Oct. 31, 1950

E. G. ROWLEDGE ET AL

2,527,657

LUBRICATING SYSTEM FOR REFRIGERATOR MOTOR-COMPRESSORS

Filed Dec. 3, 1946

3 Sheets-Sheet 1

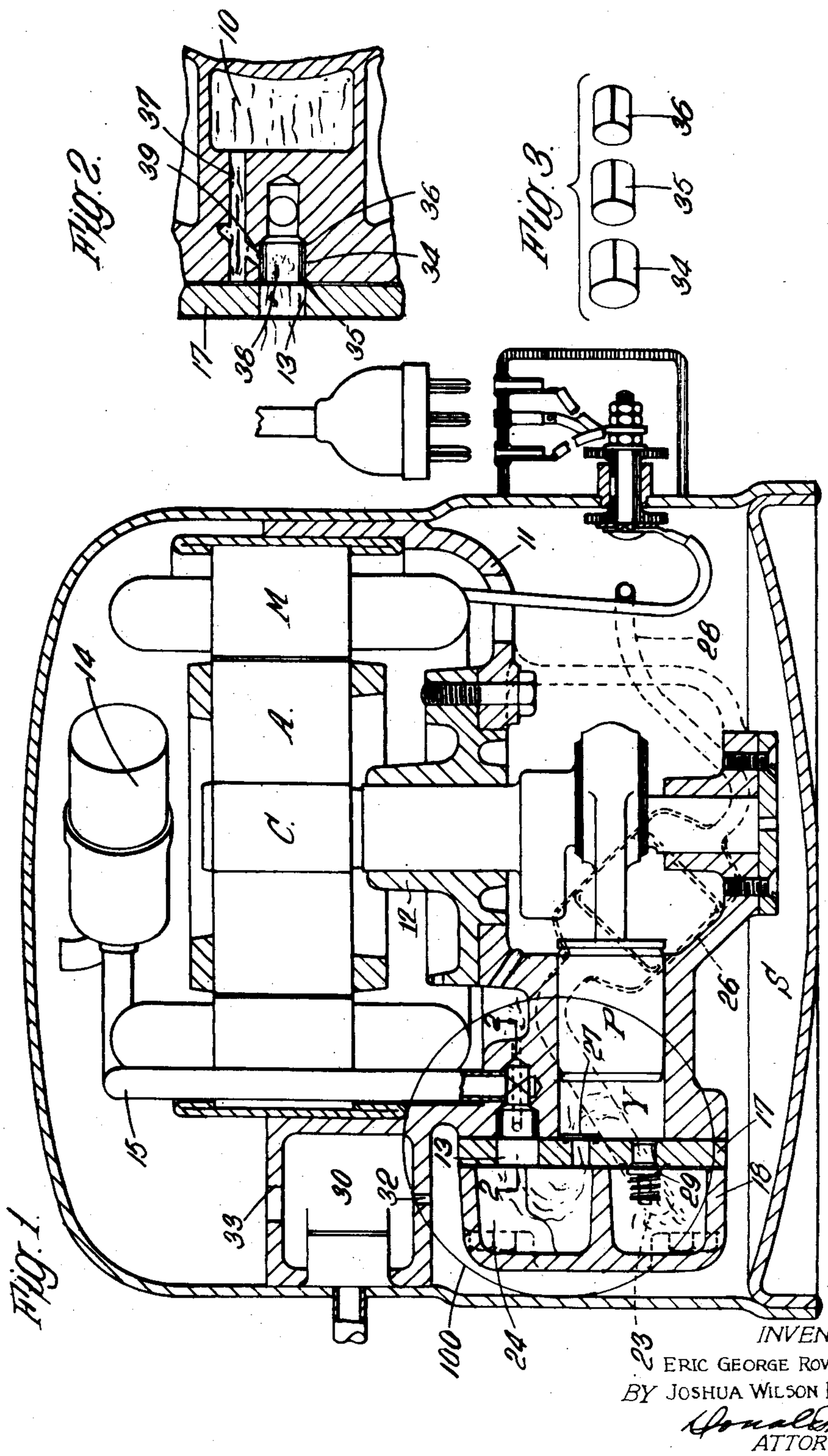

Fig. 1.

