

Jan. 18, 1927.

1,614,481

J. B. McMULLEN

COMPRESSOR

Filed August 5, 1926

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Fig. 2.

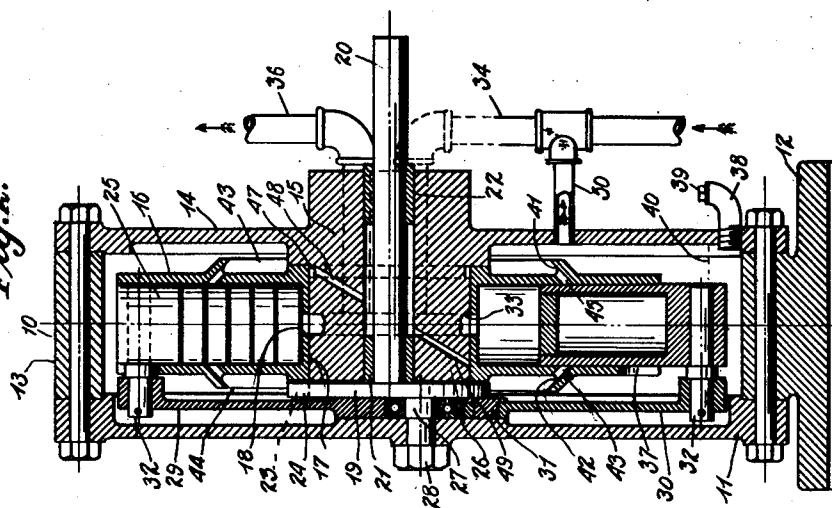
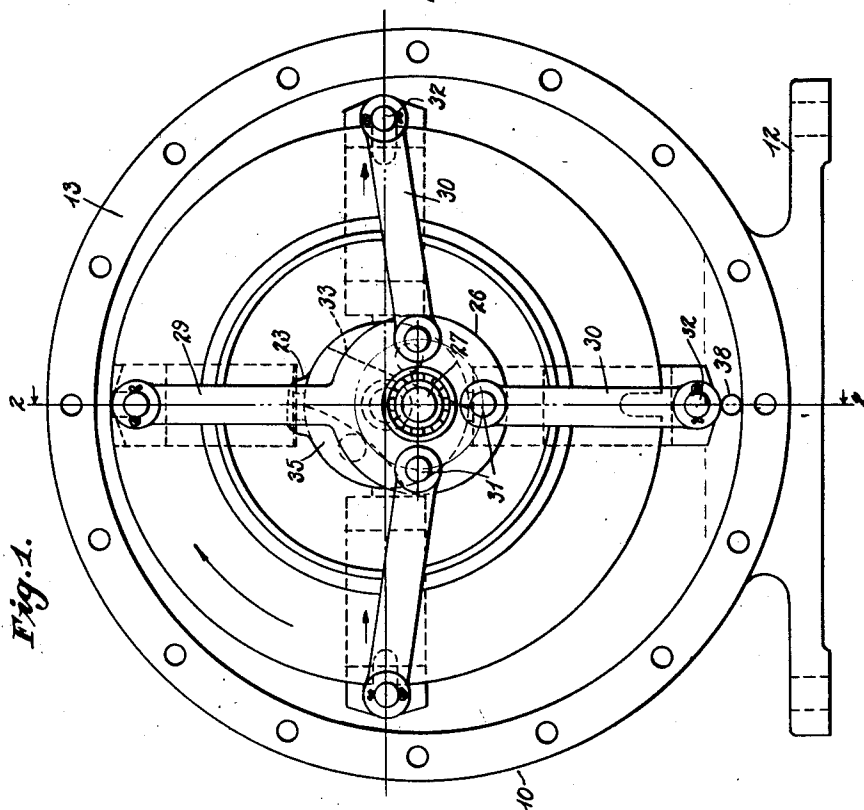


Fig. 1.



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Fig. 4.

