

F. M. BENNETT.

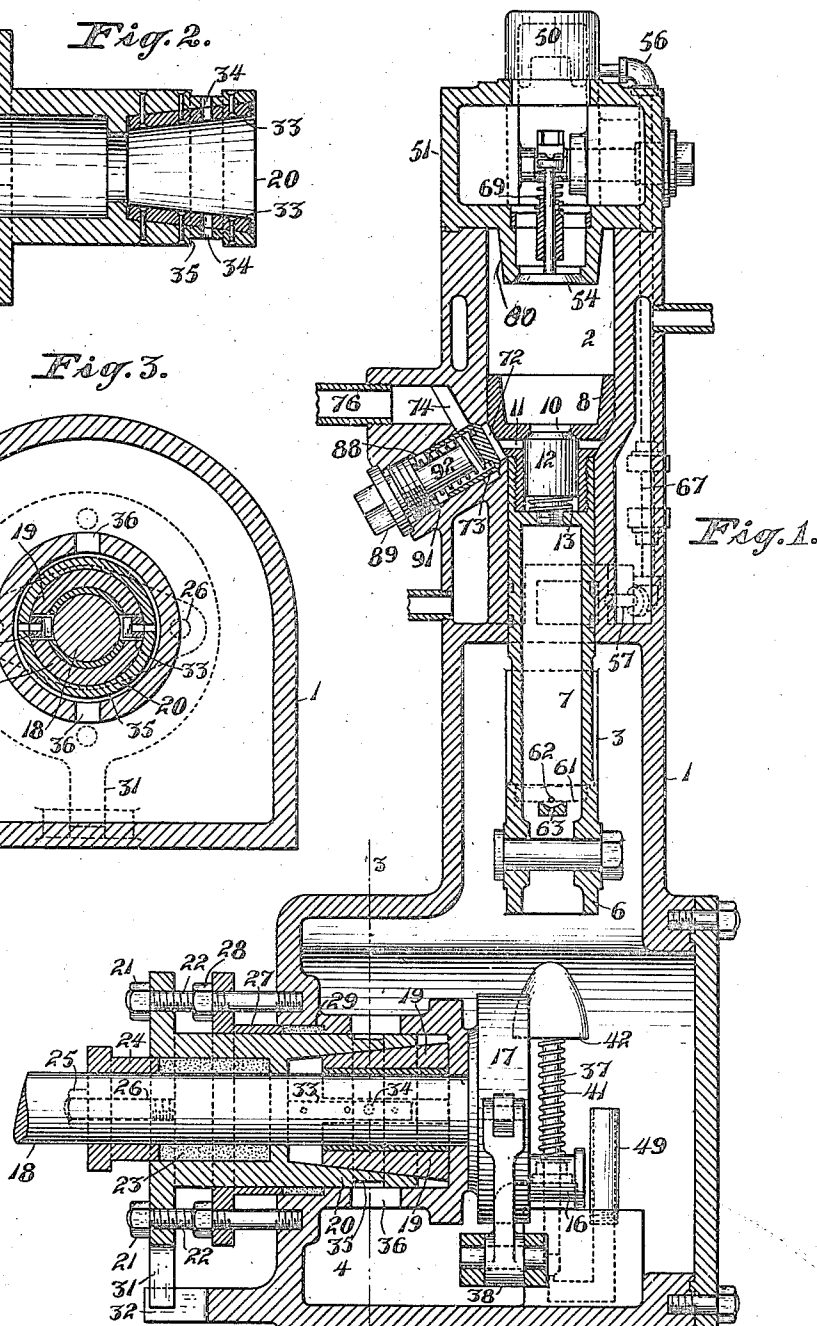
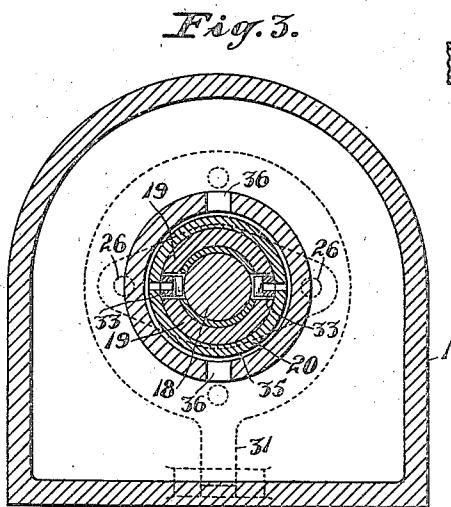
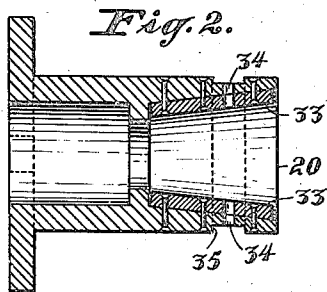
GAS COMPRESSOR.

