Oct. 20, 1925. 1,557,706

G. F. KNOX

COMPRESSOR

Original Filed March 27, 1922

Fig. 1.

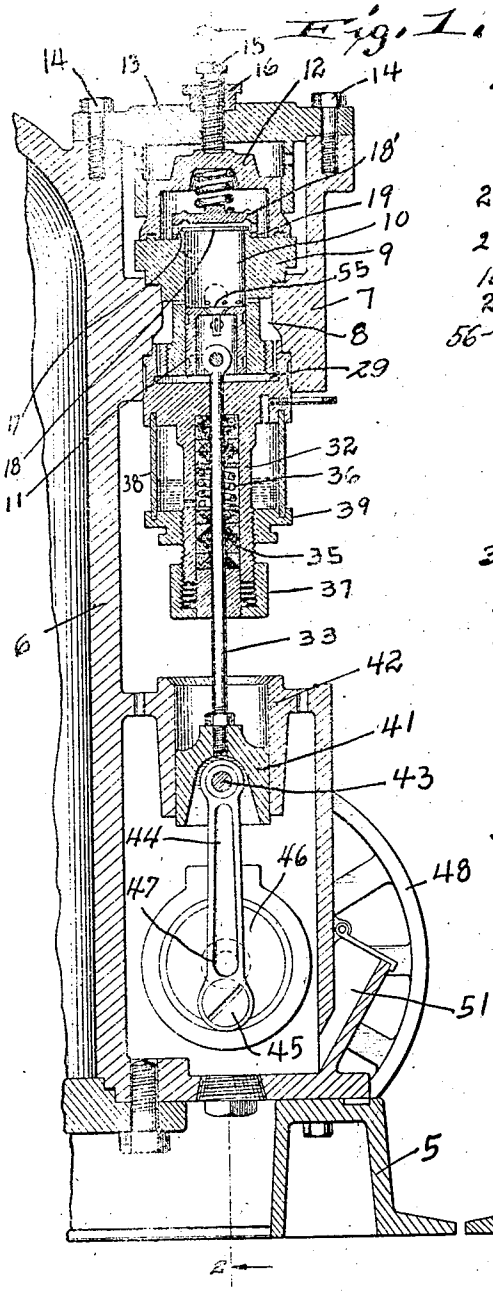
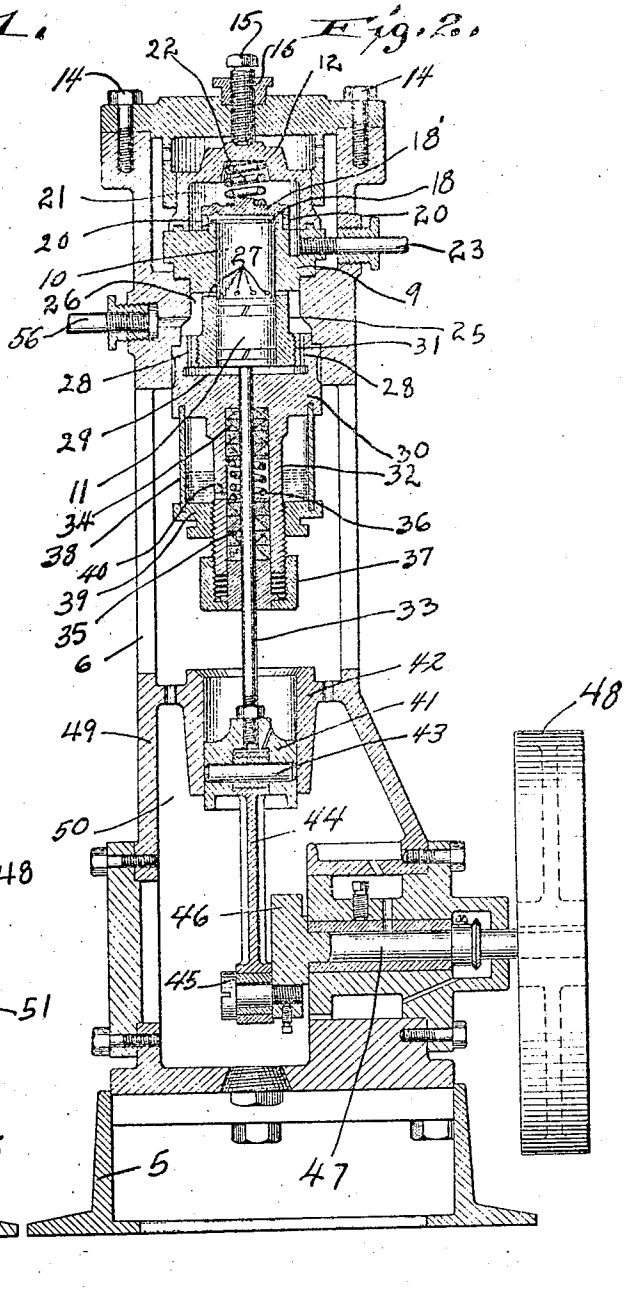


Fig. 2.



