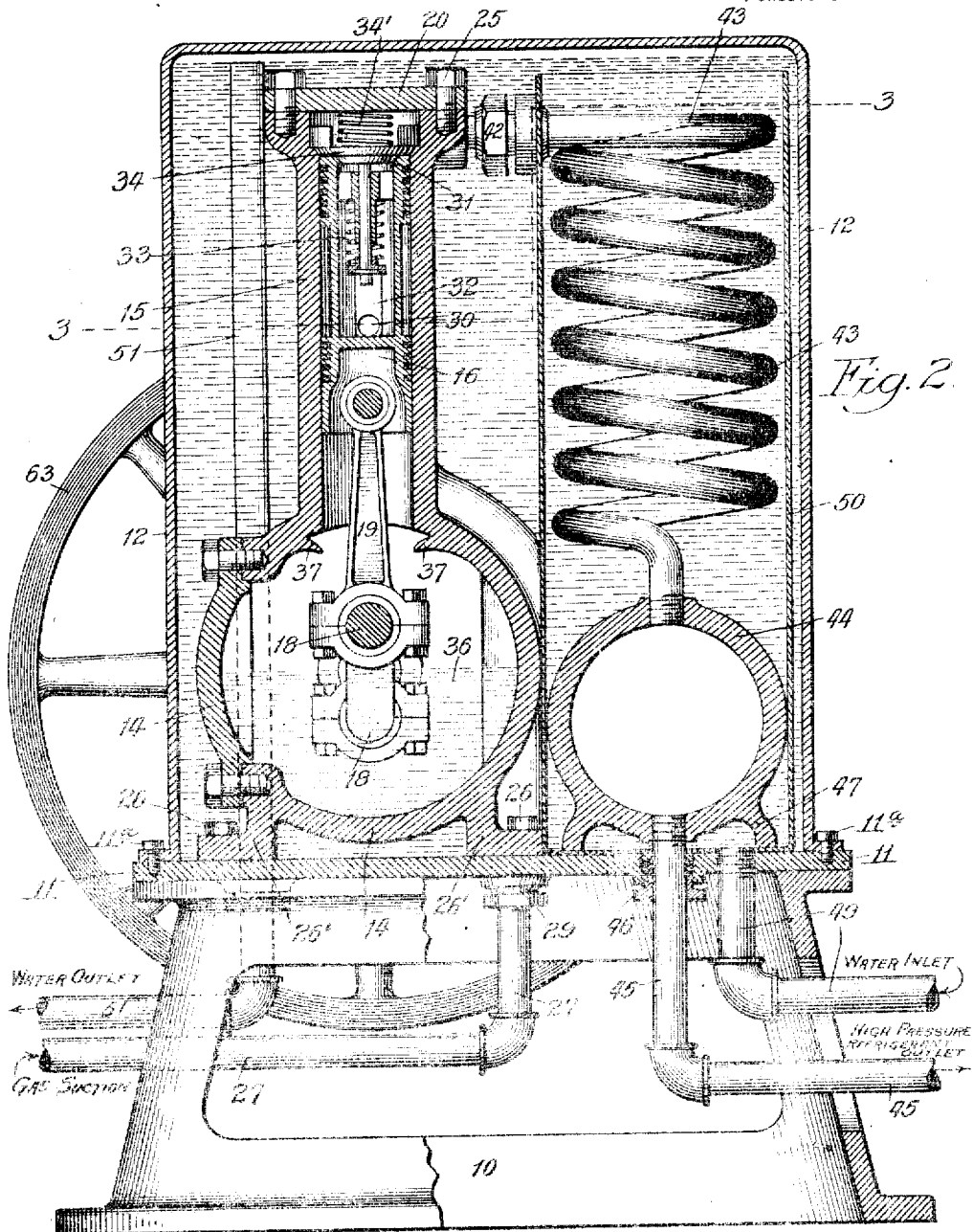


A. P. ANDERSON.
REFRIGERATING APPARATUS.
APPLICATION FILED OCT. 19, 1914.

1,284,964.

Patented Nov. 19, 1918.

