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MECHANICAL MOVEMENT.

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1,210,649. Patented Jan. 2, 1917.

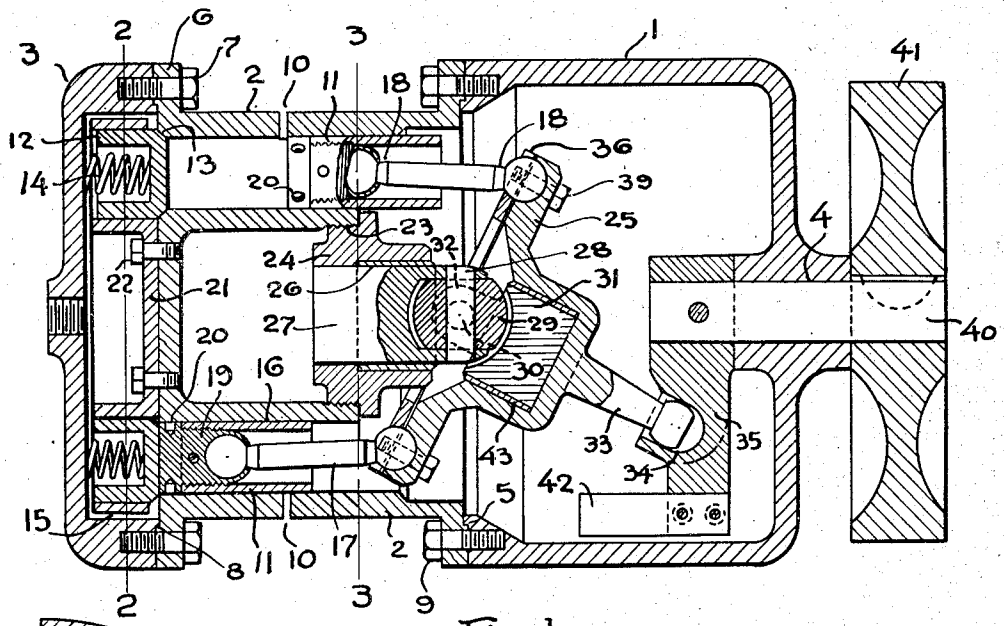


Fig. 1

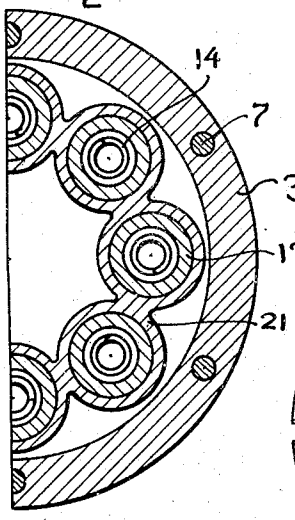


Fig. 2

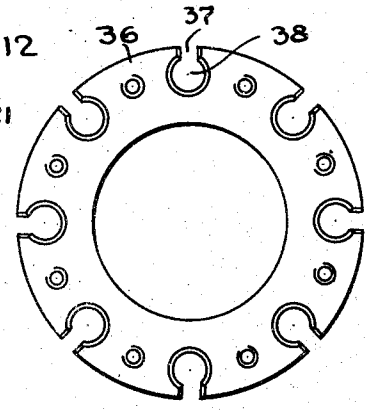


Fig. 4

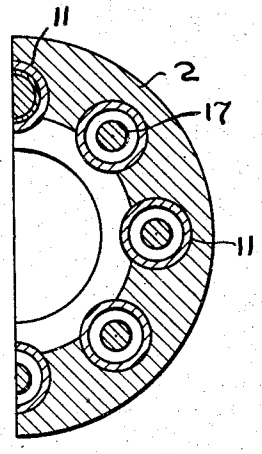


Fig. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

CLARENCE M. HOLLEY AND CHARLES C. JENNINGS, OF DETROIT, MICHIGAN, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO UTILITY COMPRESSOR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION.

MECHANICAL MOVEMENT.

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1,210,649. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed January 22, 1913. Serial No. 743,455.

To all whom it may concern:

Be it known that we, CLARENCE M. HOLLEY and CHARLES C. JENNINGS, citizens of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Mechanical Movements, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to means for converting rotary motion into reciprocatory motion and is especially adapted for air compressors.

It has for its object a machine in which rotary motion is converted into rectilinear movement by means of a wabbling thrust-ring and a plurality of universally connected connecting rods.

We are aware that engines and compressors similar in a general way to our design have heretofore used and patented. Our invention, however, lies in the peculiar features of construction by which a smoothly running and practical machine which is easily assembled and economically constructed is afforded.

