July 21, 1925. 1,546,570

J. H. DENNEDY

COMPRESSOR

Filed June 29, 1922

Fig. 1.

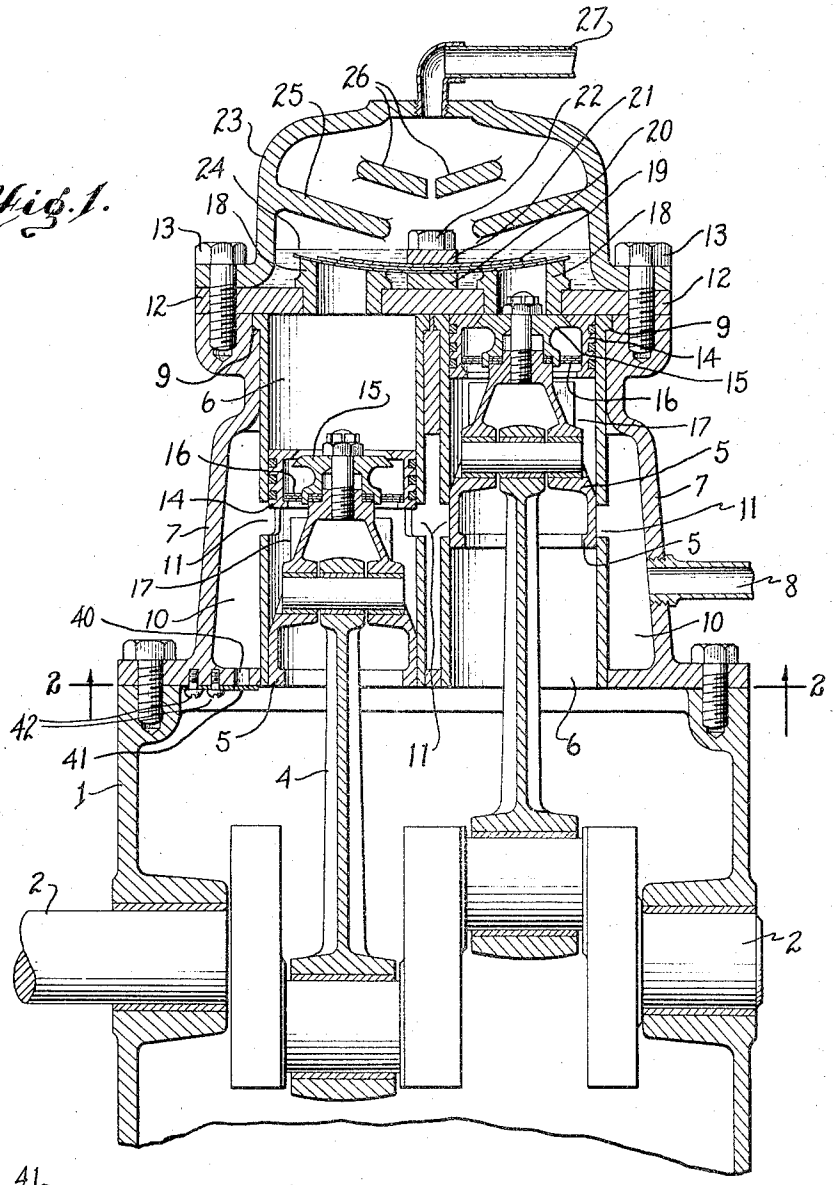
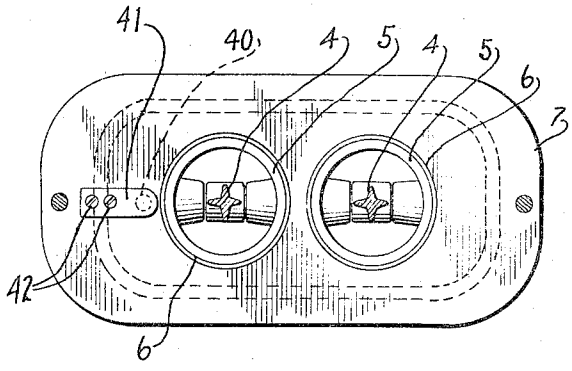


Fig. 2.