4 SHEETS—SHEET 2.



Witnesses:
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Mildred Sturtevant

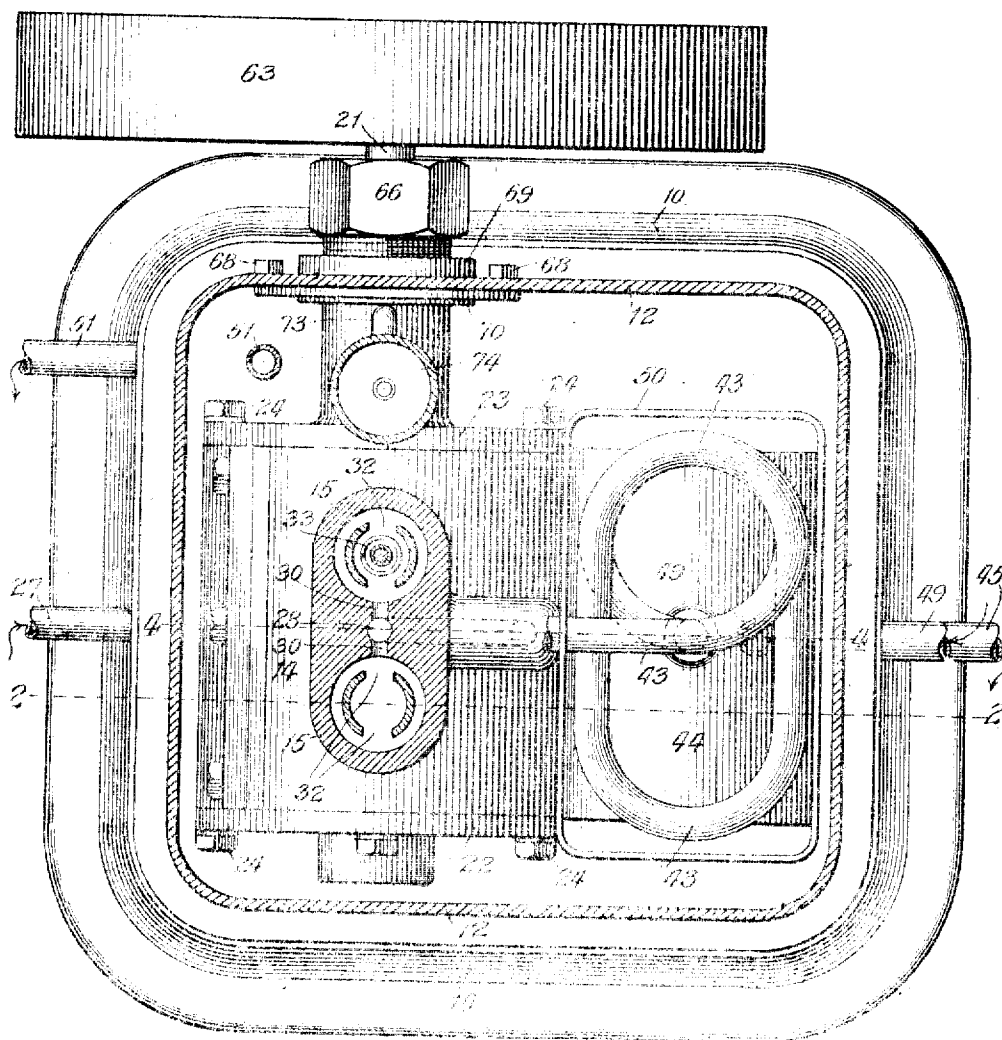
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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