In the drawings, Figure 1, is a vertical section of the machine. Fig. 2, is a half section on the line 2—2 of Fig. 1. Fig. 3, is a half section on the line 3—3 of Fig. 1. Fig. 4, is a plan view of the retaining ring.

Our machine comprises the operative parts that are incased in a casing formed by the crank-casing 1, the cylinder-casting 2 and the cap-plate 3. It will be seen from Fig. 1 that the crank-casing 1 is a member closed at one end and having an enlargement at the center of this closed end, forming a crank shaft bearing 4. The opposite end of the crank-casing 1 is open and the end of the casing itself is stepped as at 5 to receive the complementarily stepped flange of the cylinder-casting 2. This cylinder-casting 2 contains a plurality of connected cylinders arranged in a circle to form a battery of compressors. The ends of these cylinders are each open. The end of the cylinder-casting, more remote from the crank-casing 1, is provided with an annular flange 6 through which the screw bolts 7 pass to hold on the cap plate 3. The flange 6 and the cap plate 3 are stepped as at 8 for the purpose of insuring a fit. The other end of the cylinder casting is boltable to the crank casing 1 by the bolts 9.

Each of the cylinders in provided with an intake passage 10 which is controlled by the piston 11 and an exhaust valve 12 which forms the entire head for the cylinder and is normally held upon its beveled seat 13 by the spiral spring 14. However, when the piston allows the air to flow in through the intake 10 and travels to the left in Fig. 1, upon what might be termed, its inward stroke and when a given compression of the contents of the cylinder is reached, the pressure of the spring 14 is overcome and the valve is forced open, allowing the escape of the contents of the cylinder into the chamber 15. From the lower cylinder, in Fig. 1, it will be seen that the piston 11 passes out beyond the end of the cylinder and hence, when the compressed medium escapes into the chamber 15, the valve 12 is forced instantaneously against the end of the piston by the action of the spring 14 and the two retreat outward together, so that no residuum whatever is left in the chamber of the cylinder as is the case in ordinary compressors.

The piston 11 comprises a cylindrical shell 16 and a threaded piston head 19 that screws into the end of the shell 16 in the manner shown in Fig. 1. The connecting rods 17 carry a ball at each end and have reduced portions 18 adjacent the ball to form necks. The connecting rods 17 are connected with the piston heads before the piston head is attached to the piston shell. This is done by crimping the portions about the socket in the piston head over the ball, as shown in Fig. 1. When this has been accomplished the piston rod may be inserted through the piston shell 16 and the piston head 19 screwed into the piston shell by the application of a spanner wrench which can grip the piston head through the holes 20.

A valve-ring 21 is attached to the web portion of the cylinder-casting 2 by means of the screw-bolts 22 and this valve-ring furnishes the guiding means for the reciprocatory valves 12.

The interior of the cylinder-casting 2 is threaded at the end opposite the valve-ring

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by the threads 23 into which screws the bearing support 24 which carries the universal bearing upon which is mounted the wabbling thrust ring 25. This bearing support 24 has an enlarged bore for the reception of the bushing 26. Located in said bushing is the stub shaft 27 of the universal joint. The ends of this stub shaft are bifurcated and a pin 28 passes through the two bifurcated portions. Upon this pin is a rocking block 29 and journaled in this rocking block by the trunnions 30 is a sleeve 31 having bifurcated portions, shown in the dotted lines of Fig. 1 at 32 and which straddle the rocking block and carry the trunnions 30. Mounted upon this sleeve is the enlarged and protruding center of the thrust ring 25. This thrust ring is a drop-forging provided with semispherical sockets for the reception of the ball ends of the piston rods 17. The enlarged and protruding center forms the recess into which fits the sleeve 43 of the universal joint and the forging continues in an actuating arm 33 which fits into the socket 34 of the crank arm 35. The end of this actuating arm carries a ball or, as shown in the drawings, a part-ball head. This actuating arm fits into the cavity 34 without being held therein by any special means.

When the pistons and connecting rods have been fitted into the cylinders, the retaining ring 36 may be fitted over all of the globular heads at the free ends of the connecting rods by passing the neck portions 18 through the constricted openings 37 that lead into the circular holes 38 in the retaining ring. The ring may then be bolted to the thrust ring 25 by the bolts 39 and the entire machine will be assembled.

