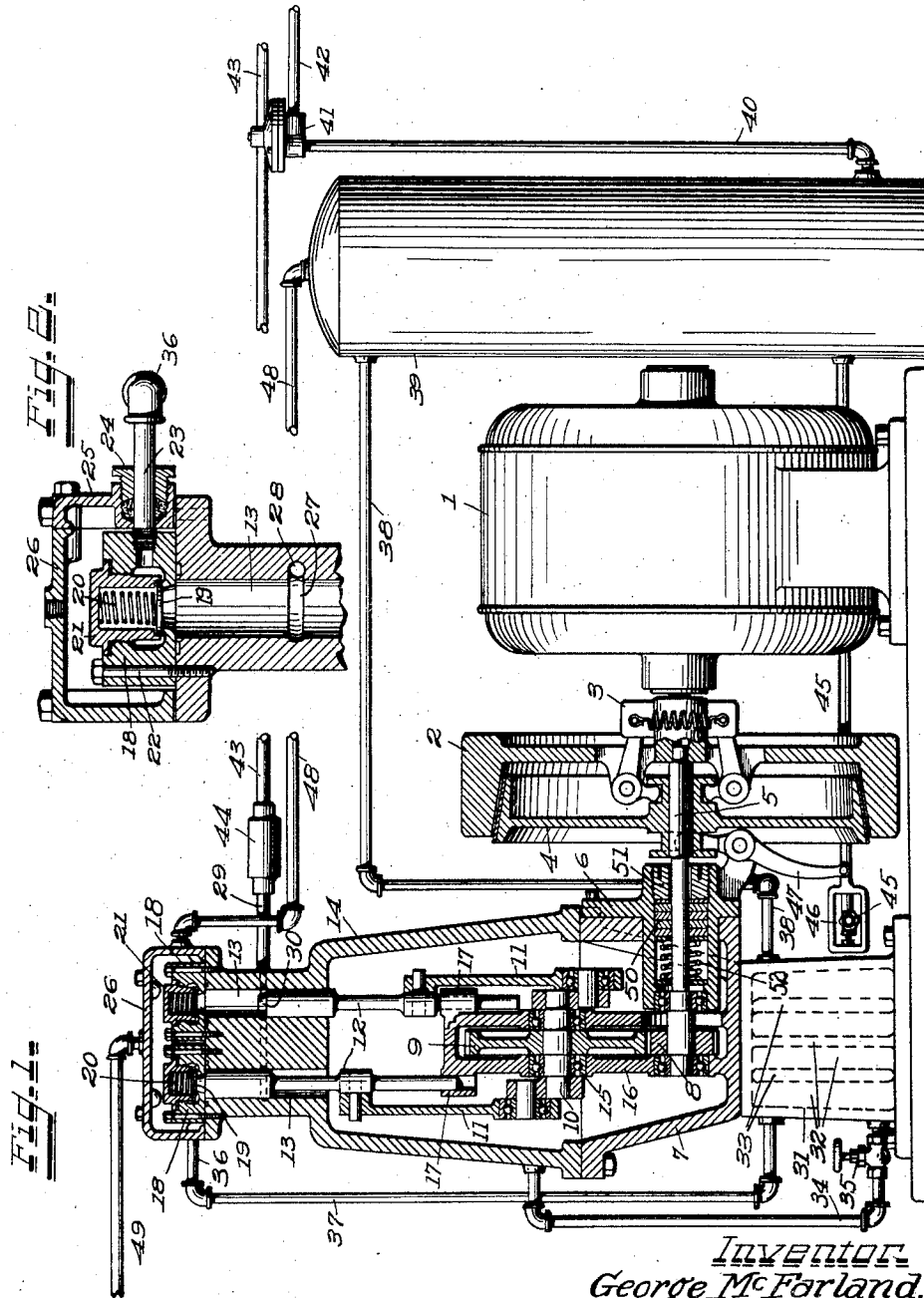


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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS.

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To all whom it may concern:

Be it known that I, GEORGE MCFARLAND, a citizen of the United States, and a resident of Fort Madison, in the county of Lee and State of Iowa, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification.