APPLICATION FILED DEC. 28, 1914.

1,240,925.

Patented Sept. 25, 1917.

2 SHEETS—SHEET 1.



WITNESSES:

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2 SHEETS—SHEET 2.

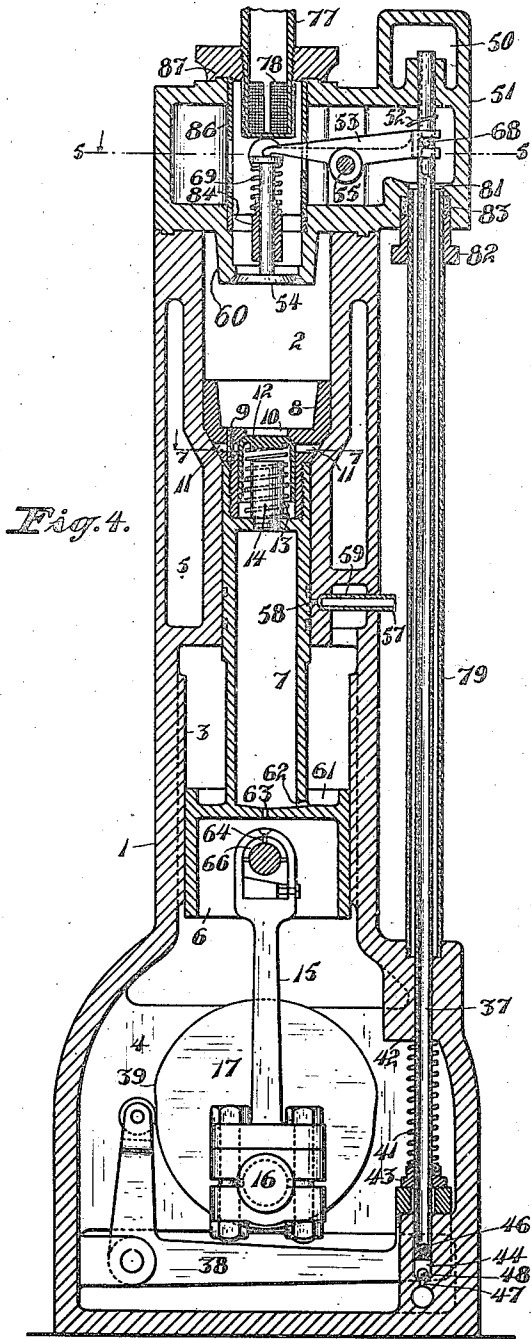


Fig. 4.

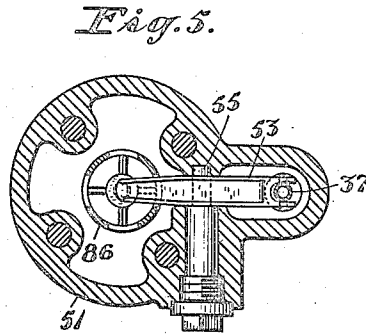


Fig. 5.

Fig. 6.

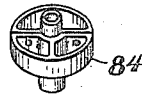
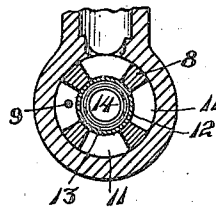


Fig. 7.



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UNITED STATES PATENT OFFICE.

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GAS-COMPRESSOR.

1,240,925.

Specification of Letters Patent. Patented Sept. 25, 1917.

