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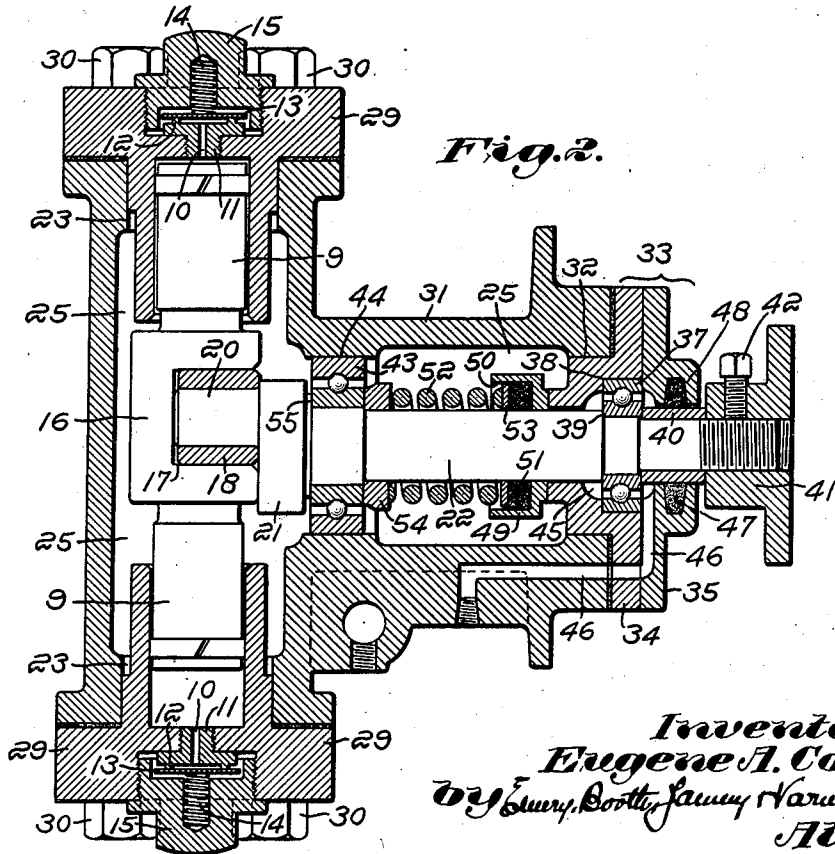
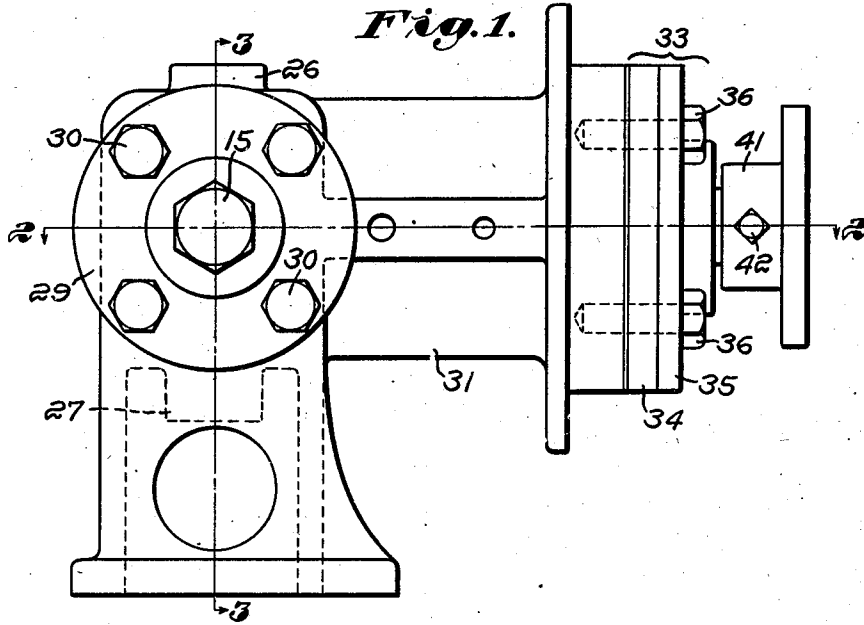
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1,789,618