Fig. 2.

Fig. 3.

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Filed Dec. 3, 1946 3 Sheets-Sheet 2

Fig. 4.

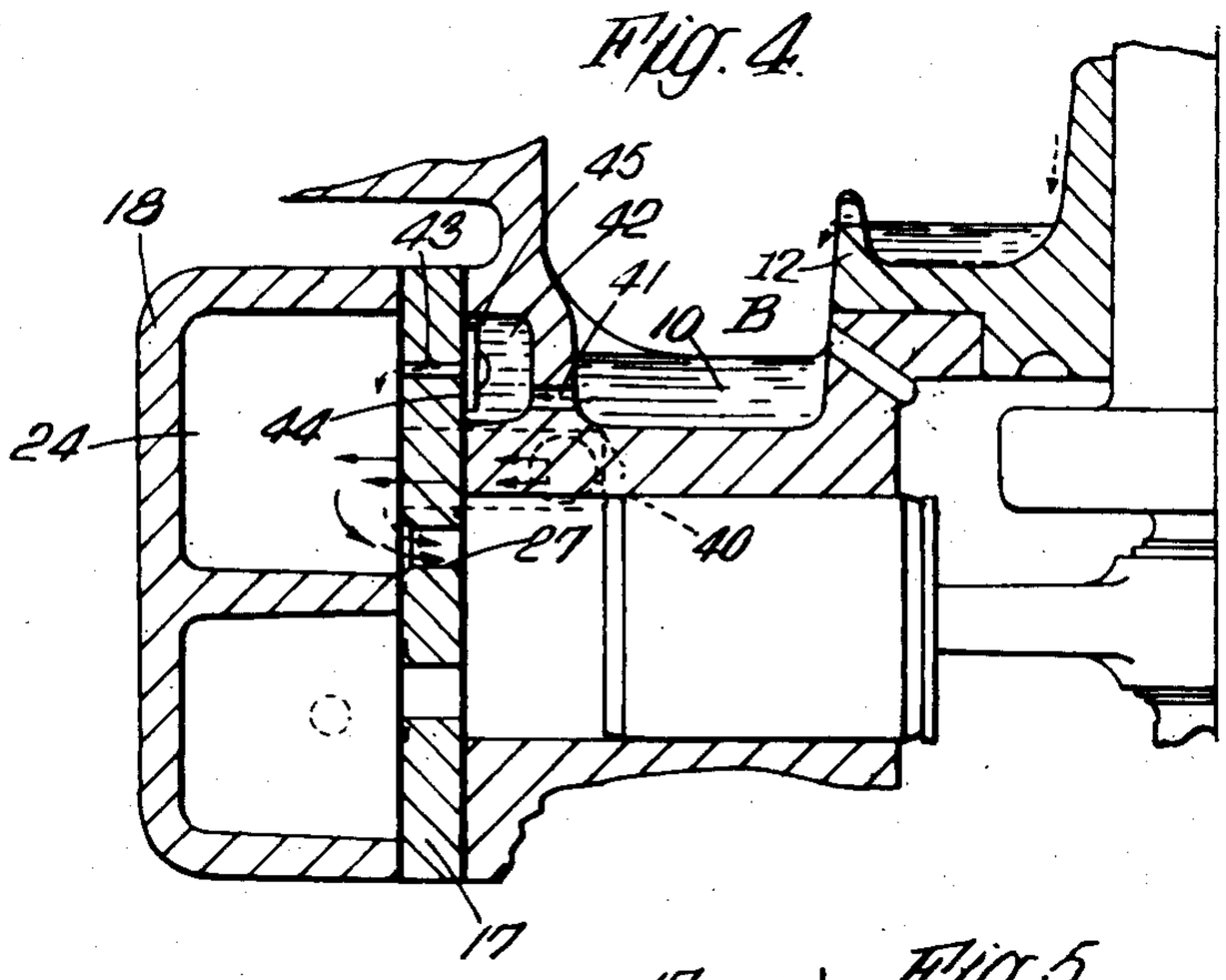


Fig. 5.