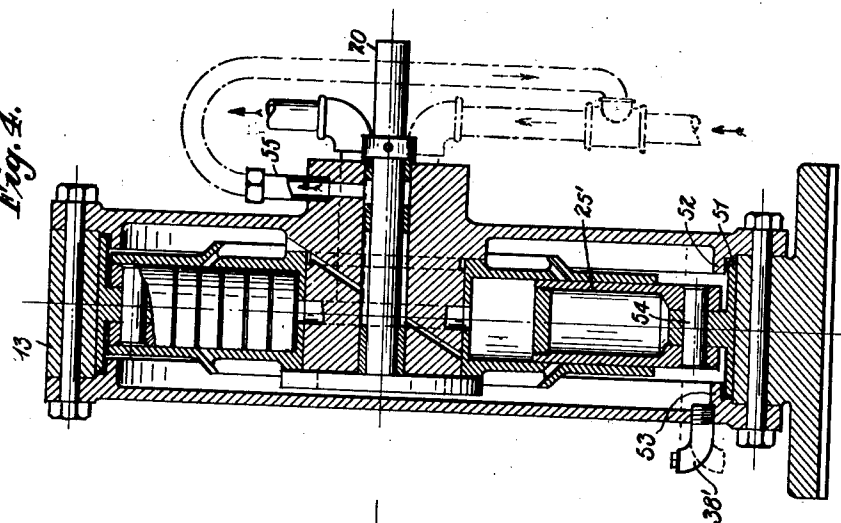
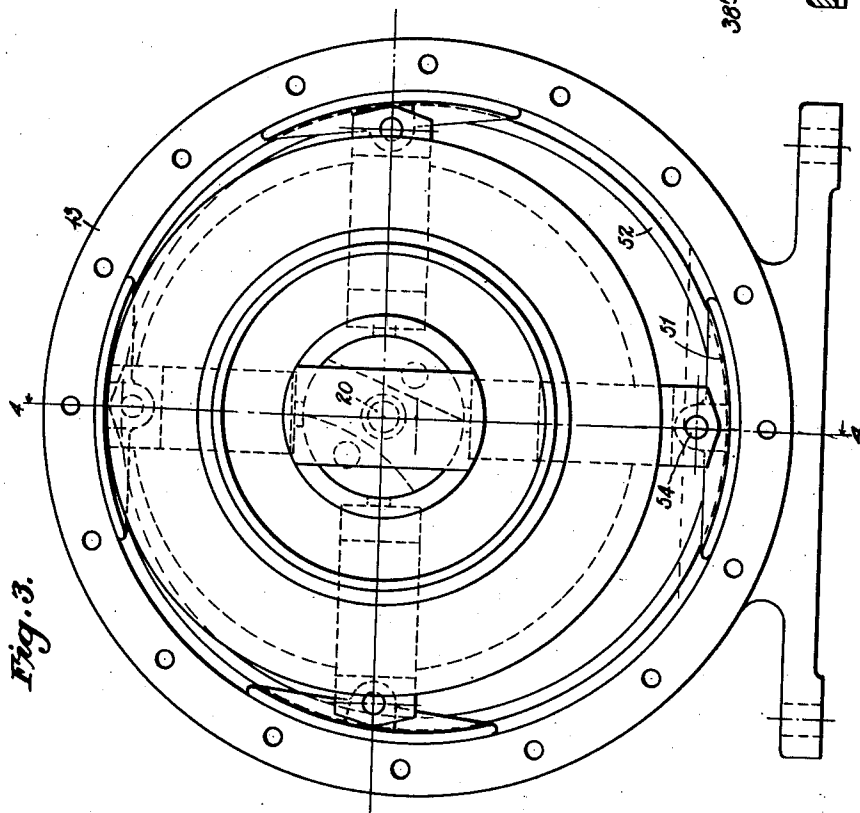


Fig. 3.



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Fig. 6.