Application filed December 28, 1914. Serial No. 879,323.

To all whom it may concern:

Be it known that I, FRANK M. BENNETT, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented new and useful Improvements in Gas-Compressors, of which the following is a specification.

The present invention relates to improvements in machines for compressing gases, especially for those used in refrigerating plants.

The principal object of the invention is to provide a machine of this character which will compress the gas in two stages in a single complete reciprocation of a piston.

Another object of the invention is to provide means for adjusting the bearing of the crank shaft to take up wear and maintain it gas-tight.

Further objects will appear from the description of the invention and will be particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of my improved gas compressor; Fig. 2 is a horizontal section through a wedge for the bearing of the crank shaft; Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 1; Fig. 4 is a vertical central transverse section; Fig. 5 is a horizontal section on the line 5—5 of Fig. 4; Fig. 6 is a perspective view of a guide; Fig. 7 is a partial horizontal section on the line 7—7 of Fig. 4.

Referring to the drawings, 1 indicates a casting comprising a compressor cylinder 2, a cross head guide 3, a crank case 4 and a water jacket 5. 6 indicates a cross head and 7 a piston rod screwed to a hollow piston 8, and locked by a set screw 9. Said piston has an opening 10 in its face, connected with lateral passages 11 leading to a conical portion of the side of the piston. The piston forms a guide and a seat for an intermediate discharge valve 12 which closes said opening 10, and is pressed to its seat by a helical spring 13. A projection 14 forms a stop for said valve and a guide for the spring.

The cross head 6 and the piston 7 are caused to reciprocate in the cylinder 2 by means of a connecting rod 15 attached to a crank pin 16 fastened on a crank disk 17, which is rotated by a crank shaft 18, driven by a belt on a fly wheel (not shown), or by other source of power.

The crank shaft 18 rotates in bearing

boxes 19 which are conically tapered. 20 indicates a cylindrical adjusting wedge, turned on the inner end to the same taper as the exterior of the bearing boxes 19, and arranged to be drawn inward on said bearing boxes by nuts 21 on studs 22, thus forcing the bearing boxes to a proper fit on the shaft 18. The outer end of the wedge 20 is bored to form a stuffing box 23 to hold packing, which is compressed by a gland 24, which is adjusted to the proper pressure by means of nuts 25 on studs 26 secured to, and extending from, the wedge 20. The stuffing box 23 and gland 24 prevent the escape of refrigerating gases from the crank case 4 along the shaft 18.

27 indicates an adjustable gland, pressed inwardly by nuts 28 on the studs 22, and compressing packing in an annular space 29 in a recessed portion of the crank case 4 around the wedge 20. The stuffing box 29 and gland 27 prevent the escape of refrigerating gases from the crank case out along the cylindrical adjusting wedge 20.

The cylindrical adjusting wedge 20 has a projecting arm 31 located to rest against a projection 32 of the crank case 4 to prevent rotation of the wedge 20, and it has strips 33 riveted thereto, as clearly shown in Fig. 2, against which the bearing boxes 19 abut to prevent their rotation with the shaft 18.

The adjusting wedge 20 and the strips 33 have oil holes 34 leading through them to conduct oil to the shaft journal from an annular space 35 on the adjusting wedge 20 into which space 35 oil enters from the crank case 4 through holes 36.

37 indicates a hollow rod or pipe, given a reciprocating motion in proper time with the piston 7 by means of a bell crank lever 38, operated by a cam 39 on the periphery of the crank disk 17 and by a spring 41 compressed between an abutment 42 on the inner surface of the crank case and a collar 43 secured on the pipe 37. Said pipe 37 reciprocates in an oil pump cylinder 44 in the crank case 4, and has a valve 46 at its lower end. The pump cylinder 44 has ports 47 and a valve 48, by means of which the pipe 37 pumps oil from the crank case through a suction pipe 49 up to an elevated oil chamber 50 in a cylinder head 51. Such oil as works back down the outside of the pipe 37 is collected, and led by means of a projection 52 on said pipe 37 to the upper concave side of a lever 53, pivoted on a pin

55 and which conducts oil to a suction valve 54, from which point the oil finds its way to the interior of the compressor cylinder 2. The remaining oil that is delivered to the chamber 50 is led by means of a pipe 56 to an oiling nipple 57, whence it is delivered by an oil hole 58 to the piston rod, and the remaining oil overflows through a hole 59 in the pipe 56, and is caught in a pocket 61 on the upper side of the cross head and is then led through holes 62 and 63 to an oil hole 64 on the upper side of the cross-head pin bearing 66. The oil pipe 56 has a sight glass 67 by which the operator can be apprised of the fact when the oil pump ceases to deliver oil for any reason, as when the oil supply in the crank case falls below the inlet to the oil suction pipe 49.