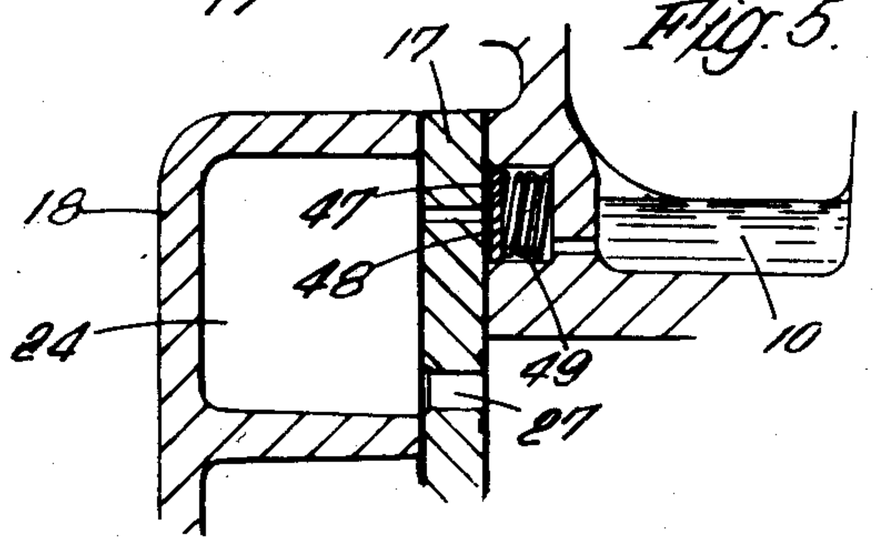
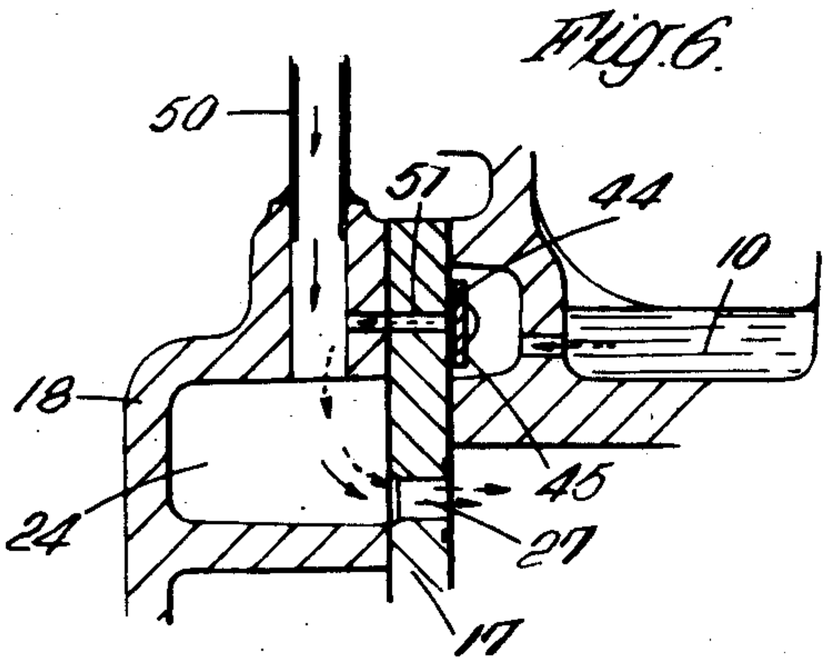


Fig. 6.



