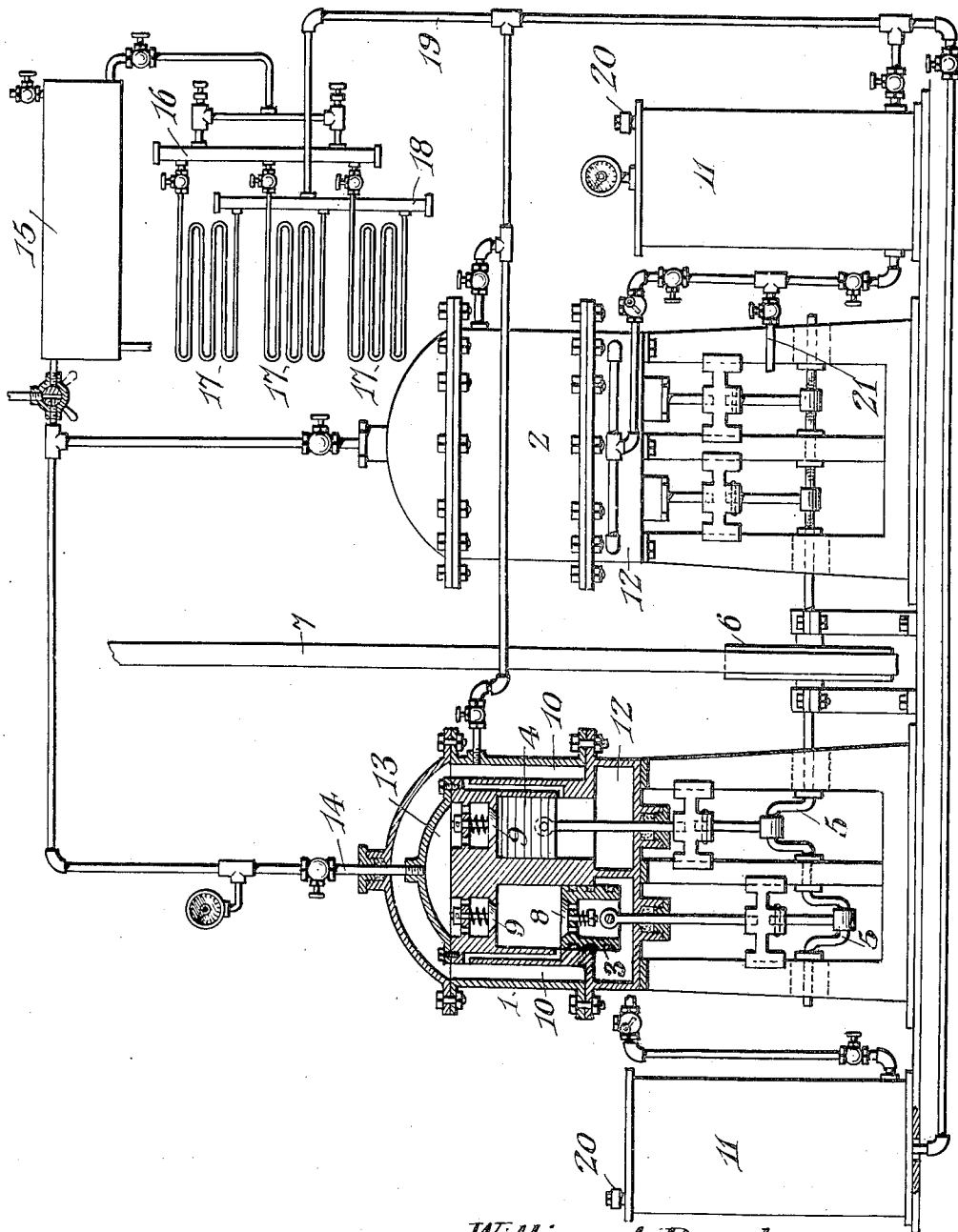


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METHOD OF TREATING REFRIGERATING-MACHINES.

1,025,561.

Specification of Letters Patent.

Patented May 7, 1912.

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To all whom it may concern:

Be it known that I, WILLIAM A. BYERLY, a citizen of the United States, residing at Bridgewater, in the county of Rockingham and State of Virginia, have invented a new and useful Method of Treating Refrigerating-Machines, of which the following is a specification.