COMPRESSOR

Filed March 15, 1928

2 Sheets-Sheet 1



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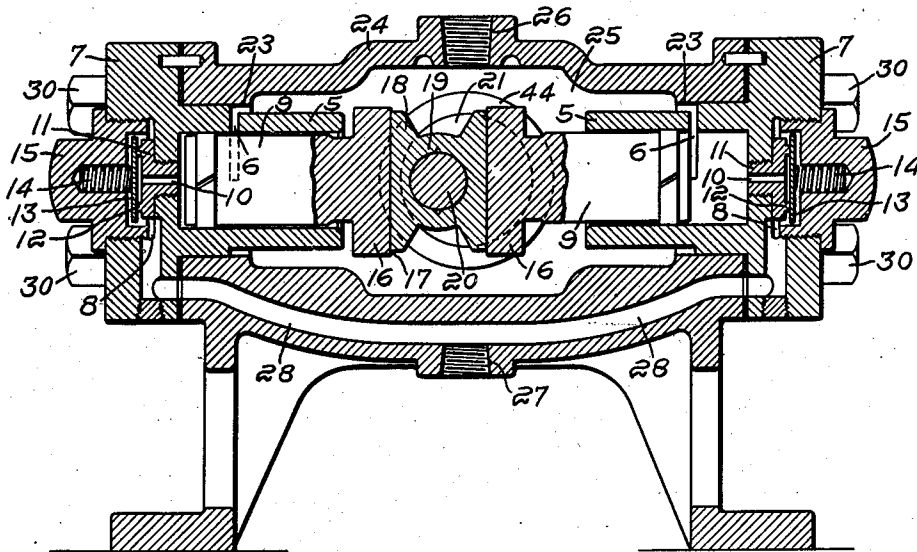
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Fig. 3.



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UNITED STATES PATENT OFFICE

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COMPRESSOR

Application filed March 15, 1928. Serial No. 261,941.

This invention relates to an improved compressor for refrigerating systems of the compressor-condenser-expander-circuit type, and will be best understood by reference to the following description, when taken in connection with the accompanying drawings of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is an elevation of a compressor exemplifying the invention;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 1.

Referring to the drawings, and to the embodiment of the invention which is selected for exemplification, and having reference at first to Fig. 3, there is shown a compressor comprising two opposed cylinders 5, each having a lateral intake port 6, and a head 7 having an outlet chamber 8. Working in each cylinder is a piston 9, which, during its inward or backward stroke, uncovers the intake port 6 and admits the gas to the compression space of the cylinder. The outward or forward stroke of the piston compresses the gas and forces it through a passage 10 leading to the outlet chamber 8, said passage in the present example being formed in a plug 11, having screw-threaded engagement with the cylinder head, and presenting a valve seat 12 for cooperation with an outlet valve, herein a flat plate or disc 13, urged toward said seat by an appropriate spring 14, which is received in a second plug 15 threaded into the cylinder head. The seat projects into and is spaced from the sides of the chamber 8, so that the fluid, in flowing from the passage 10 to the chamber 8, sweeps across the seat and keeps the latter free from foreign matter.

Referring now to Fig. 2, the pistons herein are connected to each other by a rigid connection 16, conveniently formed as an integral part thereof, and presenting in one side a groove 17 extending transversely of said pistons. Working in this groove is a sliding block 18, best shown in Fig. 3, presenting a

bearing 19 for a crank pin 20 of a crank 21 (see Fig. 2), herein conveniently formed on a crank-shaft 22, which extends transversely of the pistons. Rotation of this crank-shaft naturally causes reciprocation of the piston. Referring again to Fig. 3, it is to be noted that the groove 17 is open at its ends, and the length and stroke of the block 18 are such that toward the end of its travel, in either direction, it passes beyond the ends of the groove. This ensures even wear of the opposed faces of the groove, thereby preventing chattering of the block in the groove.

Still referring to Fig. 3, the cylinders are mounted in openings 23, presented by a housing 24, having therein an intake chamber 25, with which the intake ports 6 of the cylinders communicate. This chamber houses the cylinders, pistons, crankshaft and sliding block. The gas enters this chamber through an inlet 26, at the top, at a point just above the crank and sliding block, and in a position where the oil carried along by the gas spatters in a spray over the working parts, and ensures their adequate lubrication. The housing presents an outlet 27 at the bottom and beneath the outlet chambers 8, to which it is connected by branch passages 28 leading in a downward direction from said chambers toward said outlet, thereby to prevent oil or other liquid from being trapped and causing knocking.

Referring now to Figs. 1 and 2, the cylinders are secured in place in the housing, as by being provided with flanges 29 conveniently secured to the housing by cap screws 30. The openings 23, through which the cylinders are inserted into the intake chamber in the housing, are so related to the connection 16 between the pistons (which connection by the way is conveniently of cylindrical form) that removal of the pistons and their connection can be accomplished by first removing the cylinders, and then withdrawing the pistons through one of the openings 23.

