

Dec. 25, 1928.

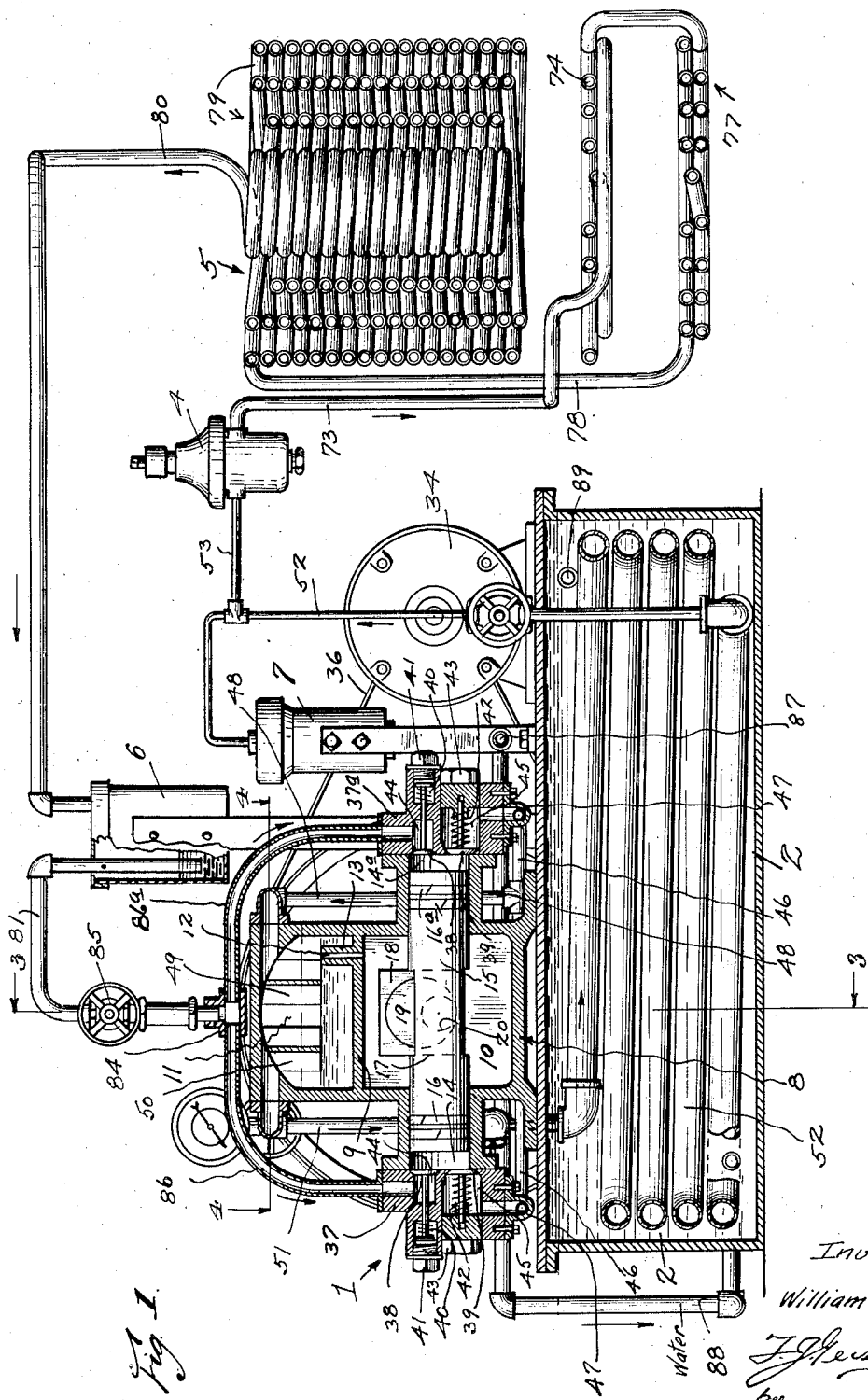
1,696,436

W. H. GRAY

PUMP FOR REFRIGERATING APPARATUS

Filed Dec. 14, 1923

2 Sheets-Sheet 1



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Fig. 2.