The crank arm 35 is fast to the shaft 40 which is rotatably mounted in the bearing 4 of the crank-casing 1. The fly wheel 41 is keyed to the shaft 40 and this fly wheel may be also used as a pulley wheel by which power is transmitted to the shaft 40 which rotates the crank 35 and this revolves the actuating arm 33 which, in turn, causes the thrust ring 25 to wabble, as it were, so as to reciprocate the pistons in and out of the cylinders. This wabbling motion is a known mechanical movement and needs no further description. However, a feature of this invention is a peculiar construction of the thrust ring and the use of a universal bearing which has a stub shaft that is accurately journaled in a sleeve-like member or in the bearing support 24. This insures accurate movement of the wabbling ring so as to prevent binding or cramping and conduces to the freedom and smoothness of running which we attain in our construction.

The blade 42 serves to splash a lubricant upon the moving parts.

What we claim is:—

1. In a device of the character set forth, a casing provided with a plurality of cylinders arranged in a circle each being provided with an inlet port substantially midway of its length, a piston for each cylinder reciprocatable therein controlling the inlet port, a discharge chamber into which all of said cylinders open, said open ends each being provided with a valve seat, a valve seating in said open end of each cylinder, and means for reciprocating the pistons in succession comprising a connecting rod for each piston having a ball and socket connection therewith, the opposite end of each connecting rod also being provided with a ball, a thrust ring provided with sockets for said balls, means for retaining the ball ends of the connecting rods in the said sockets, a universal joint connection between the thrust ring and the cylinder casing providing a support for the ring, an actuating arm extending at right angles to the plane of the ring and centrally thereof provided with a ball on the upper end, and a rotatable crank arm having a socket for said last named ball.

2. In a device of the character described, a casing provided with a plurality of cylinders arranged in a circle, pistons in said cylinders arranged to sweep the complete cylinder, a valve container having a plurality of cylindrical portions, said container being adapted to be secured to the cylinders so that the cylindrical portions are spaced from and register with the bores of the cylinders, valves contained in the cylindrical portions of the container and yieldably held against the compressor-cylinders, and an air tight inclosure for the valves, adjacent cylinder ends, and the valve container, substantially as described.

3. In a device of the character set forth, a casing provided with a plurality of cylinders open at each end and arranged in a circle, pistons reciprocatable therein for the compression of an elastic fluid, a discharge chamber common to all of said cylinders, a valve for each cylinder controlling the discharge end thereof, a valve retainer common to all said valves secured to the cylinder casing within the discharge chamber, a rotatable driving element, a wabbling thrust ring universally pivoted to the cylinder casing operated by the driving element, and connecting rods for each piston having a ball and socket connection with both the thrust ring and the piston.

4. The combination with a casing provided with a plurality of cylinders open at each end and arranged in a circle the discharge end thereof being formed with a valve seat, pistons reciprocatable therein for the compression of an elastic fluid, a valve for each cylinder seating in the discharge end thereof, and a fluid compression chamber common to all of said cylinders inclos-

ing the said valves, of a thrust ring universally pivoted to the cylinder casing, a connecting rod for each piston having a ball and socket connection with both the piston and thrust ring, an actuating stem for the thrust ring extending substantially centrally therefrom at right angles to the plane of the ring, said stem terminating in a ball end, a casing inclosing said thrust ring provided with a bearing, a drive shaft rotatable in said bearing, and a crank on the said drive shaft having a socket for the ball on the actuating stem.

5. In a device of the character set forth, a casing provided with a plurality of circularly arranged cylinders open at each end, the discharge end of each being provided with a valve seat, pistons reciprocable therein for the compression of an elastic fluid, a head secured to the discharge end of the cylinder casing providing a discharge chamber common to all the cylinders, a valve retainer secured to the cylinder casing within the discharge chamber having a series of bores or cylinders in axial alinement with the pump cylinders, a spring controlled valve reciprocatable in each of said bores and seating in the discharge end of the pump cylinders, each of said valve bores or cylinders having a discharge port adjacent the valve seat of the pump cylinders and opening into the discharge chamber, a wabbling thrust ring for reciprocating the pistons in succession, and means for actuating the thrust ring.

6. In a device of the character described, a casing section provided with a plurality of compressor-cylinders arranged in a circle, a piston in each cylinder arranged to sweep the entire cylinder, a valve container secured to one end of said casing and provided with a plurality of cylindrical portions arranged to be spaced from and register with the bores of the compressor-cylinders, a cap securable over said container and to the adjacent end of the casing section, valves reciprocable in said cylindrical portions of the container and yieldably held against the open ends of the compressor so as to follow the piston upon the return stroke and exclude all air, whereby said cap forms a compression chamber inclosing the valves, the adjacent cylinder ends, and the valve container, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

CLARENCE M. HOLLEY.
CHARLES C. JENNINGS.

Witnesses:
STUART C. BARNES,
AMELIA C. KOEHN.