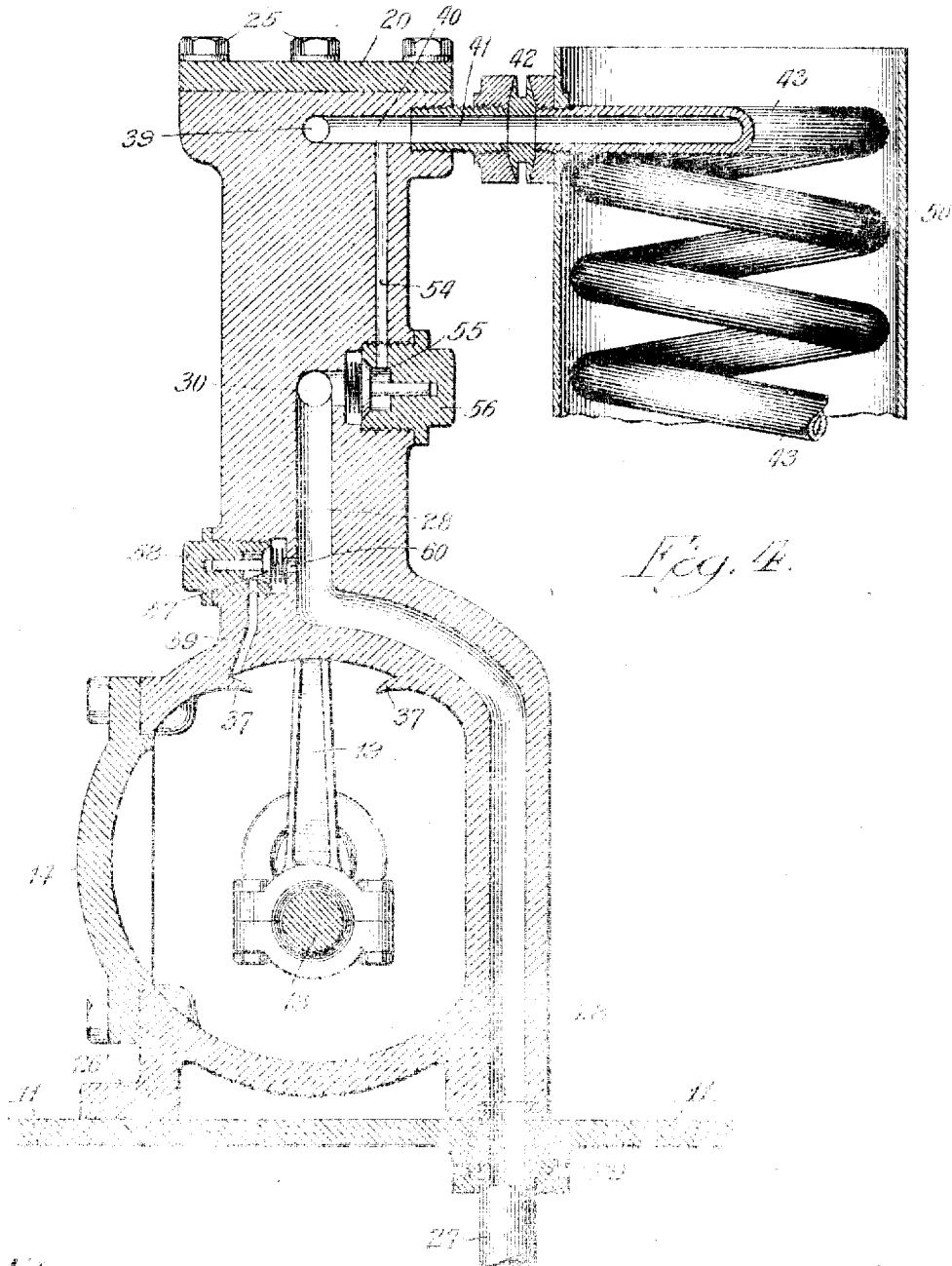


Fig. 4.

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UNITED STATES PATENT OFFICE.

AUGUST P. ANDERSON, OF CHICAGO, ILLINOIS.

REFRIGERATING APPARATUS.

1,284,964.

Specification of Letters Patent.

Patented Nov. 19, 1918.

Application filed October 19, 1914. Serial No. 867,343.

To all whom it may concern:

Be it known that I, AUGUST P. ANDERSON, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a full, clear, and exact description.

The invention relates to refrigerating apparatus in which liquefiable gas is mechanically compressed for cooling or refrigerating purposes.

One object of the invention is to provide an improved apparatus which is entirely surrounded by the condensing water, to increase the efficiency of the apparatus.

A further object of the invention is to provide an improved apparatus in which the receiver for the refrigerant under high pressure is surrounded by the water used for condensing the refrigerant agent, to increase the efficiency of the apparatus, and in which water initially passes around the receiver, next around the condenser and then around the compressor, so that the coolest water will be effective upon the receiver and condenser.

A further object of the invention is to provide an improved apparatus in which the entire compressor, including its crank-case, are surrounded by the condensing water, which will absorb any of the gas that may escape from the compressor, so that the apparatus will be rendered exceptionally safe in use.

A further object of the invention is to provide improved means for permitting the escape of high-pressure refrigerant to the low-pressure side of the refrigerant line, if the pressure of the refrigerant exceeds a safe or predetermined maximum.