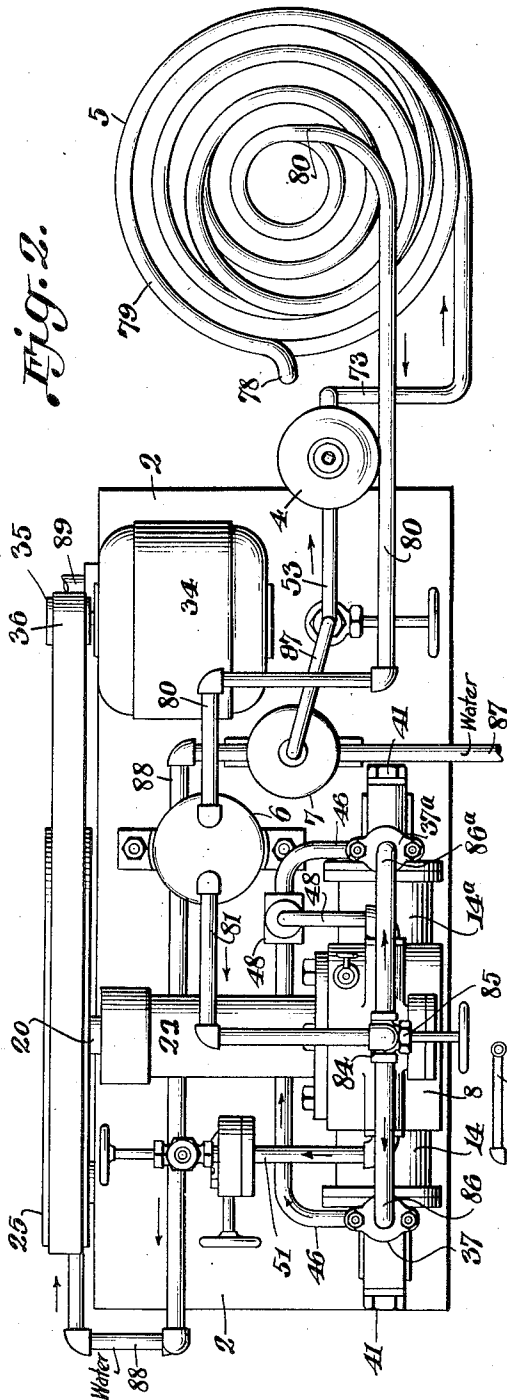


Fig. 3.

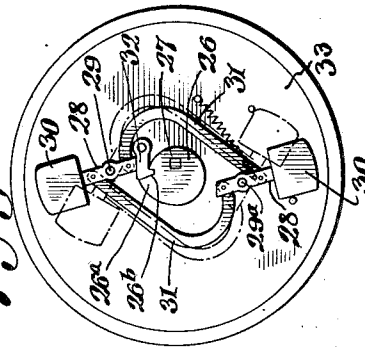


Fig. 4.

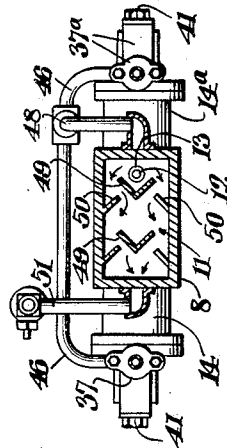
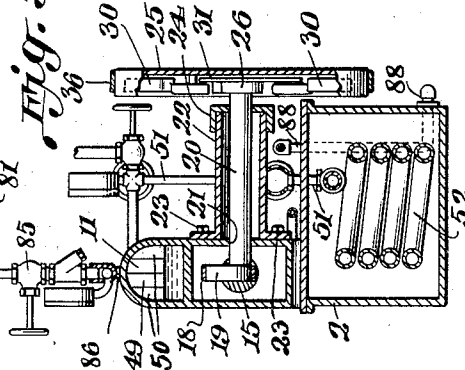


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. GRAY, OF PORTLAND, OREGON.

PUMP FOR REFRIGERATING APPARATUS.

Application filed December 14, 1923. Serial No. 680,650.

My invention relates to refrigerating machines of the type effecting and working by the compression and expansion of a refrigerant which is circulated through a continuous pipe and especially to such machines as are designed for use in the household as a substitute for, or in connection with the usual ice-box.

It is desirable that refrigeration machines to be installed in the household run very quietly, but it is a common fault with these machines that they run very noisily. This noise is due to improper construction of the pumping element, and the degree of noise usually is a determining factor in the installation of a refrigerating machine for this kind of service. These machines are constructed improperly in that the operating parts are not held down by suitable bearings and they include parts which are permitted to impact with each other and in time become loose and thus operate noisily. Another fault which I find with these machines is that they require too much attention.