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UNITED STATES PATENT OFFICE.

JAMES H. DENNEDY, OF DETROIT, MICHIGAN.

COMPRESSOR.

Application filed June 29, 1922. Serial No. 571,679.

To all whom it may concern:

Be it known that I, JAMES H. DENNEDY, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Compressors, and declare the following to be a full, clear, and exact description of the same, such as will enable other 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 compressors and the object of the invention is to provide a compressor construction which is very light and in which the parts are very easily assembled. Another object of the invention is to provide a compressor comprising a hollow casing in which tubular cylinders are rigidly positioned, the hollow portion of the casing on the exterior of the cylinders forming an intake chamber for the cylinders. Another object of the invention is to provide a compressor of the character described in which the tubes or cylinders are supported at the top and bottom in the casing and prevented from longitudinal movement therein. A further object of the invention is to provide a compressor which may be very easily assembled or taken apart and in which the parts may be very easily replaced. Another object of the invention is to provide a casing in which a pair of tubular cylinders are mounted, a head being secured to the casing and adapted to hold the cylinders from vertical movement in the casing. These objects and the several novel features of the invention are hereinafter more fully described and claimed and the preferred form of construction by which these objects are attained is shown in the accompanying drawings in which—

Fig. 1 is a vertical section through a compressor embodying my invention.

Fig. 2 is a reduced section taken on line 2—2 of Fig. 1.

The compressor as shown in Fig. 1 comprises a crank case 1 in which a crank shaft 2 is rotatably mounted. A pair of connecting rods 4 are provided each having a bearing on the crank shaft 2 and each being connected at the upper end to a piston 5. These pistons 5 are reciprocably mounted in a pair of cylinders 6 within a casing 7 to which an air intake line 8 is connected. The cylinders 6 are tubular in form and are each provided with an annular flange or shoulder 9 at the upper end as shown. The casing 7 is bored to receive the cylinders which fit snugly therein and the casing is provided at the upper end with an annular channel to receive the flange 9 of each cylinder 6. When the cylinders are positioned in the casing a chamber 10 is formed in the casing exteriorly of the cylinders and the cylinders are provided with intake ports 11 in communication with the chamber. This chamber 10 forms the intake chamber for the cylinders and air or gas may pass through the line 8 into the chamber 10 and through the apertures 11 to the interior of the cylinders. The apertures which are drilled for the cylinders in the top and bottom of the casing are of a diameter so that the cylinders fit snugly therein and by this arrangement the cylinders are supported at the top and bottom. The shoulders 9 of the cylinders engaging in the channels provided therefor prevent downward movement of the cylinders within the casing and a heavy plate 12 is secured over the upper end of the cylinders by means of the bolts 13 which prevents upward movement of the cylinders in the casing and solidly secures the cylinders in position. The piston 5 comprises two parts, a lower part 5 to which the connecting rod is connected and an upper or movable bar 14 which is slidable in relation to the remainder of the piston. The part 5 is provided with a valve 15 adapted to close the opening in the member 14 and a spider 16 is secured to the upper end of the part 5 to limit upward movement of the portion 14 in relation to the portion 5, the member 16 engaging an inwardly extending flange of the member 14 on upward movement thereof. These pistons as will be readily seen from the drawing are provided with recesses 17 in the opposite sides thereof adapted to be brought to communication with the aperture 11 of the cylinders. A central aperture is provided through the plate 12 centrally over each cylinder and a member 18 is inserted in each aperture and is provided with an upper face which is ground on an arc. The discharge valve consists of three metal leaves 19 of different lengths and the lower face of the longest leaf is ground to fit the ground faces of the members 18. These three leaves close the opening through the members 18 but at the same time will allow discharge of air or gas there-

through from the cylinders when under pressure. These three leaves are secured together between the members 20 and 21 by the bolts 22 so that the leaves are always held in proper position for closing the discharge apertures. A head 23 is secured to the plate 12 and casing 7 by the bolts 13 and is partially filled with oil 24 to form a seal between the ground faces of the leaves 19 and members 18. The head 23 is provided with baffles 25 and 26 therein and with a discharge line 27 connected to the upper end thereof.