In order that the conduit leading from one end of the cylinder to the other, that is, the opening 10 and the passages 11, may be as short as possible, and at the same time to make the side of the piston sufficiently wide to prevent leakage past its side from one end of the cylinder to the other, the piston 8 is made with a cavity, and the opening 10 is formed in the bottom of said piston, and the head 51 of the cylinder is formed with an extension 60 extending into the cavity of the piston when the piston is adjacent to said head, so as to fully compress the gas in the adjacent end of the cylinder, the suction valve 24 being seated on a seat in the extreme end of said extension 60.

The pipe 37 is so operated by means of the cam on the crank disk that it is at its upper point of travel while the piston 8 is traveling downward, and by means of a pin 68 engaging the forked end of the lever 53 it opens, and holds open during the downward stroke of the piston, the suction valve 54.

As the piston 8 commences its upward travel, the cam on the crank disk 17 allows the bell crank lever 38 to descend, allowing the spring 41 to force the pipe 37 down, moving the lever 53 so as to relieve the pressure on the valve 54, allowing a spring 69 to lift the valve 54 to its seat. As the piston 8 moves up, the refrigerating gas, trapped in the cylinder upon the closing of the valve 54, is forced through the valve 12 and passages 11 into the annular space below the face of the piston 8 inclosed by the walls of the cylinder and the piston rod 7. On the downward stroke of the piston, the gas thus trapped is forced out through the discharge valve port 72 past a valve 73 into a discharge port 74 to which is connected a discharge pipe 76.

The refrigerating gas is conducted to the compressor by means of a suction pipe 77,

the end of which is cut away to form apertures around which is secured a wire screen 78 forming a scale trap to prevent scale and dirt entering the compressor cylinder from the suction pipe.

A casing 79 around the pipe 37 is screwed at its lower end into the crank case 4, making a gas-tight joint, and at its upper end slides into an opening 81 in the cylinder head 51, and a threaded jam nut 82 compresses packing in a space 83 around said casing in said head, making a gas-tight joint around the casing.

The stem of the suction valve 54 is guided by a split guide 84, held securely in its pocket in the head by means of a cage 86, which is pressed against the guide 84 by means of the suction inlet flange 87.

The cage 86 has openings leading to the interior of the head 51, allowing the free discharge of gas into a large space in the head, which acts as a reservoir tending to equalize the flow of gas in the suction line, and insuring full suction pressure at the suction valve 54.

A valve pocket 88 is bored to form a guide for the valve 73. A plug 89 screws into the pocket 88, compressing a gasket 91, and forming a gas-tight joint. A projection 92 on the plug 89 forms a stop for the valve 73, preventing the outer end of the valve from hammering on the plug 89.

I claim:—

In a gas compressor, the combination of a cylinder having an inlet conduit at one end, and a discharge conduit at the other end, a piston rod slidable through said latter end, having a diameter sufficiently large to materially reduce the volume of the space in the cylinder around the piston rod, whereby said space may be used as a second stage compressor cylinder for the gas passing thereinto from the other end, a hollow piston connected to said rod and having a conduit leading from the portion of said cylinder adjacent to said inlet end to that around the piston rod, a non-return valve carried by said piston and controlling said latter conduit, the cylinder head at the end opposite to that through which the piston rod extends having an extension adapted to enter the cavity of the piston when the piston is moved adjacent to said end, and a non-return suction valve seated on a seat in said extension, and controlling said inlet conduit.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANK M. BENNETT.

Witnesses:

FRANCIS M. WRIGHT,
D. B. RICHARDS.