The principal object of my invention is to provide a refrigerating pump, adapted to function, noiselessly and efficiently and with only a minimum amount of attention.

Another object of my invention is to provide means within the pump housing to separate and trap the lubricant, which in the course of the operation of the pump becomes intermixed with the refrigerant, to prevent the latter from entering the pump mechanism, where it would be harmful and tend to nullify the effect of the lubricant.

I attain these objects in a refrigerating apparatus, comprising a housing divided by a horizontal partition into upper and lower chambers, the upper chamber constituting a settling tank, the lower chamber constituting a lubricant receptacle, a pump cylinder opening through the wall of the lower chamber, a piston reciprocating in said cylinder, means located in said lower chamber for reciprocating said piston, valves controlling the inlet and outlet ports of said cylinder, respectively, the outlet port of said cylinder being connected by a conduit with said horizontal partition into said lower chamber, whereby the solid particles carried by the refrigerant are deposited in said settling tank and permitted to separate therein, and the lighter lubricant is returned through said stand pipe to the pump mechanism in said lower chamber.

The details of construction and mode of

operation of my invention are hereinafter fully described with reference to the accompanying drawings, in which:

Fig. 1 shows a longitudinal section of my refrigerating apparatus in which the circulation of the refrigerant is shown by arrows;

Fig. 2 shows a plan view of my machine and illustrates the direction of flow of the refrigerant through the apparatus;

Fig. 3 shows a section taken on the line 3—3 of Fig. 1 and illustrates further details of construction;

Fig. 4 shows a section taken on a line 4—4 of Fig. 1 and illustrates further details of the settling tank and by arrows the direction of flow around the baffles and

Fig. 5 shows a diagrammatic view of mechanism which is placed on the fly wheel of my device to aid the machine in starting.

Referring now to the figures my invention comprises a pump element, 1, which is mounted on and supported by a closed receptacle 2 which encloses the cooling means for the gases. My pumping element 1 is made up with an integral body section 8. This body section is divided by a horizontal partition 9 into a chamber 10 which encloses the operating mechanism and a chamber 11 which comprises a settling tank, the chamber 11 being located directly over the chamber 10 and connected only by the bore 12 in the stand pipe 13. At each side of the casting I provide cylinders 14 and 14^a in which reciprocates a one piece double piston element 15 provided at each end with piston rings 16 and 16^a. The piston 15 has a slot 17 cut through its middle in which a sliding block 18 is mounted, and in which is journaled an eccentric member 19 fixed to the driving shaft 20. Slot 17 is arranged vertically in the double headed piston element 15 and thus as the shaft 20 and the eccentric element 19 are rotated it will cause reciprocation of this piston element. The shaft 20 is journaled adjacent the eccentric member 19 in the body section 8 as at 21 and I provide an extension 22 which is fastened to the body section 8 by means of studs 23 which support the shaft 20 at its outer end by means of the cap 24.

A fly wheel 25 is mounted on the end of this shaft but is journaled to rotate freely thereon and a ratchet element 26, as shown more clearly in Fig. 5, is provided keyed to the shaft 20 by means of the key 27. I provide arms 28 which are pivotally connected to the fly wheel 25, as at 29 and 29^a. These arms are

provided with counter weights 30 and the arms 28 are connected together by hook shaped members 31. I provide a pawl 32 which is pivotally connected to the fly wheel 33 and which is adapted to connect with the ratchet 26. The ratchet is provided with a tooth 26^a and also a recess 26^b. Thus when the point of the pawl 32 engages with the tooth 26^a it will also seat into the recess 26^b and while in this position holds the fly wheel against any movement in either direction independently of the shaft 20. This mechanism on the fly wheel normally assumes the position as shown in dotted lines and thus disengages the same from the ratchet. I provide an electric motor 34, which is mounted on the chamber 2 and is provided with a pulley 35 which is alined with the fly wheel 25. This pulley is connected to the fly wheel by means of a belt 36. As before mentioned, the fly wheel is normally disconnected from the shaft 20 and thus when the motor is started, it does not have to overcome the inertia of the moving parts of the machine and the fly wheel, but only has to drive the fly wheel until sufficient centrifugal force is created by its speed to cause the weights 30 to be swung outwardly which will engage the pawl with the tooth 26^a and thus the pump will be driven but without jerking or straining as it starts.