This invention has reference to improvements in the treatment of refrigerating machines, whereby moving parts are lubricated and the conduits for the material used to cause refrigeration are rendered smooth on the interior to offer a minimum resistance to the flow of the material employed in the refrigerating process, and whereby all joints are caused to be gas tight, so that after the apparatus has been once installed and started into operation no further attention is required, and no additional material is needed since the machine need not be dismantled for cleaning and there is no waste of material for all leaks are effectually prevented.

The invention is designed for use in connection with refrigerating machines where the refrigerant used is an anhydrous gas, and specifically sulfurous oxid, such gas being readily reducible to liquid form by pressure and is a commercial article since it may be purchased in liquid form in tanks.

The use of sulfurous oxid as the circulating fluid for refrigerating machines is not in itself new, but great difficulty is experienced in lubricating such machines, since oily lubricants such as have been heretofore employed are so affected by the sulfurous oxid that the lubricant which will flow by or leak past the pistons of the compressor pumps and so get into the circulating pipes is converted into a spongy mass often so swollen as to choke up the pipes and thus necessitate the dismantling of the installation to a greater or less extent in order that the pipes may be cleaned. Furthermore, the lubricating properties of the oily materials are changed and the converted mass becomes of a character which causes the valves to stick and the apparatus fails to work efficiently until it has become heated to an extent which will cause the melting of the masses holding the valves and such valves

are released. This has been found to be a grave defect in refrigerating machines employing sulfurous oxid as the circulating fluid, but the great advantages of sulfurous oxid over such circulating fluids as ammonia makes it preferable to use this material even with the disadvantages named, to which may be added the waste of lubricant and the slow change of the supply thereof by such of the circulating material as may reach it until the lubricant must ultimately be entirely replaced with fresh lubricant. With the present invention, these troubles are entirely eliminated, while other advantages are obtained which cannot be obtained with an oily lubricant.

In accordance with the present invention the storage tank of the machine is supplied with a suitable quantity of finely powdered graphite prior to the introduction of the supply of sulfurous oxid, all oil and moisture being rigidly excluded, and then the machine is set into operation, the graphite being carried by the circulating fluid through the pumps and by the flow of the fluid through all the pipes, so that in a short time the interiors of all the pipes become coated with a layer of graphite and all joints are filled with graphite, thus providing a smooth anti-friction surface offering so little resistance to the passage of the fluid that such resistance becomes negligible, while all moving parts become highly polished, due to the presence of graphite and though in intimate contact have negligible friction, while at the same time the graphite constitutes an auto-packing, so that all leakage past the pistons or valves is practically eliminated, and, furthermore, there is no sticking of any parts and the valves always freely respond, whether the machine be working or be starting up after a period of rest.

After the machine is installed and charged both with the graphite and with the liquid sulfurous oxid, the outfit may be run continuously for indefinitely long periods, since the wear of the parts is negligible, and after the machine is once closed and has been run for a time no leaks occur and consequently there is no wastage of the circulating fluid. Actual practice has demon-

strated that refrigerating machines treated as described have been operated continuously for long periods of time, and then taken apart without discovering noticeable wear or loss of the circulating medium.

The invention is not confined to any particular refrigerating machine, but is particularly adapted to the ice making machine set forth in Letters Patent No. 974,184, granted Nov. 1, 1910, to W. M. Pruett and to myself as assignee of said Pruett.

The accompanying drawing is a diagrammatic view of a machine such as described in the said Letters-Patent, but it is to be understood that the invention is not confined to the machine shown, but this showing is deemed sufficient for an understanding of the present invention.

Referring to the drawings, there are shown two duplex compressors 1, 2, each of which is provided with two pistons 3, 4 connected to a crank shaft 5 for reciprocation in relatively opposite directions, the crank shaft 5 carrying a pulley 6 receiving power from a belt 7 which may be driven from any appropriate prime mover, or, as will be readily understood, a prime mover may be directly connected to the shaft 5. It is observed that in the particular machine shown each piston 3 and 4 is provided with a check valve 8 and each cylinder within which the piston moves is provided with an outlet check valve 9, while the pump cylinders are surrounded by a jacket 10 which at the completion of each suction stroke of a piston is in communication with the compression chamber of the pump and at the completion of each power stroke of a piston is in communication with the receiving chamber of the pump.

Each pump is provided with a supply tank 11 designed to contain the circulating medium, and each tank may be placed in communication with the receiving chambers 12 of the pump supplied from said reservoir through suitable valved conduits. The two pump members of each duplex pump discharge into a common chamber 13 from which there leads a pipe or conduit 14 to a condenser 15, which in turn is connected to a manifold 16 distributing to coils 17, which latter in turn communicate with a manifold 18 connected by return pipes 19 to the jackets 10 of the pumps, there being appropriate valves in these several conduits, all as described in the aforesaid Letters-Patent.