INVENTOR.

BY George F. Knox.

Merrell, Kenny & Morsell

ATTORNEY.

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UNITED STATES PATENT OFFICE.

GEORGE F. KNOX, OF MILWAUKEE, WISCONSIN.

COMPRESSOR.

Original application filed March 27, 1922, Serial No. 547,071. Divided and this application filed January 7, 1924. Serial No. 684,800.

To all whom it may concern:

Be it known that I, GEORGE F. KNOX, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Compressors, of which the following is a description, reference being had to the accompanying drawings which are a part of this specification.

This invention relates to a fluid compressing apparatus and has for one of its objects to provide a device of this character which will be simple in construction, comparatively inexpensive to manufacture and more efficient in use than those which have been heretofore proposed.

The compressor constituting the present invention, while primarily designed for use in connection with small refrigerating plants, such for example as that disclosed in my co-pending application, Serial Number 547,071, filed March 27, 1922, entitled "Refrigerating apparatus," of which this application is a division, is at the same time not limited solely to such use but is susceptible of employment in a wide field for the compressing of fluids, as will be readily understood from the following description.

The invention further relates to a compresser of the type employing a piston working within a cylinder, which latter is provided with a movable head constituting an exhaust valve therefor, and has for a further object to provide a compressor of this type which will operate more economically and will require a minimum amount of power.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction and the combinations of parts, more fully hereinafter described, and particularly pointed out in the appended claims.

Referring to the accompanying drawings in which like numerals designate like parts in all the views;

Figure 1 is a central vertical sectional view of a compressor made in accordance with the present invention, illustrating the same as used in connection with a receiving tank or chamber for a refrigerating apparatus, such as that disclosed in my said co-pending application; and,

Fig. 2 is a similar view, taken at right angles to Fig. 1.

In the said drawings, the numeral 5 indicates a base upon which is suitably mounted a support 6, which is here shown as comprising a wall of a receiving tank or chamber, although this support may take any suitable form when the compressor is employed with other forms of apparatus than the refrigerating machine. The said support 6 is preferably provided with an extension 7, provided with a bore 8 to receive the cylinder block 9. The said block 9 is bored to provide a cylinder 10, within which is slidably mounted the piston 11, as will be clear from the drawings.

The said block 9 is further preferably shaped substantially as illustrated, and may be retained within the bore 8 by means of a hollow head or retaining member 12, seated upon the upper face thereof, which in turn is maintained in position by means of the movable cap or plate 13, secured to the extension 7, as by the bolts 14. A set screw 15, provided with a lock nut 16, extends through the member 13, and engages the cap member to retain the same in position upon the cylinder block 9.

The upper portion of the cylinder block 9 immediately surrounding the cylinder bore 10, is formed to constitute a valve seat 17, upon which is adapted to fit a valve disc 18. A valve cover 18′ provided with an annular flange 19, which flange may be provided with a plurality of ducts or apertures 20, extending therethrough, retains the valve 18 in position, as will be readily apparent. These said ducts or aperturnes 20 lead from the cylinder 10 to the chamber 21, formed within the cap member 12, and afford communication between the said cylinder and chamber when the valve 18 is in open position, whereby ammonia gas or other fluid may pass from one to the other. The said valve disc 18 is movable vertically relative to the cylinder block 9, by pressure and is closed by gravity, while the valve cover 18′ is normally maintained in position by means

of a coiled spring 22, and is moved upwardly by abnormal pressure, as will presently appear. An exhaust pipe 23, leads from the chamber 21, as clearly shown in Fig. 2, to conduct the compressed fluid from the said chamber to the point where it is to be used.

The lower portion 25 of the cylinder block 9 is of reduced diameter, being somewhat smaller than the bore 8 of the extension 7, thereby providing an annular chamber 26, surrounding the said cylinder block which constitutes a feed chamber, from which the fluid may be introduced into the cylinder 10. A plurality of circumferentially arranged ducts 27 lead from the chamber 26 through the cylinder walls to the interior of the said cylinder at points approximately half way between the ends thereof, and a second series of ducts or passages 28 extend downwardly from the chamber 26 and communicate with a chamber 29, which in turn is in communication with the lower end of the cylinder 10.

The lower end of the said cylinder may be closed by a cylinder head block 30, threaded as at 31 upon the lower reduced portion 25 of the cylinder block 9, and the said block 30 may be provided with a reduced downwardly extending annular portion 32, through which passes the piston rod 33, as will be readily apparent from the drawings.

