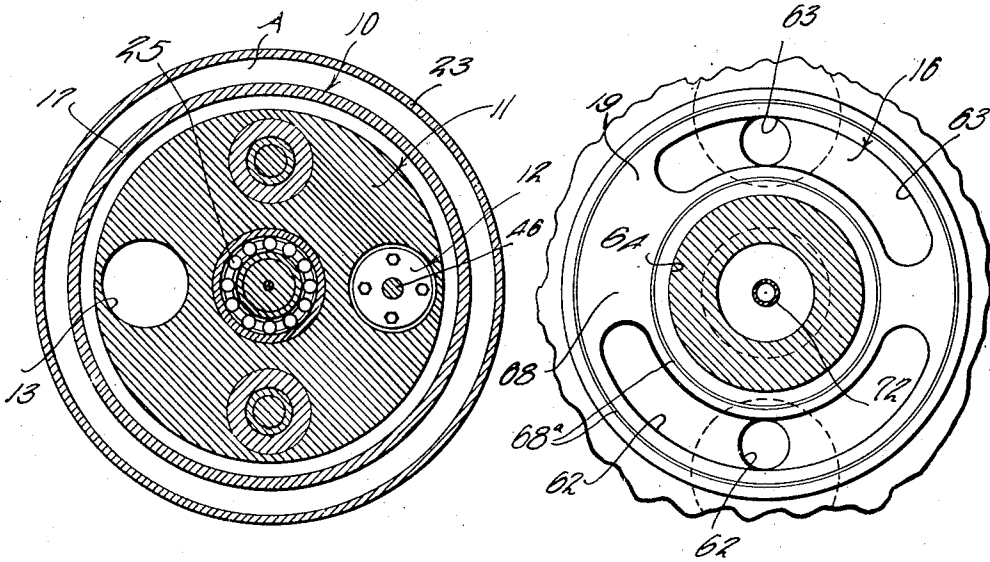
C. S. SORENSSEN

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Filed June 23, 1930

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

CLARENCE S. SORESENSEN, OF LOS ANGELES, CALIFORNIA

COMPRESSOR

Application filed June 23, 1930. Serial No. 463,134.

This invention relates to a pump or compressor and it is a general object of the invention to provide an efficient and practical compressor suitable for handling various fluids.

An object of the invention is to provide an improved compressor of the general character described and claimed in my co-pending application Serial Number 307,840, filed September 24, 1928, entitled "Pump or compressor."

An object of the invention is to provide a simple, compact and quiet operating pump or compressor of general utility.

It is another object of the invention to provide a compressor that embodies an improved means or valve arrangement for controlling the flow of fluid. The valve means incorporated in the present invention is particularly simple in its construction and operation and does not embody parts that are noisy in operation and quickly worn.

Another object of the invention is to provide a compressor that is operable to discharge fluid against a comparatively high pressure in a line or reservoir without causing a back pressure on the pistons.

It is a further object of this invention to provide a compressor of the character mentioned that is particularly compact and sturdy in construction and embodies but few simple parts.

Another object of the invention is to provide a valve construction for a rotary compressor which is effective in holding pressure and which automatically takes up wear that may occur between the working parts.

Other objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a longitudinal detailed sectional view of the compressor provided by the present invention, being a view taken between the inlet and outlet ports. Fig. 2 is a longitudinal detailed sectional view of a portion of the compressor taken as indicated by line 2—2 on Fig. 1 illustrating the inlet and outlet

ports in communication with the cylinders. Fig. 3 is a reduced transverse detailed sectional view taken substantially as indicated by line 3—3 on Fig. 1, and Fig. 4 is a transverse detailed sectional view, being a view taken substantially as indicated by line 4—4 on Fig. 1.

The mechanism provided by the present invention includes, generally, a stationary housing 10, a rotatable cylinder block 11 mounted within the housing 10, pistons 12 operable in cylinders 13 in the block 11, a drive ring 14 mounted within the housing 10 for causing reciprocation of the pistons 12, a drive shaft 15 for driving or rotating the cylinder block 11 and the drive ring 14, and means 16 for controlling the flow of fluid to and from the cylinders 13.

The housing 10 includes a body 17, a head 18 closing the inner end of the body 17, and a head 19 closing the outer end of the body. The body 17 is substantially cylindrical and is made hollow or tubular to hold or carry the various parts of the mechanism. The heads 18 and 19 may be detachably secured to the body 17 by suitable cap screws 20 and a service opening 21 may be provided in the body 17 so that the interior of the housing may be readily accessible. The opening 21 may be closed by a removable cover plate 22. A jacket 23 may be provided around the body 17 to provide a space A for containing a suitable cooling medium.