The housing presents a large boss 31, into which the intake chamber 25 extends. The outer end of this hub has an opening 32, closed by an appropriate closure 33, herein

comprising two plates 34 and 35, conveniently secured to the housing as by cap screws 36 (see Fig. 1). This closure affords a convenient support for an appropriate bearing 37, herein a ball bearing of the type comprising two curved races in which the balls are received, said bearing being adapted to carry the radial load of the shaft, as well as to prevent endwise movement of the same. To this end, the outer race of the bearing is received in a chamber 38 presented by the plate 34. It is held in place therein by the overlying plate 35, while the inner race rests against a shoulder 39 on the crankshaft, and is held in place against said shoulder by a sleeve 40 and a nut 41 threaded onto the outer end of the shaft. Proper adjustment of this nut is conveniently maintained by a set screw 42.

The crankshaft has another bearing, herein a ball-bearing 43, which in the present example is similar to the bearing 37 but of larger size, located adjacent the crank 21. This bearing is conveniently supported by the hub 31, which has an opening 44, in which the bearing is received. For convenience of machining the openings 32 and 44, they are made of the same diameter, so that one boring operation finishes both of them. By simply removing the cap screws 36, the closure 33, together with the crankshaft and its bearings, can be withdrawn as a unit from the housing. When this has been done, the cylinders can be removed in the manner previously explained.

While the bearing 43 receives ample lubrication from the oil which spatters from the gas intake onto the crank and associated parts, the bearing 37 is provided with its own separate means of lubrication, the same herein comprising a chamber 45 formed in the closure 33, and fed with lubricant through a passage 46, which is formed partly in the plates 34 and 35 and partly in the housing 31. Escape of oil in an outward direction from this chamber is conveniently prevented by a felt collar 47 encircling the sleeve 40 and received in an annular groove 48 provided in the plate 35.

The crankshaft is provided with a suitable stuffing box, herein a cupped sleeve 49 encircling the shaft and provided with a recess 50, which receives a soft washer 51, made of felt or other appropriate material, held under compression and squeezed against the shaft by a spring 52 disposed about the shaft and interposed between a metallic washer 53 pressing against the washer 51 on the one hand, and a collar 54 on the other hand, which rests against the inner race of the bearing 44. The other end of said race rests against a shoulder 55 presented by the crank 21. Thus the spring 52 keeps the bearing 43 in its place, and maintains the soft washer

51 under compression, thereby preventing leakage along the shaft at this point.

When power is applied to the crankshaft, the reciprocation of the pistons (see Fig. 3) draws gas from the intake 26 into the intake chamber 25, whence it passes through the lateral intake ports 6 into the cylinders, where it is compressed and then discharged through the passages 10 past the outlet valves 13 into the outlet chambers 8, and thence through the branch passages 28 to the outlet 27. The pump has a minimum number of working parts and a minimum number of joints, its parts can be machined easily, and it can be easily and quickly assembled and dismounted. It will run with a minimum of vibration, so little in fact, that it cannot be heard above the hum of the usual electric motor which drives it.

Having thus described one embodiment of the invention, but without limiting myself thereto, what I claim and desire to secure by Letters Patent is:

1. In a compressor, the combination of two opposed cylinders, each having a lateral intake port and a head having an outlet chamber, an outlet valve, a piston working in each cylinder, a rigid connection between said pistons and presenting in one side a groove extending transversely of said pistons, a block slidable lengthwise of said groove, a crankshaft extending transversely of said cylinders and having a crank provided with a crank-pin received in a bearing presented by said block, a housing provided with a T-shaped intake chamber in which said cylinders, said pistons, said block, and said crankshaft are housed, said housing being provided with an outlet passage connecting said outlet chambers below the latter, said intake chamber having three openings, two of which are closed by said piston heads, a closure for said third opening and presenting a bearing through which said crankshaft extends to the exterior of said housing, and another bearing for said crankshaft within said intake chamber and adjacent said crank.

2. In a compressor, the combination of two opposed cylinders, a piston working in each cylinder, a rigid connection between said pistons and presenting a guide extending transversely of said pistons, a block slidable lengthwise of said guide, a crankshaft extending transversely of said cylinders and having a crank provided with a crank-pin received in a bearing presented by said block, and a housing provided with a chamber in which said cylinders, said pistons, said connection, said block and said crankshaft are housed, said chamber having three openings, one through which said crankshaft may be withdrawn, and two through which said cylinders project into said chamber and through either of which said pistons and said rigid connection may be withdrawn.