My invention relates more particularly to the smaller type of refrigerating apparatus such as used in residences although it is capable of use in other sizes and for other purposes.

One object of my invention is the provision of a simple and compact compressor.

Another object of my invention is the provision of means for connecting and operating the compressor so that by the employment of a simple thermostatic switch, the whole apparatus will be automatic.

Other objects of my invention will appear and be described in the specification.

The novelty of my invention will be hereinafter more fully set forth and specifically pointed out in the claim.

In the accompanying drawing:

Fig. 1 is a side elevation, partly in section, of an apparatus embodying my invention.

Fig. 2 is an enlarged view of the upper portion of the compressor, the view being taken through one of the cylinders thereof and transversely of the position shown in Fig. 1.

The same numerals of reference are used to indicate identical parts in all the figures.

As illustrating one form of device embodying my invention, I have shown an apparatus consisting of a motor 1 which carries a fly wheel 2 and a governor 3 which controls a clutch 4 carried by the compressor drive shaft 5. The shaft 5 extends through a stuffing box and bearing carrier 6 and into the base 7 of the compressor and carries the drive pinion 8 which meshes with the gear 9 carried on the crank shaft 10 to which the connecting rods 11 are connected, these rods extending upward and being connected to the plunger 12, the upper end of each plunger forming a piston in a cylinder 13 formed in the upper portion of the frame 14 of the compressor.

The crank shaft 10 is mounted, preferably by means of anti-friction bearings 15

in a housing 16 carried by the base 7, the lower end of the plunger 12 being guided in bearings 17 carried by the upper portion of the housing 16.

A valve box or head 18, shown more clearly in Fig. 2, is mounted over each of the cylinders 13 and contains a disk valve 19 held in its seat by a spring 20 and confined to its position and limited in its movement by the cap 21. The valve box is held in position by suitable cap or other screws 22 and each valve box is provided with an outlet pipe 23 which passes through a stuffing box 24 in the removable side 25 of the removable water jacket 26 which surrounds the valve box.

Each cylinder is provided with an annular inlet port 27 which communicates with an inlet passage 28 to which the inlet pipe 29, Fig. 1, is connected, the inlet port 27 being located adjacent the lower position of the upper portion of the plunger 12. To reduce the clearance volume in each cylinder when its plunger is in its upper position, a projection 30 is carried by each plunger which fills the space between the valve 19 and the upper end of the cylinder.

The base 7 of the compressor is mounted on an oil trap 31 which is provided with partitions 32, the latter being provided with passages 33 thus forming a number of compartments in which any liquid particles carried by the compressed gas are collected and from which they may be transferred to the crank case of the compressor through a pipe 34, the latter being controlled by a valve 35, the outlet pipe 23 from each valve box being connected to a header 36 from which the pipe 37 extends to the separator 31.

A pipe 38 leads from the separator 31 to the condenser 39 from which a pipe 40 leads to the pressure reducing valve 41, and from the latter a pipe 42 extends to the refrigerating coil or other device, the return from the refrigerating device being from the pipe 43 to the scale trap 44 which is connected to the inlet pipe 29.

A water pipe 45 which is controlled by a valve 46 arranged to be opened by lever 47, the latter being operated by the shifting of the clutch 4, leads to the condenser 39, the return being through pipe 48 to the water jacket 26 from which the outlet pipe 49 conducts the waste water.

The stuffing box 6 contains a plurality of packing rings 50 held in place by a nut

51 and compressed by a spring 52, the latter being in a chamber which is in communication with whatever pressure may be generated in the crank case of the compressor to the end that this pressure will be communicated to the packing rings in addition to the pressure of the spring 52 so that the stuffing box will be automatically tightened against leakage by an increase in pressure in the crank case of the compressor.

The shaft 5 of the compressor is preferably mounted on antifriction bearings as shown, similar bearings being also used in the crank ends of the connecting rods 11. The discharge valves 19 and associated parts may be removed from the machine by disconnecting the water pipe 48 and 49 and removing the water jacket 26, after which if desired the caps 21 may be removed or if it is desired to remove the valve box 18 the bolts 22 may be removed and the bolts which hold the removable portion 25 of the water jacket whereupon, by disconnecting the pipe 37, both valve boxes may be removed from the compressor for repair or for any other reason.