The said annular extension 32 may be provided with suitable packing rings, 34 and 35, spaced apart by means of a coiled spring 36, and retained in position by means of the cap 37 threaded upon the lower end of the portion 32. A glass or other transparent cylinder 38 is positioned between the enlarged head of the block 30 and a retaining nut 39 threaded upon the reduced portion 32, and constitutes an oil reservoir from which oil or other lubricant may be supplied to the piston rod through a duct 40.

The lower end of the piston rod 33 preferably carries a cross head 41, which is slidably mounted in a suitable cross head guide 42, and the said cross head also has pivotally secured to it, as by the pin 43, a connecting rod 44. The lower end of the said rod 44 is carried by a crank pin 45, mounted on a crank disc 46, rigidly carried by the main power shaft 47, suitably journalled in the support 6, and also provided with a pulley or other drive member 48. The lower portion 49 of the support 6 may be enclosed to provide a crank casing or chamber 50, which may be filled to a suitable level with lubricating oil through an opening 51, whereby the crank pin and cross head may be lubricated in the well known manner.

Going back to the piston 11 and referring more especially to Fig. 1, it will be noted that the said piston preferably takes the form of a hollow cylinder, the upper end of which is closed and which is provided with a valve 55, opening upwardly and providing communication between the upper part of the cylinder 10 and the interior of the said piston. A pipe 56 is also provided for supplying fluid from any suitable source to the chamber 26.

In operation the piston 11 is reciprocated by means of its piston rod 33 through the motion imparted thereto by the connecting rod 44, and the crank 45 when the power shaft 47 is rotated by the pulley 48, which pulley may be driven from any suitable source of power not shown. As the piston 11 moves upwardly, fluid contained in the cylinder 10 is compressed therein against the valve 18, and when the pressure becomes high enough to overcome the force of gravity acting on said valve, the latter is unseated, and the fluid escapes through the ducts or passages 20 into the chamber 21. These said passages are of sufficient dimensions to take care of the normal fluid flow, but if for any reason conditions become abnormal so that the pressure within the cylinder 10 becomes great enough to overcome the pressure of the spring 22, the valve cover 18′ will be lifted, thereby providing an additional avenue of escape for the fluid beneath its flange 19. As soon as conditions again become normal, the spring 22 will reseat the cover 18′, and the operation will proceed with the parts in such positions. The valve cover 18′ and spring 22 thus constitute a safety or relief valve, for preventing too much pressure building up in the cylinder 10, with the consequent possible overloading of the motor and undesired stopping of the apparatus.

As the piston begins its down stroke, the valve 18 will reseat itself, and a partial vacuum will be created within the cylinder 10. This vacuum will serve to unseat the valve 55 in the piston head and will permit fluid within the piston 11 to pass therethrough into the cylinder 10, as will be readily understood.

As the piston approaches its lower limit of travel it will uncover the ports or passages 27, thereby permitting additional fluid from the chamber 26 to pass into the cylinder 10 above the piston so that when the latter begins its next upward stroke the said cylinder will be completely filled with fluid to be compressed. This cycle of operation will be repeated continuously, as above described, so long as the power shaft 47 is rotated.

While one form of the invention has been illustrated and described, it is obvious that those skilled in the art may vary the details of construction as well as the arrangement of parts without departing from the spirit of the invention, and therefore it is not

wished to be limited to the above disclosure except as may be required by the accompanying claims.

What is claimed is:

1. A compressor comprising a cylinder having an open end; a valve normally closing said open end; a cover member yieldingly engaging said cylinder end and guiding said valve; and a piston working in said cylinder.

2. A compressor comprising a cylinder having an open end; a gravity controlled valve normally closing said open end; a cover member yieldingly engaging said cylinder end and guiding said valve; and a piston working in said cylinder.

3. A compressor comprising a cylinder having an open end; a gravity controlled valve normally closing said open end; a spring controlled cover member yieldingly engaging said cylinder end and guiding said valve; and a piston working in said cylinder.

4. A compressor comprising a cylinder having an open end; a gravity controlled valve normally closing said open end; a cover member yieldingly engaging said cylinder end, provided with a flange surrounding and guiding said valve; and a piston working in said cylinder.

5. A compressor comprising a cylinder having an open end; a gravity controlled valve normally closing said open end; cover member yieldingly engaging said cylinder end, provided with a flange surrounding and guiding said valve, said flange having ports co-acting with said valve; and a piston working in said cylinder.

6. In an apparatus of the class described, a cylinder having an open end; a hollow head member engaging and covering said open end; a gravity controlled valve normally closing said open end; a cover member mounted within said head member having a perforated flange engaging said cylinder end and co-acting with said valve; a spring interposed between said head member and said cover member; and a piston working in said cylinder.

In testimony whereof, I affix my signature.

GEORGE F. KNOX.