3. In a compressor, the combination of two opposed cylinders, a piston working in each cylinder, a connection between said piston, a bearing carried by said connection, a crank-shaft extending transversely of said cylinders, and having a crank provided with a crank-pin received in said bearing, a crank-shaft bearing adjacent said crank, and a housing within which said crank-shaft is housed, said housing being provided with an opening through which said crank-shaft and said bearing may be withdrawn.

4. In a compressor, the combination of two opposed cylinders, a piston working in each cylinder a connection between said pistons, a bearing carried by said connection, a crank-shaft extending transversely of said cylinders and having a crank provided with a crank-pin received in said bearing, a crank-shaft bearing adjacent said crank, a housing within which said crank-shaft is housed, said housing being provided with an opening through which said crank-shaft and said bearing may be withdrawn, a closure for said opening, and a crank-shaft bearing carried by said closure.

5. In a compressor, the combination of two opposed cylinders, a piston working in each cylinder, a connection between said pistons, a bearing carried by said connection, a crank-shaft extending transversely of said cylinders and having a crank provided with a crank-pin received in said bearing, a crank-shaft bearing adjacent said crank, a housing within which said crank-shaft is housed, said housing being provided with an opening through which said crank-shaft and said bearing may be withdrawn, a closure for said opening, and a crank-shaft bearing carried by said closure, said closure and said bearing carried thereby cooperating normally to hold said crank-shaft against axial displacement, and to withdraw said crank-shaft and the first-mentioned bearing when said closure is removed from said housing.

6. In a compressor, the combination of pumping mechanism comprising opposed cylinders and pistons working therein, and a housing having an intake chamber between and communicating with said cylinders, an inlet leading into said chamber above said mechanism, said cylinders having outlet ports and downwardly-directed passages leading therefrom and a common outlet passage connecting said downwardly-directed passages and having at its lowest point an outlet below said cylinders and below said downwardly-directed passages.

7. In a compressor, the combination of a pumping mechanism comprising a cylinder, a piston, and a crank which reciprocates said piston, and a housing having an intake chamber communicating with said cylinder, an inlet leading into said chamber above and dis-

charging downwardly onto said crank, and an outlet below said cylinder.

8. In a compressor, the combination of a pumping mechanism comprising a horizontal cylinder having a lateral inlet port, an outlet chamber, a valve controlling the outlet from said cylinder to said chamber, a piston working in said cylinder and covering and uncovering said port, a crank which reciprocates said piston, and a housing having an intake chamber at one end of said cylinder and communicating with the latter and with said lateral port, an inlet leading into said chamber above and discharging onto said crank, and an outlet leading from said outlet chamber below the latter.

9. In a compressor, the combination of a piston, a cylinder in which said piston works, said cylinder having a head provided with an outlet chamber, inner and outer plugs in said head, said inner plug presenting a valve seat, an outlet valve cooperating with said seat, and a spring interposed between said valve and the outer plug and urging said valve toward said seat, removal of said outer plug affording access to and removal of said valve, said spring and said inner plug.

10. In a compressor, the combination of a piston, a cylinder in which said piston works, said cylinder having a head provided with an outlet chamber, a valve seat projecting into and spaced from the sides of said chamber, an outlet valve cooperating with said seat, a plug in said head affording a guide for said valve, and a spring held by said plug and urging said valve toward said seat.

11. In a compressor, the combination of a piston, a cylinder in which said piston works, said cylinder having a head provided with an outlet chamber, a valve seat projecting into and spaced from the sides of said chamber, an outlet valve cooperating with said seat, a plug in said head affording a guide for the margin of said valve, said guide being about and spaced from said seat, and a spring held by said plug and urging said valve towards said seat.

12. In a compressor, the combination of pumping mechanism comprising opposed cylinders and pistons working therein, said cylinders being provided with lateral ports covered and uncovered by said pistons; and a housing having an intake chamber between and communicating with said cylinders by way of said ports when the latter are uncovered by said pistons, an inlet leading into said chamber above said mechanism, said cylinders having outlet ports and downwardly-directed passages leading therefrom, and a common outlet passage connecting said downwardly-directed passages and having at its lowest point an outlet below said cylinders and below said downwardly-directed passages.

13. In a compressor, the combination of a pumping mechanism comprising a cylinder

provided with a lateral port, a piston and a crank which reciprocates said piston in said cylinder and causes said piston to cover and uncover said port, and a housing having an intake chamber communicating with said cylinder by way of said port when the latter is uncovered by said piston, an inlet leading into said chamber and discharging downwardly onto said crank, and an outlet below said cylinder.

In testimony whereof, I have signed my name to this specification.

EUGENE A. COBB.

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