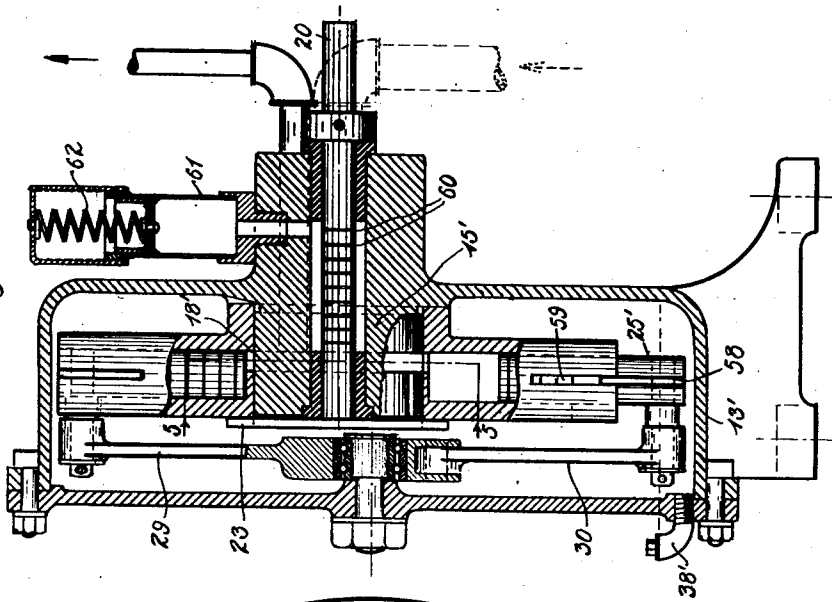
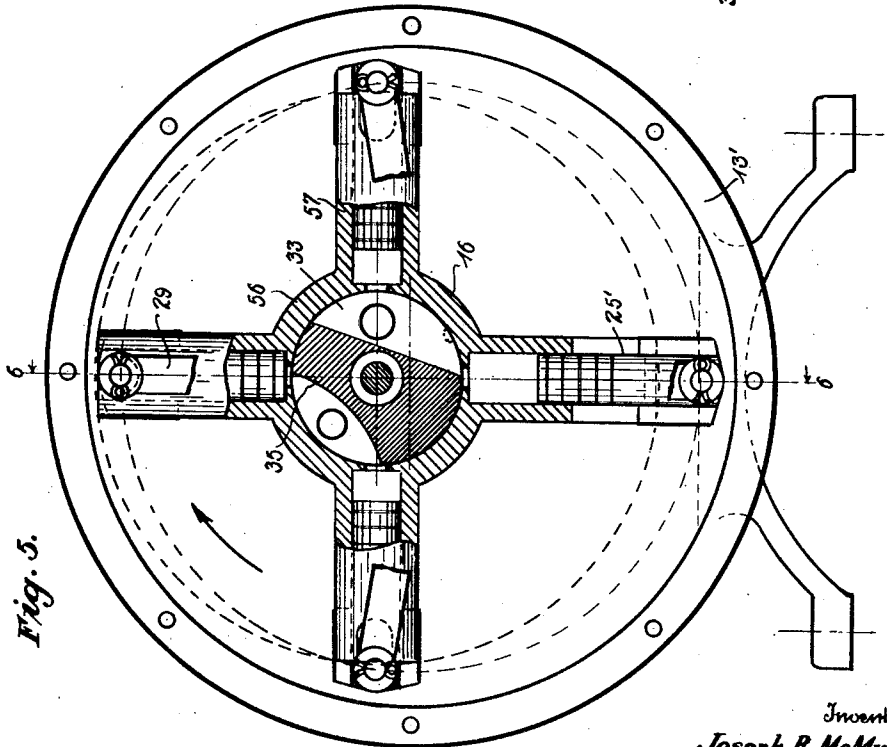


Fig. 5.