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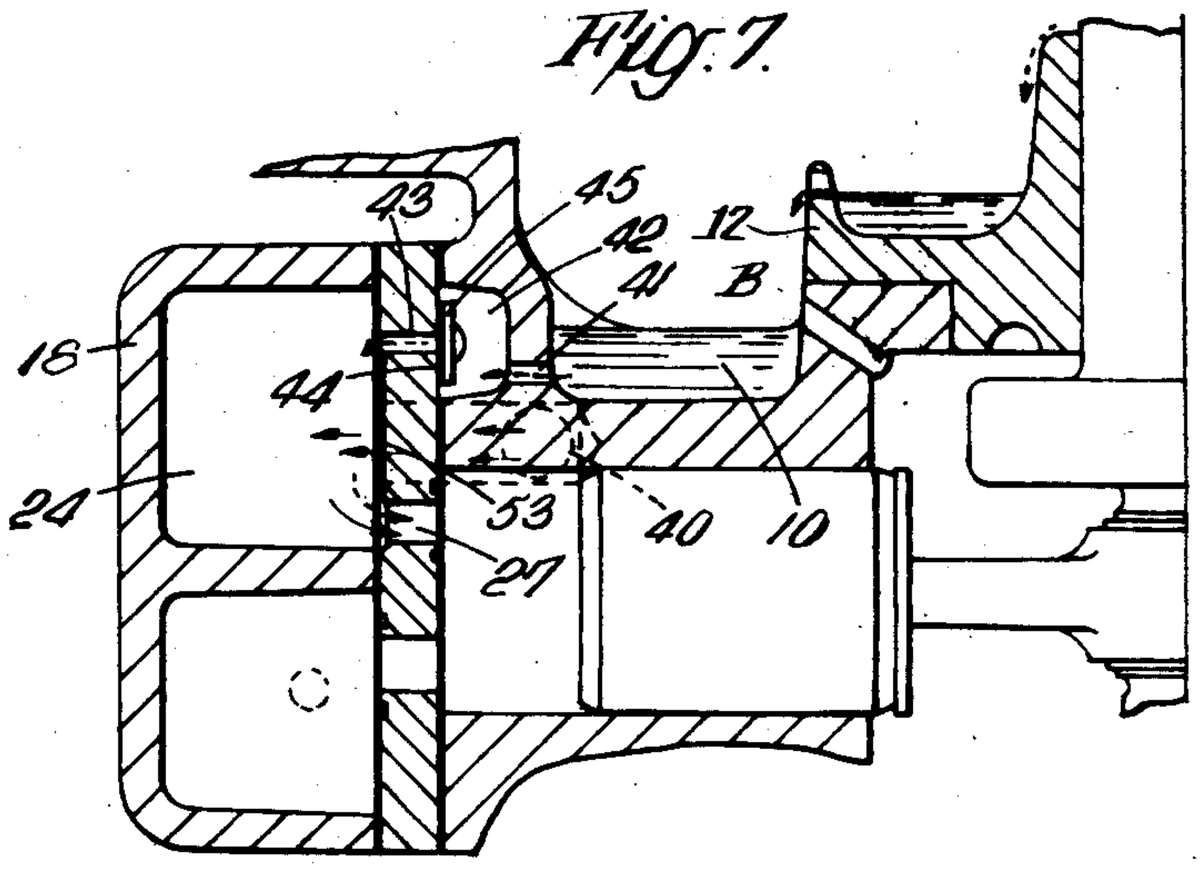
3 Sheets-Sheet 3

Fig. 7.



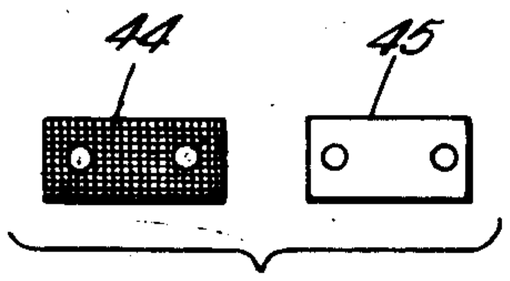


Fig. 8.