In operation the crank shaft 2 is rotated which by means of the connecting rod 4 reciprocates the pistons in the cylinders 6. On upward movement of the part 5 of the piston the valve 15 is moved into its seat in the portion 14 thus closing the valve and allowing the air to be compressed in the cylinder from which it is discharged through the members 18 and through the head 23 and the discharge line. On downward movement the valve is drawn out of its seat in the member 14 until the spider 16 strikes the flange of the member 14 as shown at the left of Fig. 1 and, at this time the air may pass through the intake ports 11, through the member 14 about the valve 15 and into the upper part of the cylinder and upon the next upward stroke of the piston the air is compressed as hereinbefore described. As the compressed air passes upwardly through the discharge member 18 the oil is blown away from the opening and due to the circuitous path through which the air travels about the baffles 25 and 26 any oil picked up by the air will gather on the baffles and drain back to position over the discharge valves. It will be noted that the casing 7 being apertured at the top and bottom to receive the cylinders which fit snugly therein forms a support for each end of the cylinders so that no side-play of the cylinders is possible and by means of the annular groove on which the shoulder 9 rests there can be no downward movement of the cylinders and the securing of the plate 12 on the upper face of the casing engages the upper edge of the cylinders and prevents upward movement thereof. By this construction it will also be noted that the cylinders may be easily interchanged so that should one of the cylinders become scored or otherwise damaged it may be easily removed and replaced by a new cylinder at very little additional cost.

The low pressure in the intake chamber 10 during operation of the compressor tends to draw in lubricating oil which is carried upwardly in the cylinder by the piston, which oil will collect in the bottom of the chamber. In addition to this, any oil which may be carried from the compressor to the system will eventually be returned through the low pressure side into the intake chamber 10. Because of the large volume of the chamber 10 as compared with the low pressure conduit 8, the speed of the oil laden gas will be retarded upon entering the chamber, permitting the heavier oil to drop to the bottom of the chamber. In order to insure proper lubrication of the compressor, this oil must be returned to the crank case. This I do by means of an aperture 40 in the bottom wall of the chamber which partitions it from the crank case.

I have found that it is objectionable to permit a continuous communication between the intake chamber 10 and the crank case, especially during operation of the compressor. This is because the lubricating oil contained in the crank case tends to hold the vaporized refrigerant in suspension, the percentage of refrigerant thus held in suspension increasing with the pressure. If the oil drain aperture 40 were left open during the operation of the compressor, the lubricating oil in the crank case being violently churned by the crank shaft would quickly become fully charged with the vaporized refrigerant. This would result in an extensive foaming of the oil, greatly multiplying its volume. The foaming oil, under such conditions, would readily back up through the aperture 40 into the intake chamber 10 and be pumped through the system. The oil thus withdrawn from the crank case would not only lessen the lubrication of the compressor and tend to cause trouble in other parts of the system and affect its delicate operation, but would cause a very noticeable pounding of the compressor as it was pumped therethrough.

In order to avoid these objections, I have provided a spring metal flap valve 41, held to the lower wall of the chamber 10 by cap screws 42 and yieldingly closing the aperture 40. When the compressor is in operation, the pressure in the intake chamber 10 and that in the crank case are practically the same—or, perhaps, the pressure in the intake chamber is a trifle less so that the spring flap valve 41 will remain closed, effectively preventing the passing of oil from the aperture 40 into the chamber 10.