The operation of the device is as follows, assuming that the apparatus is properly charged with ammonia or other refrigerating medium and that the motor 1 is properly connected to a source of current supply through either a manually operated switch or a thermostatic switch, or both.

If manually controlled, the operator closes the circuit to the motor thus starting it and the fly wheel 2 which carries the governor 3 whereupon, as soon as the parts have attained sufficient momentum to operate the governor, the clutch 4 engages the fly wheel 2 and the compressor begins its operation.

The suction stroke of the compressor produces a vacuum in the cylinder which is filled through the inlet port 27 as soon as the plunger reaches its lower position, the compression stroke discharging the compressed gas into the header 36 and through the pipe 37 to the separator 31 wherein, should any liquid particles such as oil be carried by the moving gas, separation occurs and the compressed gas passes through the pipe 38 to the condenser. Meanwhile the movement of the clutch into engaged position opens the valve 46 and permits a flow of cooling water through the condenser, the cooling water then passing through the water jacket of the compressor and out through the waste pipe 49. As soon as the compressed gas enters the condenser, its temperature is reduced thus producing liquefaction, the liquid passing into the reducing valve 41 where expansion takes place and the liquid again becomes a gas having refrigerating qualities, the gas being conducted through the pipe 43, scale trap 44 and to the inlet ports to the cylinders of the com-

pressor. The scale trap 44 collects and retains any scale which may separate from the inner surface of the various parts of the apparatus or other foreign substances in the gas so that when the gas enters the compressor, it is in a state to be handled without risk of injury to the cylinder walls, plungers, or other parts of the compressor.

If a thermostatic switch is used, the current to the motor will be cut off when the refrigeration has reached a sufficient degree to operate the thermostatic switch.

During the time the compressor is operated, the crank case will be under pressure about equal to that of the low side of the system or the pressure in the pipe 43, though when the compressor stops, the pressure in the crank case will gradually build up until the whole system is under substantially the same pressure, the pressure of the high side of that portion of the system between the reducing valve 43 and the compressor cylinders and including the condenser, being gradually reduced and the pressure on the low side or that leading from the reducing valve to the inlet ports being gradually increased until the two strike a balance, this pressure balance being communicated to the crank case of the compressor through leakage past the plunger, this pressure with the pressure of the spring 52 serving to tighten the stuffing box around the shaft 5 against leakage, the construction of the compressor being such that the crank case carries a considerable amount of lubricant the level of the lubricant being nearly up to the line of the joint between the base 7 and the frame 14.

The starting of the compressor again builds up the pressure on the high side of the apparatus and consequently reduces it on the low side and consequently reduces it in the crank case and relieves the stuffing box from the pressure to which it was subjected to the pressure produced by the spring plus the pressure of the low side of the apparatus.

During the operation of the compressor, the valve 35 may be opened for a short time and any accumulation of oil in the separator 31 will be at once transferred to the crank case of the compressor due to the fact that the separator 31 is under the high side pressure while the crank case is under the low side pressure, the difference serving to cause a rapid transfer to the crank case after which the valve 35 may be closed until there has been other accumulation in the separator.

It is to be noted that all of the mechanical and moving parts of the compressor with the exception of the cylinders and valves are carried by the base 7 to the end that all of the parts may be assembled ready for operation before the frame and cylinders are attached thereto, in this way confining most

of the machine work and assembling of the compressor to the base 7 and permitting easy and rapid assembling and ready checking of the mountings and movements of the parts, and producing a structure which is exceedingly rigid and substantial.

Having thus fully described my invention, I claim:

10 In a refrigerating apparatus the combination of a compressor base, a cylinder carrying frame mounted thereon, a gear housing carried by the base and projecting above the joint between it and the cylinder carrying

frame, a shaft journaled in the gear housing, cranks carried by the shaft, a gear carried by the shaft, cylinders carried by the cylinder carrying frame, plungers in the cylinders, plunger guides carried by the gear housing and in line with the cylinders and guiding the plungers, connections from the plungers to the cranks of the shaft, a driving pinion below the shaft, a driver shaft for the pinion, and means for driving the last mentioned shaft. 15 20

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