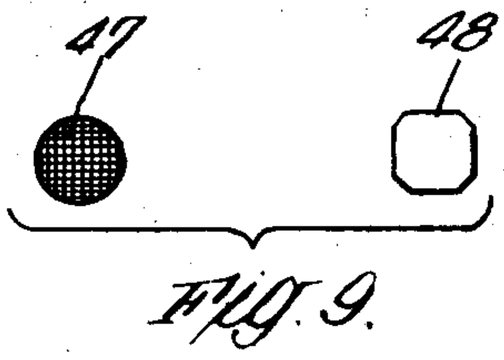


Fig. 9.

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Patented Oct. 31, 1950

2,527,657

UNITED STATES PATENT OFFICE

2,527,657

LUBRICATING SYSTEM FOR REFRIGERATOR MOTOR-COMPRESSORS

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Application December 3, 1946, Serial No. 713,748
In Great Britain September 26, 1944

Section 1, Public Law 690, August 8, 1946
Patent expires September 26, 1964

8 Claims. (Cl. 230—206)

1

In refrigerating systems of the motor-compressor type it is well known that where the compressor itself is of the type having a large crank case volume with respect to the displacement of the cylinder, there is relatively little pressure change in the crank case so that the flow of lubricant along the piston into the bearing space between the top of the piston and the cylinder head is not assisted since the mean pressure above the piston is always greater than that below the piston and consequently, particularly where pistons having no piston rings are used, the upper half of the piston and the suction and discharge valves are starved of oil with a consequent reduction in the efficiency of the compressor and an increase in the general noise level of the valve mechanism.

The object of the present invention is to provide a compressor of this type which does not suffer from the above disadvantages and according to the invention the valves and upper portions of the cylinder of a motor-driven compressor for a refrigerating unit are lubricated by metering lubricant through a gauze restrictor into or adjacent to the refrigerant vapour stream as it passes to the compressor on the suction stroke thereof, whereby the lubricant is converted to a fine mist entrained in the vapour. In one form of the invention refrigerant vapour is passed through a silencer into passages drilled in the cylinder casting, whence it passes to the valve chamber. The passages in the compressor casting communicate with an oil sump and are fitted with a gauze restrictor to provide a choke at which oil will be entrained metered into the suction gas stream and be finely atomised. In this form it will be carried into the valve chamber in suspension, passing the suction valve of the compressor and wetting it with oil as it passes. The top portion of the cylinder will be similarly wetted as will the discharge valve on the exhaust stroke. The oil carried through with the discharge gas will mix with the circulating refrigerant in the usual manner to be returned with the refrigerant vapour from the evaporator to be rectified in any well known manner.

The restrictor may be in the form of a gauze and foil cylinder fitted within the passage in the compressor casting. An alternative arrangement, contemplates the direct entry of the refrigerant vapour to the cylinder head or valve chamber, the oil being metered into said vapour from a sump through an orifice in the compressor casting, which orifice is closed by a gauze and retainer plate. With such an arrangement the oil is required to enter the orifice at the outer

2

edges of the gauze and this provides a larger filter area. Furthermore, the gauze will be held between the valve plate, which has a lapped finish, and the retainer plate, which may have a ground finish, so that variations in the oil flow due to variations in the surface finish, are eliminated.

The invention is illustrated in the accompanying drawings of which

Figure 1 is a vertical section of a motor-compressor unit of the hermetically sealed type with parts omitted which do not form any feature of this invention, whilst Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is an exploded view of the gauze and foil cylinder of Figure 1.

Figures 4, 5 6 are fragmentary views of the part of the motor-compressor unit shown within the circle 100 of Figure 1 illustrating modifications of the invention.