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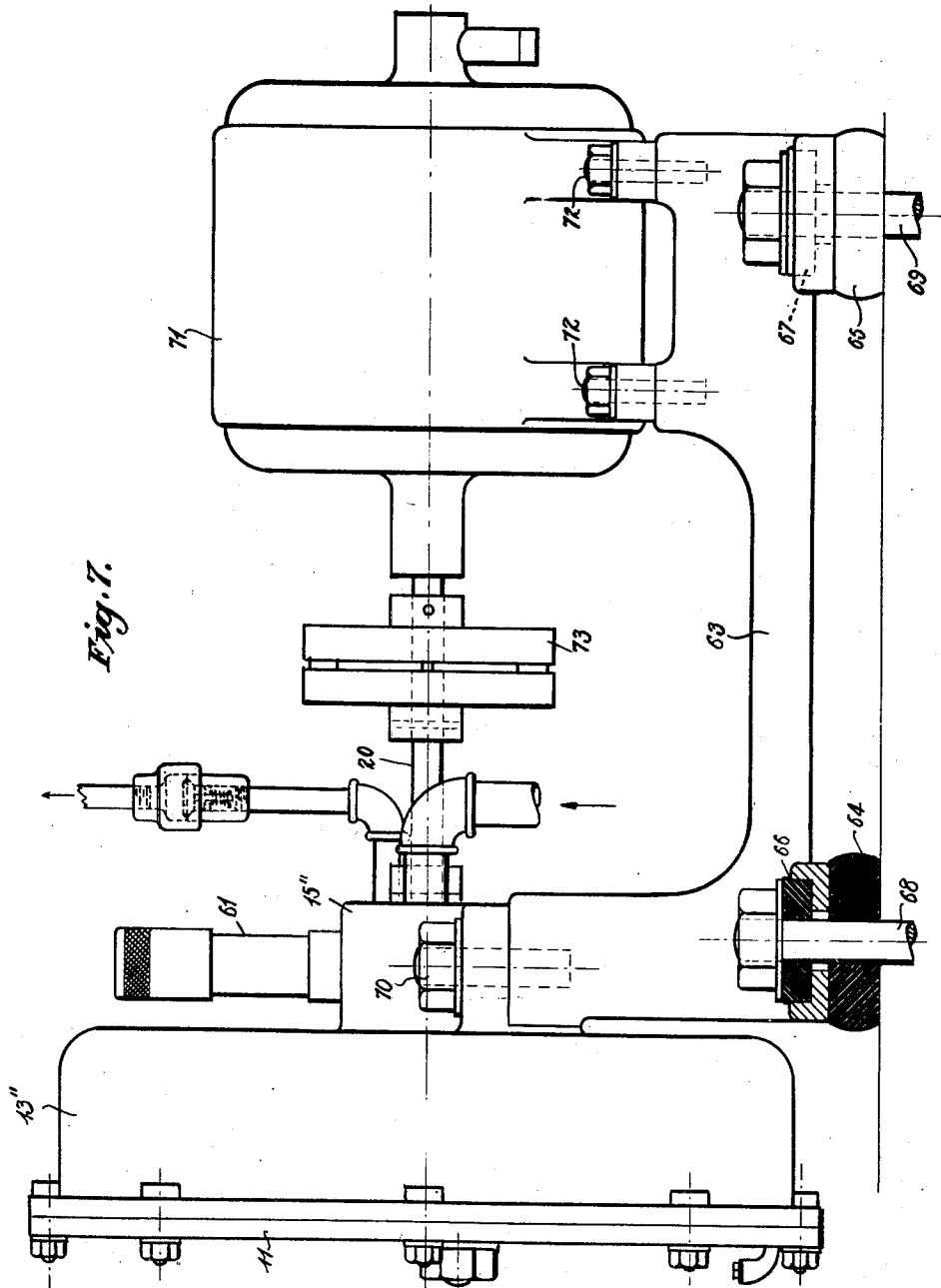
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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COMPRESSOR.