The reciprocation of the piston in the pump interposes a different resistance to the driving element in its different positions and the recess 26^b is provided so that if the fly wheel lags behind the driving shaft due to the re-expansion of the refrigerant in the pump, it is prevented from doing so by the pawl 32 engaged therein.

I provide valve heads 37 and 37^a on the end of each cylinder, the valve head 37 being on the end of the cylinder 14 and the valve head 37^a being on the cylinder 14^a. These valve heads have inlet valves 38 and exhaust valves 39. The inlet valve being held in place by a coil spring 40 which acts against the removable nut 41 and the exhaust valves 39 being held on their seats by means of the coil spring 42 which acts against the removable nut 43. Each of these valves is provided with suitable tapered seats. The inlet valves 38 work in the valve chambers 44, 44 respectively, and the exhaust valves work in the valve chamber 45, 45 respectively. The exhaust-valve chambers 45 are connected to the pipe 46 by means of a header or pipe 47 which serves both ends of the pump and is connected to a pipe 48 which passes the gases into the chamber 11, the lower part of which constitutes the settling tank.

This chamber is provided with a number of V-shaped baffle plates 49 and a number of inclined baffles 50 (see Fig. 4) which co-operate therewith. Thus as the compressed refrigerant is passed into this chamber it has

to pass circuitously therethrough and if there is any lubricating oil or any refrigerant which is liquefied it will be dropped in the bottom of this chamber and only the gaseous refrigerant will pass on and to the pipe 51 into the cooling coils 3 in the housing 2. The refrigerant which I preferably use is sulphur dioxide. Liquid sulphur dioxide has a specific gravity of 1.5 and the lubricating oil which I use has approximately a specific gravity of .85. These two liquids do not intermix in the least and thus it can be seen that the lubricating oil will rest on top of the liquid sulphur dioxide. The stand-pipe 13 projects up into the chamber 11 sufficiently to permit excess oil to be floated up to the top and through the opening 12 back into the chamber 10 but is too high to permit the liquid sulphur dioxide to overflow through the stand pipe and into the pump. The heat of the pump soon causes the sulphur dioxide in the chamber 11 to vaporize and pass out through the opening 51 as previously described with the gas which is passing therethrough. The cooling coils 3 cause the refrigerant in the vaporized form to liquefy in that it decreases the temperature and thus the liquid refrigerant is passed out in the bottom of the coils through the pipe 52 where a portion passes to the expansion valve 7 which controls the water supply, the remainder then passing into the expansion valve 4 through the pipe 53.

The refrigerant then passes through the pipe 73 to the flat refrigerating coils 74 and 77 which I have called pan cake coils and from there to the coils 79 and in this the pipe is formed into the form of a hollow cylinder from the outside towards the center and the pipe is then led from the central coil, as 80, to a supplementary settling tank 6 from whence the refrigerant is returned to the pump through the pipe 87.

I claim:

1. In a refrigerating apparatus, a circulation pump element comprising a housing divided by a horizontal partition into upper and lower chambers, the upper chamber constituting a settling tank, the lower chamber constituting a lubricant receptacle, a pump cylinder opening through the wall of the lower chamber, a piston reciprocating in said cylinder, means located in said lower chamber for reciprocating said piston, valves controlling the inlet and outlet ports of said cylinder, respectively, the outlet port of said cylinder being connected by a conduit with said upper chamber, a stand pipe carried by and extending through said horizontal partition into said lower chamber, whereby the solid particles carried by the refrigerant are deposited in said settling tank and permitted to separate therein, and the lighter lubricant is returned through said stand pipe to the pump mechanism in said lower chamber.

2. In a refrigerating apparatus, a circulation pump element comprising a housing divided by a horizontal partition into upper and lower chambers, the upper chamber constituting a settling tank, the lower chamber constituting a lubricant receptacle, a pump cylinder opening through the wall of the lower chamber, a piston reciprocating in said cylinder, means located in said lower chamber for reciprocating said piston, valves controlling the inlet and outlet ports of said cylinder, respectively, the outlet port of said cylinder being connected by a conduit with said upper chamber, a stand pipe carried by and extending through said horizontal partition into said lower chamber, baffles carried on the roof of said upper chamber, whereby the solid particles carried by the refrigerant are deposited in said settling tank and permitted to separate therein, and the lighter lubricant is returned through said stand pipe to the pump mechanism in said lower chamber.

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