Figure 7 shows a slight modification of Figure 4, whilst Figures 8 and 9 show details of alternative forms of gauze and retainer as used with the arrangements shown in Figures 4 to 7 respectively.

Referring to Figure 1, the rotor A of an electric motor M drives the crankshaft C which operates the piston P in the cylinder Y. A sump S provides lubricant for oiling all the working parts of the machine. A well or auxiliary sump 10 is provided in the stator casting 11 which is maintained full of oil by overflow from the main bearing 12 of the crankshaft C. The refrigerant gas is drawn through a silencer 14 and along a down-pipe 15 to a passage 38 drilled in the stator-casting 11. Inserted in this passage and immediately before the passage 13 through the valve plate 17 to the cylinder head 18 is a restrictor and filter in the form of a gauze and foil cylinder 34, 35 held in the passage 38 by a clip 36. Lubricant from the well 10 is conveyed via a passage 37 and a small hole 39 to the passage 38 whence it passes through the gauze, between the wall of passage 38 and the foil and thus as the suction gas passes through the passage 38 it draws with it lubricant which becomes finely atomised, passes to the suction side 24 of the cylinder head and is drawn in to the cylinder Y by the piston P and the walls of the cylinder Y, after which it passes through the discharge valve 29 which is in turn lubricated, the oil then passing, entrained in the discharge gas, via the pipe 23, silencer 26 and outlet pipe 28, throughout the system, ultimately to be rectified in the relatively warm receptacle 30 formed in the stator frame, the separated oil being conveyed

to the main sump S via a small hole **32** formed in the bottom of the receptacle, whilst the refrigerant vapour passes via the opening **33** for the cycle to be repeated.

In the modification of Figure 4 the refrigerant vapour is conveyed directly from the silencer via the suction inlet **40** to the cylinder head **24**. Oil from the sump **10** due to the pressure difference between the parts A and B, is drawn through the opening **41** to the chamber **42**. The orifice **43** leading from the chamber **42** to the cylinder head is covered by a gauze **44** and retainer plate **45**, secured for example by means of hammer drive screws. Oil runs down the outer face of the valve plate **17** until it reaches the suction port **27** where it is picked up by the refrigerant vapour and atomised as before.

The somewhat similar arrangement of Figure 5 shows a gauze **47** and retainer plate **48** held in position by means of a coiled spring **49**.

In Figure 6, the refrigerant vapour is drawn through the inlet pipe **50**, leading directly into the cylinder head **24** and the oil orifice **51**, closed by the gauze **44** and retainer **45**, leads directly into the pipe **50** so that atomisation of the oil in the vapour stream is improved.

In Figure 7 which shows an arrangement very similar to that shown in Figure 5, the oil after leaving the orifice **43** is constrained to trickle down a capillary slot **53** cut in the face of the valve plate **17**, to prevent spreading of the oil and to ensure its concentration at the periphery of the inlet port.

Figure 8 shows the gauze **44** and retainer plate **45** punched for reception of the hammer drive screws, whilst Figure 9 shows a modified gauze **47** and retainer **48** as might be used in the arrangement shown in Figure 5.

The amount of oil flowing through the restrictor is dependent upon three factors viz. (*a*) the pressure drop between the areas **24** and B (see Figure 4), (*b*) the gauze area and size of mesh and (*c*) the viscosity of the oil. By variation particularly of factor *b* the oil flow can be adjusted as desired to suit any particular machine.

We claim:

1. A motor-compressor unit for refrigerating systems of the vapour compression type, including a cylinder, a valve plate, a cylinder head, suction and delivery ports in said valve plate, suction and delivery chambers in the cylinder head, an inlet in said valve plate and cylinder head for refrigerant vapour, an oil sump, means for conveying oil from said sump to said inlet and a cylinder of gauze telescopingly fitted in said inlet and a cylindrical cover on the inside of said gauze for forcing oil on its way from said means to said inlet to pass in axial direction through said gauze cylinder between the surface of the inlet and said cover.