Application filed August 5, 1926. Serial No. 127,332.

The invention relates to compressors of a type adaptable to refrigerators and has as an object the provision of a compressor having rotating cylinders and pistons in which the pistons reciprocate in the cylinders, which parts are enclosed in a gas-tight casing.

A further object of the invention is to provide means for preserving the relation of the pistons to the reciprocation-causing means.

A further object of the invention is to provide means for withdrawing any gas which may find its way into the cylinder casing.

A further object of the invention is to provide a compressor having means to seal the shaft against the leakage of gas therealong.

A further object of the invention is to provide a compressor having no movable valves.

A further object of the invention is to provide means for lubricating the pistons in the cylinders.

Further objects will appear from the following description when read in connection with the accompanying drawings showing illustrative embodiments of the invention, and wherein:

Fig. 1 is a side elevation with the cover of the casing removed;

Fig. 2 is a vertical section on line 2—2 of Fig. 1;

Fig. 3 is a view corresponding to Fig. 1 showing a modified form;

Fig. 4 is a vertical section on line 4—4 of Fig. 3;

Fig. 5 is an elevation corresponding to Fig. 1 partly in section on line 5—5 of Fig. 6 showing a modified form of cylinder member and showing the inlet and outlet ports;

Fig. 6 is a section on line 6—6 of Fig. 5; and

Fig. 7 is a side elevation partly broken away showing the compressor assembled with the motor.

As shown in Figs. 1 and 2, the device comprises a casing 10 having a cover 11, the casing comprising a base 12 having an annular ring 13 preferably cast integral there-

with, and a side plate 14 shown as formed integral with a hub 15.

Revolving upon the hub 15 there is shown an annular member 16 having a plurality of cylinders formed therein and provided with a ring 17 forming a closure for one end of each of the cylinders, each of the cylinders being provided with a port 18 through the ring 17.

There are shown in the embodiment illustrated, four cylinders formed in the member 16 but it will be understood that a greater or less number may be utilized.

To cause revolution of the member 16 upon the hub 15, there is shown a disc 19 rigidly secured to the end of the driving shaft 20, which shaft is shown as journaled in hub 15, bearing metal bushings 21, 22, being provided in which the shaft 20 rotates. The driving force of the disc 19 is desirably applied to the member 16 by means of lugs 23 projecting from the member 16 and extending upon each side of a projection 24 carried by the disc.

To cause reciprocation of the pistons in the cylinders, there is shown a disc 26 eccentrically mounted upon a stub shaft 27 having a shoulder bearing against the inner side of the cover 11 and secured therein by means of a nut 28. One of the pistons 25 is shown as held in fixed relation to the center of shaft 27 by means of an arm 29 integral with the disc 26 and the remaining pistons 25 are preserved in this relation by means of links 30 pivotally attached to the disc 26 upon studs 31 formed upon the disc 26. The ends of each of the links 30 and of the arm 29 are pivotally secured to the pistons 25 by means of pins 32 rigidly secured to the pistons 25.

An important feature of the invention is shown by the provision of the rigid arm 29 for one of the pistons and the links 30 for the remaining pistons. It will be seen that if each of the pistons 25 were connected to the disc 26 by links in pivotal arrangement with the parts at each end, there would be a possible motion of the disc 26 independently of the rotation of the member 16, by means of which motion the pistons could

be moved in the cylinders independently of the rotation of the member 16 thus making possible an engagement of the ends of the pistons with the closed ends of the cylinders. By the arrangement shown revolution of the part 16 will cause a reciprocation of the pistons in the cylinders.

To admit to the cylinders gas or air to be compressed, there is shown a groove 33 in the hub 15, the bottom of the groove formed upon a chord of a circle and having communication with an intake pipe 34 in communication with a passage parallel with the axis of the hub 15 by means of which air may be drawn into the groove.