The cylinder block 11 is rotatably mounted in the body 17 of the housing adjacent the outer head 19. In the preferred construction the cylinder block 11 is rotatably mounted on an inwardly extending hub or projection 24 on the inner side of the head 19. A suitable anti-friction bearing 25 may rotatably support the cylinder block 11 on the projection 24.

The block 11 is provided with a plurality of axial cylinders 13 for carrying the pistons 12. The cylinder openings 13 are symmetrically arranged or equally spaced around the central axis of the mechanism. There may be any suitable number of cylinder openings 13. In the particular form of the invention illustrated there are four equally spaced

cylinder openings 13 extending longitudinally or axially through the block 11. The outer ends of the cylinder openings 13 are closed by heads 26. The heads 26 may be secured to the block 11 in any suitable manner and may be provided with inwardly extending projections 27 fitting into the openings 13. The inner ends of the cylinders 13 are open.

The pistons 12 are mounted for reciprocation in the several cylinders 13 and are operable by the drive ring 14 during operation of the mechanism. The pistons 12 are provided with sealing rings 27^a to frictionally engage the walls of the cylinders 13.

The drive ring 14 is rotatably mounted within the housing 10 adjacent the outer head 18. The drive ring 14 is mounted to rotate in a plane tilted or angularly disposed relative to a plane perpendicular to the central longitudinal axis of the compressor. The drive ring 14 surrounds the shaft 15 and is rotated or driven by the shaft as will be hereinafter described. In accordance with the preferred construction the ring 14 is rotatably supported on a shoulder 28 on the inner side of the head 19 through a suitable anti-friction bearing 29. The bearing 29 supports the ring 14 on the shoulder 28 so that it is rotatable in a tilted plane.

The drive shaft 15 is provided to drive or rotate the cylinder block 11 and the drive ring 14. The shaft 15 extends through an opening 30 in the head 18 to project into the housing 10. A suitable anti-friction bearing 31 may be arranged in an opening or bore 32 in the head 18 to rotatably support the shaft 15 in the opening 30. A thrust or retaining collar 33 may be provided on the shaft 15 to engage the bearing 32. A cap 34 may be provided on the head 18 to encase the bearing 31 and adjacent parts and to carry a lubricant for lubricating the bearing. A suitable packing gland 35 may be provided in connection with the cap 34 to seal around the shaft 15. The cap 34 may be jacketed to have a space 36 for carrying a suitable cooling medium. The inner end of the shaft 15 extends into an opening in the cylinder block 11 and a suitable key 37, or the like, may be provided to rotatably connect the shaft and cylinder block.

A suitable drive connection is provided between the drive ring 14 and the shaft 15. In the preferred form of the invention a universal drive is provided between the shaft and the ring 14 and includes a collar 40 surrounding the shaft 15 and pivotally carried on pins 41 projecting from diametrically opposite sides of the shaft. The collar 40 is provided with diametrically opposite pins 45 extending into openings in the drive ring 14.

Connecting rods 46 are provided to operatively connect the pistons 12 with the drive ring 14 so that the pistons 12 are reciprocated in the cylinders 13 upon rotation of the block 11 and drive ring 14. Spherically curved heads 47 are provided on the rods 46 to seat in sockets 48 in the pistons and retaining members 49 are provided to retain the heads in the sockets. The drive ring ends of the connecting rods 46 are provided with spherically curved heads 50 seating in sockets 51 in bearing blocks 52 carried by the ring 14.

The construction thus far described may be varied considerably without departing from the broader principles of the invention. The means 16 for controlling the flow of fluid to and from the cylinders 13 is an important feature of the invention. With the incorporation of the means 16 in the compressor it is operable to deliver or discharge fluid under pressure into a line or reservoir carrying fluid under comparatively high pressure without causing a back pressure on the pistons 12.

The means 16 includes a valve ring 60 having ports 61 communicating with the cylinders 13 and operable to cooperate with an intake port 62 and a discharge or outlet port 63. In the preferred form of the invention the valve ring 60 is mounted to operate or rotate with the cylinder block 11 to cooperate with stationary intake and discharge ports in the head 19. The valve ring 60 is slidably mounted in an opening 64 in the cylinder block 11. The ring 60 is slidable longitudinally in the bore or opening 64 and is connected with the cylinder block 11 to rotate with the block. In the particular form of the invention illustrated pins 65 project from the cylinder block 11 into notches 66 in the ring 60 to prevent rotation of the ring relative to the cylinder block. Spaced sealing rings 67 are provided on the ring 60 at opposite sides of the ports 61 to seal with the walls of the opening 64.