2. A motor-compressor unit for refrigerating systems of the vapour compression type, including a cylinder, a valve plate, a cylinder head, suction and delivery ports in said valve plate, suction and delivery chambers in the cylinder head, an inlet in said valve plate for refrigerant vapour, an oil sump, means for conveying oil from said sump to said inlet including a passage through said valve plate, a gauze disc covering said passage, and another solid disc covering said gauze disc forcing the oil on its way to said passage to pass through the gauze disc between the valve plate and said solid disc.

3. A motor-compressor unit for a refrigerating system of the vapour compression type, including a cylinder, a cylinder head, a valve plate, suction and delivery ports in said valve plate, suction and delivery chambers in said head, an inlet port in said valve plate to said suction chamber, means for conveying lubricant to said inlet port, a gauze restrictor in said inlet port, and a capillary slot formed in the face of said valve plate to constrain lubricant to trickle from said inlet port along said valve plate to concentrate at the periphery of the suction port.

4. In a refrigerating system of the vapour-compression type having a suction duct for the refrigerant vapor, a wall separating said suction duct from a lubricant supply and a passage through said wall, a gauze sheet held between one surface of said wall and a cover plate, said gauze sheet and cover plate overlying and extending beyond said passage so that the lubricant on its way to the suction duct has to pass through said gauze sheet in the direction of the plane thereof.

5. In a compressor for a refrigerating system of the vapour-compression type, a cylinder body for a reciprocatingly driven piston, a cylinder head and a valve plate between said cylinder head and said cylinder body, a suction duct in said cylinder head communicating over a suction port and valve on said valve plate with the interior of the cylinder bore, a recess formed in the end of the cylinder body at the side of and spaced from the cylinder bore and communicating with a source of liquid lubricant, said valve plate closing said recess and being provided with a passage connecting the recess with the suction duct, a gauze plate covering and extending beyond said passage on the side of the valve plate facing said recess, a cover plate for said gauze plate and means for holding said cover plate against the gauze plate and the valve plate so that lubricant from said recess on its way to said passage has to flow from the outer margins of the gauze plate through the gauze between the surface of the valve plate and said cover plate, thereby acting as a filter and as a metering device controlling the amount of lubricant admitted to the suction duct.

6. A lubricant metering and filtering device for vapor compression type refrigerating systems, comprising a hollow duct adapted for connecting a source of lubricant with the suction duct for the refrigerant vapor, said duct being formed at least in part by two closely-spaced walls firmly holding between them a piece of gauze so that lubricant has to flow longitudinally through said gauze thereby filtering the lubricant and controlling the rate of its admission to the suction duct.

7. A lubricant metering and filtering device for vapor compression type refrigerating systems, comprising a hollow duct adapted for connecting a source of lubricant with the suction duct for the refrigerant vapor, said duct being formed in part by two closely-spaced plane walls firmly holding between them a plane sheet of gauze, a passage in one of said walls communicating respectively with a central portion of said space and with said suction duct whereas a peripheral region of said space opens toward the source of lubricant, the arrangement being so that lubricant has to flow longitudinally through said gauze, thereby filtering the lubricant and controlling the rate of its admission to the suction duct.

8. A lubricant metering and filtering device for vapor compression type refrigerating systems, comprising a hollow duct adapted for connecting a source of lubricant with the suction duct for the refrigerant vapor, said duct being formed at least in part by two closely-spaced concentric walls holding between them a cylinder of gauze so that lubricant has to flow longitudinally through said gauze cylinder, thereby filtering the lubricant and controlling the rate of its admission to the suction duct.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,687,780	Neale	Oct. 16, 1928
1,731,774	Gurley	Oct. 15, 1929
1,858,817	Carrey	May 17, 1932
1,947,586	Fletcher	Feb. 20, 1934
2,167,057	Safford	July 25, 1939
2,236,088	Doeg	Mar. 25, 1941
2,236,112	Philipp	Mar. 25, 1941