An outlet for compressed gas is provided in the form of a second groove 35 in the hub 15 having communication with an outlet pipe 36 also communicating with the groove 35 by means of a passage parallel with the axis of the hub. The grooves 33 and 35 are more clearly indicated in the modified form of Fig. 5, which modification introduces a modification of the grooves.

From the dotted lines of Fig. 1, it will be seen that one of the pistons 25 is at the inner limit of its travel in the position at the top of this figure, from which point the piston begins to leave the bottom of the cylinder and almost immediately its port 18 is uncovered by the intake groove 33, permitting the continued rotation of the cylinder with outward travel of the piston 25 to draw in air or gas to be compressed until the outward limit of travel is reached in the position shown by the lower piston in said figure, at which point the piston begins its inward travel with compression of the contents of the cylinder, which compression continues unrelieved through a rotation of substantially 90° to the position shown of the piston at the left in Fig. 1 when the outlet groove 35 is uncovered, whereupon continued inward motion of the piston will be accompanied by flow of compressed gas or air into the groove 35 and out of the pipe 36.

As a result of this action and when four pistons are used, there will at all times be one cylinder delivering compressed gas to the groove 35 resulting in a continuous flow of compressed fluid thereby avoiding the pulsation of pressure which results from single cylinder compressors heretofore in use.

The reciprocation of the pistons 25 in the cylinders is guided through a portion of the travel in the cylinders by the entry of pins 32 in slots 37 in a wall of the cylinder. It will be obvious that the diameter of member 16 can be increased to such an extent by enlargement of the casing that the pins may be at all times present in the slots 37 for complete guidance of the pistons axially of the cylinders.

To lubricate the parts shown, there is shown a filling pipe 38 closed by means of

a plug 39 whereby an oil level 40 may be determined in the bottom of the casing. Oil carried upwardly in contact with member 16 will flow down and be received in oblique channels 41, 42, formed by annular fins 43, 44, carried by the member 16 and communicating with passages 45, 46 in the walls of the member 16, which passages open out of the space about the shaft 20 into the cylinders.

In the form shown in Figs. 1 and 2, oil from the inner wall of the member 16 will gain access to an annular groove 47 in the hub 15 to the space about the shaft 20 through passage 48 and through passage 49 out of the space about the shaft 20 to the surface of the hub 15.

The casing of the compressor can be made gas-tight and it is important in the use of the device with refrigerant compressors in which the gas is often corrosive in character that gas be not allowed to escape from the casing. Almost unavoidably some compressed gas will escape from the cylinders to the interior of the casing. To remove such gas, there is shown a pipe 50 in communication with the interior of the casing discharging to the inlet pipe 34, which pipe will be under rarefaction due to the suction of the cylinders during their intake action, whereby any gas present in the casing will be led into the intake and removed from the casing.

In the form of the device shown in Figs. 3 and 4, reciprocation of the pistons in the cylinders is caused by means of shoes 51 sliding upon the interior of ring 13 and preserved in contact with the surface of the ring by means of flanges 52, 53, overhanging the shoes 51. Each shoe 51 is shown as pivotally connected to the pistons 25' by means of pins 54. In this form of the device, a modified form of means for removing the gas from the interior of the cylinder is shown in the form of a pipe 55 communicating with a passage in the hub 15 which in turn communicates with the space about the shaft 20. It will be understood that this form of gas removal may be utilized with the form of Figs. 1 and 2. In Fig. 4, the lubrication-introducing pipe 38' is shown in dotted lines as turned downward for drainage of the oil from the casing.

In the form of the device shown in Figs. 5 and 6, the member 16' carrying the cylinders is provided as an annular ring 56 having the cylinders 57 projecting therefrom in spoke-like relation thereto. In this form of the device also, each of the pistons 25' is shown as provided with a rib 58 reciprocating in slots 59 in the walls of the cylinders.