The outer end of the valve ring 60 is inwardly conical or beveled inwardly to cooperate with a conical or beveled shoulder or seat 68 on the head 19. The beveled outer end of the valve ring 60 and the seat 68 are smoothly finished to effectively seat together. In accordance with the invention means is provided for holding the seat ring 60 in effective engagement with the seat 68 and to provide for compensating for the wear between the seat and ring. A helical spring 69 is arranged under compression between the bottom or inner end of the opening 64 and the valve ring 60 to urge the beveled outer end of the valve ring into effective seating engagement with the shoulder 68.

The ports 61 in the valve ring 60 register with ports or openings 70 in the cylinder block 11 communicating with the cylinder openings 13 adjacent their inner ends. The pins 65 hold the valve ring 60 in a position where the ports 61 are always in register

The ports 61 in the valve ring 60 register with ports or openings 70 in the cylinder block 11 communicating with the cylinder openings 13 adjacent their inner ends. The pins 65 hold the valve ring 60 in a position where the ports 61 are always in register

with the openings 70. The ports 61 extend to the beveled outer end of the valve ring 60 where they are adapted to cooperate with the inlet port 62 and the outlet port 63 in the head 19. The ports 62 and 63 in the stationary element or head 19 are related to the spaced ports 61 in the valve ring so that they pass fluid into and out of the cylinders 13 during reciprocation of the pistons 12.

The inlet port 62 and the outlet port 63 extend inwardly from the exterior or outer side of the head 19 to the beveled seat 68. The outer portions of the ports 62 and 63 at the exterior of the head 19 may be screw threaded to receive suitable fluid conduits. The inner portion of the inlet port 62 is elongated so that it extends around or along the beveled face 68 and is adapted to be in register with each port 61 during substantially the entire suction or intake stroke. The elongated portion of the inlet port 62 at the beveled shoulder 68 is substantially semi-circular, extending around the seat 68 between substantially diametrically opposite points. With the inlet port 62 formed in this manner, a port 61 is in register or communication with the port 62 during approximately the entire intake stroke of a piston 12 and where there are four cylinders 13, the ports 61 come into register with the inlet port 62 successively so that there are two ports 61 in communication with the port 62 simultaneously.

In accordance with the preferred form of the invention the discharge or outlet port 63 of the stationary element is formed so that a port 61 is in communication with the outlet port 63 during a portion of the compression stroke of a piston 12. When the mechanism is to handle gas, the ports 61 and 63 are preferably formed and related so that a port 61 in communication with a given cylinder 13 is closed during the first part of the compression stroke of the piston 12, the corresponding cylinder, so that the fluid in the cylinder is compressed before the port 61 moves into register with the outlet port 63. The receiving end of the outlet port 63 at the shoulder 68 is elongated and curved concentric to the axis of rotation of the cylinder block 11. The distance between the ports 62 and 63 may be related to the size of the cylinders 13 so that a given pressure may be developed in the cylinders 13 before fluid is discharged into the outlet port 63. When the mechanism is to handle a liquid, the ports 61 and 62 are related so that a given port 61 is in communication with the port 62 upon the start of the compression or out stroke of the piston in the cylinder connected with the port 61.

In the preferred form of the invention small sealing grooves 68^a are formed in the seat 68 to extend around the seat above and below or at opposite sides of the ports 62 and 63. The grooves are effective in preventing

leakage of fluid between the valve ring and seat.

The projection 24 and the portion providing the shoulder 68 may be integral with the head 19. The head 19 is provided with a comparatively large space 73 for carrying a cooling medium to prevent overheating of the parts through engagement of the valve ring 60 with the shoulder 68. The space 73 may extend around the outer or peripheral portion of the end plate 19 and a central opening or space 71 may be provided in the head 19 for carrying a cooling medium. The invention provides means for lubricating the bearing 25 and the valve ring 60. A conduit 72 extends through the head 19 from its outer end to deliver a lubricant to the end of the projection 24. The lubricant supplied through the conduit 72 effectively lubricates the bearing 25 and the valve ring 60.

It is believed that the operation of the compressor provided by the present invention will be readily apparent from the foregoing detailed description. The shaft 15 may be rotated in any suitable manner to drive or rotate the cylinder block 11 and the drive ring 14. The drive ring 14 being tilted relative to the plane of rotation of the cylinder block 11, causes the pistons 12 to reciprocate in the cylinders 13. The reciprocation of the pistons 12 in the cylinders causes fluid to be drawn through the port 62 and ports 61 into the cylinders 13 during the intake strokes of the pistons. During the first part of the compression strokes of the pistons 12 the ports 61 are out of register with the outlet port 63 so that they are closed by the shoulder 68. Fluid is compressed in the cylinders 13 during the first part of the compression stroke, and when the ports 61 come into register with the outlet port 63 the compressed fluid is discharged through the port 63. It will be apparent that the compressor is operable to effectively supply fluid under pressure to a line carrying considerable pressure.