For the purposes of the present invention each tank 11 has an opening normally closed by a cap 20, so that a suitable quantity of graphite may be introduced into the tank 11 and the cap 20 applied in gas tight relation to the tank, so that no leakage may occur at this point.

By suitable manipulation of the pumps,

air is pumped out of the apparatus, thereby establishing sub-atmospheric pressure within the tanks and conduits and then by a proper manipulation of the valves the liquid gas may be introduced, a suitable pipe 21 being provided for the purpose. Now, by starting the apparatus and operating it in the manner set forth in the aforesaid Letters-Patent, a circulation of the gas introduced into the machine is caused, the said gas expanding in the coils 17, which latter, as is customary, are immersed in a suitable brine tank, although this is not shown, and the gas after absorbing heat from the brine tank to chill the latter is conducted back to the pumps to be there compressed and again sent to the coils 17, all as described in the aforesaid Letters-Patent.

The refrigerating material on passing from the storage tanks 11 to the pumps carries with it the graphite already deposited in these storage tanks, and the agitation of the fluid maintains the graphite in suspension sufficiently to cause it to pass throughout the entire system, and this graphite is ultimately deposited upon all the walls of the pump cylinders, pump chambers, conduits, condenser, and brine-tank coils, so that all these surfaces become coated with graphite and ultimately become very smooth due to the passage of the gas thereover, thus very materially reducing the frictional contact of the flowing fluid with the walls of the conduits and other parts. Moreover, the pistons of the pumps, the cylinders of the pumps where engaged by the pistons, and the valves become coated with the graphite which fills all uneven parts no matter how slight and soon presents a highly polished surface, so that the frictional engagement of the pistons with the pump cylinders is reduced to a negligible minimum, while all packing, if used, becomes so filled with graphite as to be practically gas tight, and consequently there are no appreciable losses due to leakage of the gas by the pistons. Moreover, all joints become covered with graphite and liability of leakage at these points is correspondingly reduced and ultimately eliminated.

By first pumping out the air from the system before the introduction of the sulphurous oxid which is an anhydrous material, the presence of any quantity of moisture which might be detrimental is avoided, and since all oily matters are to be rigidly excluded so far as possible, the choking of the conduits, the sticking of the valves, the hard running of the pistons, or the leakage of gas by the pistons is eliminated and the necessity of cleaning the machine from time to time is avoided.

The quantity of graphite employed may, of course, vary under different circumstances

and with different machines, but usually there is used about two pounds of graphite per ton capacity of the machine.

Any deleterious effect of the circulating medium, such as the corrosion of the pump cylinders or pistons, and of the coils and conduits, is completely obviated by the coating of graphite produced upon all the surfaces with which the circulating medium may come into contact.

What is claimed is:—

1. The method of treating refrigerating machines using sulfurous oxid as the refrigerant, which consists in introducing graphite into the circulatory system of the refrigerating machine and causing said graphite to pass through the circulatory system by the flow of the sulfurous oxid therethrough.

2. The method of treating refrigerating machines employing sulfurous oxid as the refrigerant and provided with means for forcing the refrigerant through the machine, which consists in causing graphite to pass through the refrigerant forcing means and from the latter to the circulatory system of the machine by the flow of the refrigerant through the forcing means and the circulatory system.

3. The method of treating refrigerating machines which consists in introducing graphite and sulfurous oxid into the machine and then causing a circulation of the sulfurous oxid and the graphite together through the machine.

4. The method of treating the circulatory system of refrigerating machines which consists in introducing therein a suitable quantity of graphite in finely divided condition, then producing sub-atmospheric pressure within the circulatory system, then introducing sulfurous oxid into said circulatory system, and then causing the circulation of the sulfurous oxid through the circulatory system and by such circulation of sulfurous oxid causing the distribution of the graphite through the circulatory system of the machine to produce a coating of graphite on the walls of the ducts traversed by the sulfurous oxid.

5. The method of treating the circulatory system of refrigerating machines which consists in first introducing a suitable quantity of finely divided graphite into the storage portion of said system, then introducing into the circulatory system a suitable quantity of sulfurous oxid, and then causing a circulation of the sulfurous oxid with graphite carried thereby through the circulatory system of the machine to distribute the graphite throughout such circulatory system.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM A. BYERLY.

Witnesses:

JOHN H. SIGGERS,
EDITH L. BROWN.