In this form of the invention also, the cylinders 57 are offset upon the annular member 56 to bring the ports 18' at one side of the cylinders thereby providing a greater

surface between said ports and the inner end of hub 15' to provide greater resistance to leakage of the compressed gas into the casing. In this form of the device also the ring 13' is made integral with the disc 14 and the hub 15'.

An additional feature of the invention is shown in Figure 6 in the form of means to seal the space about the shaft 20 against leakage of gas in the form of annular grooves 60 in the surface of the shaft 20 and of means 61 to feed grease to this space under the constant pressure of spring 62. Heavy grease fed to the space about the shaft 20 under this constant pressure will be squeezed into grooves 60 thereby providing a series of tongues of grease projecting into these grooves to assist in preventing the passage of gas along the surface of the shaft 20.

In Figure 7 there is shown a check valve in the outlet pipe adapted to close when the pressure in the receptacle containing compressed air or gas exceeds that in the compression cylinders of the pump, as when the pump is at rest, to prevent back pressure causing gas to leak into the casing of the pump.

In the assembly shown in Fig. 7, bed plate 63 is shown desirably mounted upon resilient blocks 64, 65 and clamped thereagainst through the medium of resilient blocks 66, 67, by means of hold-down bolts 68, 69. Upon the bed plate 63 the hub 15' is shown as bolted by means of hold-down bolts 70 and a motor 71 is also secured to the bed plate as by means of hold-down bolts 72, a universal joint 73 providing drive from the motor 71 to the shaft 20.

The operation of the device will be clear from the above description and it will be seen that a compressor which is simple to manufacture is provided and one which will provide a steady flow of compressed gas and which may be run for long periods of time without attention, there being few wearing parts and no movable valves.

Minor changes may be made in the physical embodiment of the invention within the scope of the appended claims without departing from the spirit thereof.

I claim:

1. A compressor comprising in combination, a casing having an inwardly projecting hub, said hub having inlet and outlet grooves and inlet and outlet passages in communication with said grooves, a member having a cylinder revoluble in said casing upon said hub, said cylinder having a port in the surface thereof bearing upon said hub, said port being in communication with said grooves in turn upon revolution of the member, a shaft journaled in said hub, means upon said shaft to cause revolution of said member, a piston in said cylinder, means in said

casing revolving eccentrically with respect to said hub and connected with said piston whereby to cause reciprocation of the piston upon revolution of the member.

2. A compressor comprising, in combination, a casing having an inwardly projecting hub provided with inlet and outlet passages and with circumferential grooves in communication with the respective passages each groove having a substantial extent, a member having a cylinder revoluble in said casing upon said hub and a port placing said cylinder in communication with said grooves successively, a drive shaft to cause revolution of said member, a piston in said cylinder, means in said casing mounted to revolve eccentrically with respect to said hub and connected to said piston to cause reciprocation thereof during revolution of said member, the location and extent of said grooves being such as to place said cylinder in communication with the intake passage during substantially all of the intake stroke of the piston and with said outlet passage during substantially all of the compression stroke thereof.

3. A compressor comprising in combination, a casing, a hub projecting inwardly thereof having inlet and outlet grooves and passages in communication therewith, inlet and outlet conduits in communication with said passages, means placing the inlet conduit into communication with the interior of the casing at a point removed from the lubricated surfaces thereof to withdraw gas from the interior of the casing, a member carrying a cylinder mounted for revolution upon said hub, said cylinder having a port adapted to come into registry alternately with said grooves upon revolution of the member, a shaft journaled in the hub, means carried by the shaft for causing revolution of the member, means mounted for revolution in the casing eccentrically of said shaft, a piston adapted to reciprocate in the cylinder and connected to said last named means whereby revolution of the member may cause reciprocation of the piston.