It is to be noted that the invention provides a pump or compressor that is particularly simple and compact in construction and which operates with a minimum of noise. A suitable lubricant may be provided in the housing 10 so that the various parts of the mechanism in the housing are effectively lubricated during operation. The valve means 16 embodies but few simple parts. The head 19 provides the support for the cylinder block 11 as well as the stationary element of the valve means 16. The head 19 is provided with the cooling medium containing spaces 73 and 72 so that the adjacent working parts do not become overheated.

Having described only a typical preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the

art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring connected with one element and retained in pressural engagement with the other element to seal therewith and having openings communicating with the ports of said element with which it is connected and registering with one port of the said other element during the outward movement of the pistons and registering with another port of the said other element during the inward movement of the pistons.

2. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring retained in pressural sealing engagement with the stationary element and connected with the cylinder block to rotate therewith, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out stroke of the pistons, and adapted to register with the outlet port during the in stroke of the pistons.

3. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders and means for

controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and slidably connected with the cylinder block to rotate therewith, and means holding the ring in engagement with the stationary element, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out strokes of the pistons, and adapted to register with the outlet port during the in strokes of the pistons.

4. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and connected with the cylinder block to rotate therewith, and a spring holding the ring in engagement with the stationary element, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out strokes of the pistons, and adapted to register with the outlet port during the in strokes of the pistons.

5. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and connected with the cylinder block to rotate therewith, and means for maintaining the valve ring in pressural sealing engagement with the stationary element, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out stroke of the pistons, and adapted to register with the outlet port during the last portions of the in stroke of the pistons.

6. A mechanism of the character described including, a housing, two elements, one a sta-

tionary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and slidably connected with the cylinder block to rotate therewith, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out stroke of the pistons, and adapted to register with the outlet port during the in stroke of the pistons, the inlet port being elongated at the valve ring so that the openings in the ring remain in register with the inlet opening during substantially the entire out strokes of the pistons.

7. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and connected with the cylinder block to rotate therewith, and means for maintaining the valve ring in pressural sealing engagement with the stationary element, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out stroke of the pistons, and adapted to register with the outlet port during the in stroke of the pistons, the inlet port being elongated at the valve ring so that the openings in the ring remain in register with the inlet opening during substantially the entire out strokes of the pistons, the outlet port being spaced from the inlet port at the ring so that the openings in the ring are closed during portions of the in strokes of the pistons.

8. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for

causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a valve ring engaging the stationary element and connected with the cylinder block to rotate therewith, and spring means for holding the valve ring in pressural sealing engagement with the stationary element, the valve ring having openings communicating with the ports of the cylinder block and adapted to register with the inlet port during the out stroke of the pistons, and adapted to register with the outlet port during the in stroke of the pistons, the inlet port being elongated at the valve ring and curved concentric to the axis of rotation of the mechanism so that the openings in the ring remain in register with the inlet port during approximately the entire out strokes of the pistons, and the outlet port being elongated and concentrically curved and spaced from the inlet port so that the openings in the valve ring are closed after passing the inlet port during the first portions of the in strokes of the pistons before registering with the outlet port.

9. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston.

10. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means

for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block including a spring in the opening in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston.

11. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, means for cooling the stationary element and the ring, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston.

12. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and

means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, there being a space in the stationary element for holding a cooling medium for cooling the stationary element and the ring, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston.

13. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being circumferentially spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston.

14. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled

end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being circumferentially spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston, there being a groove in the beveled seat for holding fluid to seal between the stationary element and the ring.

In witness that I claim the foregoing I have hereunto subscribed my name this 26th day of May, 1930.

CLARENCE S. SORENSEN.

15. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port being elongated at the seat to register with the openings in the ring during the out stroke of the pistons, and the outlet port being circumferentially spaced from the inlet port at the seat to register with the said openings during a portion of the in stroke of each piston, there being a groove in the ring to carry fluid to seal with the said seat.

16. A mechanism of the character described including, a housing, two elements, one a stationary element carried by the housing, the other a rotatable cylinder block in the housing and rotatably mounted on the stationary element, pistons mounted for reciprocation in the cylinders of the cylinder block, means for causing reciprocation of the pistons upon rotation of the cylinder block, the stationary element having spaced ports, one an inlet port, the other an outlet port, the cylinder block having ports communicating with the inner ends of the cylinders, and means for controlling the passage of fluid through the ports of the cylinder block including, a beveled seat on the stationary element, a valve ring slidably carried in an opening in the block and having a beveled end to cooperate with the seat, and means retaining the ring in cooperation with the seat, there being openings in the ring registering with the ports in the cylinder block, the inlet port