When the compressor stops, however, there will be the usual instantaneous rise in the pressure on the low pressure side which is equalized through the aperture 40 against the yielding tension of the valve 41. During the short time that this valve is opened, any oil which has collected in the bottom of the chamber will first be returned through the opening to the crank case.

As soon as the pressures in the chamber and the crank case have been practically equalized, the valve 41 will again close.

The construction and function of the valve 19 and of the pistons are set forth in greater detail and claimed in my Patent

No. 1,528,733 of March 3, 1925 and my copending application Serial No. 571,679 filed June 29, 1922, respectively.

From the foregoing description it becomes evident that the device is very simple and efficient in operation, will not easily get out of order, is of low manufacturing cost, may be easily assembled and taken apart and provides a device which accomplishes the objects described.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. In a compressor, an outer casing, a cylinder extending thereinto and fitting the casing at the upper and lower ends, the casing being shaped to provide a chamber about the cylinder between the ends and the cylinder having an aperture in the wall opening to the said chamber, an intake line opening to the chamber, a crank case on which the casing is mounted, a piston in the cylinder, a crank for operating the piston, a port between the chamber and the crank case, and a valve for said port adapted to open by pressure in the chamber for draining oil therefrom.

2. A compressor comprising an outer casing, a pair of cylinders inserted therein, the cylinders having flanges at the upper end and the casing being bored for the cylinders and counterbored to receive the flanges, the cylinders fitting the casing at both the upper and the lower ends and the casing being shaped to provide a chamber about the cylinders between the ends, a crank case on which the casing is mounted and into which the lower ends of the cylinders open, a head providing an outlet chamber for the cylinders, a valve controlled discharge port between the cylinders and the head including a plate for supporting the valve structure and maintaining the cylinders in place, said cylinders each having ports opening to the chamber thereabout above the lower end, a piston in each cylinder, a crank and connecting rods for operating the pistons, said pistons being formed of two relatively movable parts providing an automatic valve opening on the down stroke of the piston and closing on the up stroke thereof, said pistons being formed to permit an ingress of fluid between the parts on the down stroke, an intake line for the said chamber about the pistons, a port between the chamber and the crank case, and a valve for said port opened by pressure within the chamber to drain oil from the chamber to the crank case.

3. A compressor for an artificial refrigerating system comprising a cylinder, a piston reciprocable therein, a crank for reciprocating the cylinder, a crank case for the crank containing lubricating oil, an intake chamber for the cylinder between it and the low pressure side of the system, a passageway between the chamber and the crank case for draining oil back to the crank case, and a valve for the passageway seating toward the chamber.

4. The combination, with an artificial refrigerating system having a high pressure side and a low pressure side, of a compressor therebetween for the drawing of vaporized refrigerant from the low pressure side and discharging it as compressed refrigerant to the high pressure side, the compressor having a lubricant containing crank case, and a valved passage between the low pressure side of the system and the crank case, the passage opening only when pressure in the crank case is less than that in the low pressure side, thereby preventing back flow from the crank case into the low pressure side.

5. The combination, with a compressor for a refrigerating system comprising a low pressure intake chamber for vaporized refrigerant and a lubricating oil containing chamber, of a valved passage for draining lubricating oil from the intake chamber to the oil chamber, the passage being arranged to prevent back flow of refrigerant charged oil from the oil chamber into the intake chamber.

6. A compressor for the refrigerant of an artificial refrigerating system comprising a casing, a pair of spaced cylinder sleeves mounted therein, a flange at one end of each of the sleeves, shoulders in the casing for the reception of the flanges, a plate secured across one end of the casing for holding the sleeves positioned therein, exhaust passages for the cylinder through the plate, valve closures for the passages mounted on the plate, and a compressor head forming an exhaust chamber for the passages and within which the valve closures are disposed, the head being secured to the casing with the plate therebetween.

In testimony whereof, I sign this specification.

JAMES H. DENNEDY.