4. A compressor comprising in combination, a casing having a hub projecting interiorly thereof and having inlet and outlet grooves and inlet and outlet passages connected with said grooves, a member mounted for revolution upon said hub within the casing carrying a plurality of cylinders, said cylinders having ports adapted to communicate in turn with said grooves, a flange carried by said member adapted to intercept oil upon the wall of said member, said cylinders having passages opening upon the axial side of said flange to admit intercepted oil to the cylinders, a piston mounted for reciprocation in each cylinder, a member mounted for revolution in said casing eccentrically of said hub and connected to said pistons to

cause reciprocation thereof and means jour-
nalled in the hub for causing revolution of
the member.

5. A compressor comprising in combina-
tion, a casing, a hub projecting inwardly
thereof having inlet and outlet grooves and
inlet and outlet passages in communication
therewith, a member journaled upon said
hub carrying a plurality of cylinders, each
cylinder having a port adapted to be placed
in communication in turn with said grooves
upon revolution of the member, means jour-
nalled in the hub for causing revolution of
the member, means journaled upon a wall
of the casing eccentrically of said hub hav-
ing an arm rigidly associated therewith, pis-
tons mounted for reciprocation in the cylin-
ders, one of said pistons connected to said
rigidly associated means, a link pivotally
connected to said eccentric means corre-
sponding to each of the remaining pistons,
each of said pivoted means connected to one
of said remaining pistons whereby revolu-
tion of the member will cause reciprocation
of the pistons in the cylinders and the axial
relation of said pistons to the eccentric mem-
ber will be preserved by said rigid means.

6. A compressor comprising in combina-
tion, a gas-tight casing, having a hub pro-
jecting inwardly thereof said hub having in-
let and outlet grooves and inlet and outlet
passages in communication therewith, a
member journaled upon said hub within
the casing having a plurality of cylinders,
each cylinder having a port adapted to be
placed in communication with said grooves
in turn as the member revolves, means jour-
nalled in the hub for causing revolution of
the member, a piston mounted for reciproca-
tion in each of said cylinders, a stub shaft
mounted upon the wall of the casing oppo-
site said hub-carrying wall and eccentric of
said hub, a disc journaled upon said stub
shaft within the casing, an arm rigidly car-
ried by said disc connected to one of said
pistons, links pivotally connected to said
disc, one of said links connected to each of
the remaining pistons, whereby revolution
of the member will cause reciprocation of

the pistons in the cylinders and the axial re-
lation of the pistons to the discs will be pre-
served by said rigid arms.

7. A compressor comprising in combina-
tion, a gas-tight casing comprising an annu-
lar ring and side walls secured thereto, one
of said side walls bearing an inwardly pro-
jecting hub, a member journaled upon said
hub for revolution in the casing carrying a
cylinder, a shaft, bushings at opposite ends
of said hub journaled said shaft in said
hub, a portion of the shaft in spaced relation
to the interior of the hub, means carried
by the shaft for causing revolution of the
member, a piston mounted for reciprocation
in the cylinder, means in the casing eccen-
trically related to said shaft connected to said
piston to cause reciprocation thereof upon
revolution of the member, said shaft having
a circumferential groove upon its surface
within said space, means for supplying
heavy lubricant under pressure to said space
whereby to cause the lubricant to protrude
into said groove to seal the surface of said
shaft against passage of gas therealong.

8. A compressor comprising in combina-
tion, a gas-tight casing having a side wall
and an annular wall integral therewith, a
hub projecting through said side wall into
said casing having inlet and outlet grooves
and inlet and outlet passages in communica-
tion therewith, a member carrying a cylin-
der and mounted for revolution upon said
hub, said cylinder offset with respect to said
groove and having a port offset with respect
to the axis thereof adapted to come into com-
munication with said groove in turn upon
revolution of the member, a side wall asso-
ciated with said annular wall in gastight
relation thereto, a piston mounted for recip-
rocation in said cylinder, means to prevent
revolution of the piston in the cylinder,
means journaled upon said last named side
wall eccentrically of said hub and connected
to said piston whereby to cause reciproca-
tion of the piston upon revolution of the
member, means journaled in the hub to
cause revolution of the member.

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