A further object of the invention is to provide improved means for permitting the escape of gas which may leak into the crank-case from the compressor-cylinder.

Other objects of the invention will be apparent from the description of the apparatus hereinafter set forth.

The invention consists in the several novel features hereinafter set forth and more particularly pointed out by claims at the conclusion hereof.

In the drawings: Figure 1 is a vertical longitudinal section of an apparatus embodying the invention. Fig. 2 is a transverse section taken on line 2—2 of Fig. 3. Fig. 3 is a horizontal section taken on line

3—3 of Fig. 2. Fig. 4 is a section taken on line 4—4 of Fig. 3.

For convenience in connecting the inlet and outlet pipes to the apparatus, the latter is mounted upon a base 10. A compressor, condenser and receiver are all inclosed in a case which is mounted on the base and comprises a bottom-plate 11, and a bonnet 12, which forms the sides and top of the case for containing the condensing water and is secured to said plate by bolts 11^a. The compressor comprises a crank-case 14, a pair of cylinders 15, each containing a piston 16, oppositely disposed cranks 18, a pitman 19 between each piston 16 and crank 18, and a head 20 closing the upper end of each cylinder. Cranks 18 are secured to a shaft 21 which has one of its ends journaled in a head 22 at one side of the crank-case and its other end in a head 23 at the other side of said case. These heads 22 are removably secured to the body of the crank-case by bolts 24. Cylinder-heads 20 are removably secured to the cylinder casting by bolts 25. Legs 26' on the body of the crank-case are secured upon the bottom-plate 11 by bolts 26. A pipe 27, leading from the cooler or refrigerator, conducts the spent refrigerant or low-pressure gas to a duct 28 which is formed in the crank-case and a cylinder casting. Pipe 27 is connected to the crank-case and passes through the bottom-plate 11. A packing-box 29 is provided to prevent the escape of water from the case. Duct 28 communicates with a cross-duct 30 which leads to both cylinders 15. Each piston is provided with a suitable check-valve 31, at its upper end, is hollow between its upper and lower ends, and is formed with openings 32, so that gas in the cylinders will be supplied to the check-valves 31 which are normally closed by springs, 33 and through which the gas will pass during the downstroke of the piston. A check-valve 34, normally closed by a spring 34', permits the refrigerant under compression in each cylinder to pass to the high pressure side of the refrigerant line and prevents back-flow of the high-pressure refrigerant into the cylinders.

The crank-case contains a supply of lubricant 36 in which the cranks and lower ends of the pitmen work, so they will be lubricated and to prevent an excess of lubricant from being splashed into the cylinders, guards or wings 37 are formed in the upper

portion of the crank-case adjacent the lower ends of the cylinder. The purpose of these guards is to prevent excessive lubrication of the cylinders, thus preventing the lubricating oil from passing with the gas through the check-valves of the compressor. It having been found that, if this oil gets into the freezing coils, the efficiency of the refrigerant is lessened.

The body of the crank-case 14 is elevated somewhat above the bottom-plate 11, being supported by legs 26 so that the water surrounding the crank-case will pass thereunder.

The gas passing through check-valve 31 is compressed by the piston and forced into a cross duct 39 in the cylinder casting which communicates with the upper ends of both cylinders. From this cross-duct the compressed refrigerant passes to a duct 40 in the cylinder casting, which is connected by a short pipe 41 and union 42, to the upper end of the condenser coil 43. The lower end of this coil is connected to a receiver 44 in which the high pressure refrigerant is retained. An outlet pipe 45 for the high-pressure refrigerant is connected to the lower portion of the receiver 44, being extended through a packing box 46 in the bottom plate 11. Pipe 45 leads to the cooler or refrigerator, as well understood in the art, and together with pipe 27 constitutes the refrigerant line through which the refrigerant circulates. Receiver 44 is mounted upon the bottom plate 11 and is provided with legs 47 which separate the lower portion from the bottom, so that water will flow around substantially all portions of the receiver.

The compressor, substantially in entirety, the condenser coil and the receiver, are all contained within the case formed by a hood 12 and bottom plate 11. A supply pipe 49 is connected to the bottom plate 11 to deliver water for condensing and cooling the refrigerant into the case. In practice, it has been found desirable to cause the condensing liquid to initially pass around the receiver, thence around the condenser and then around the compressor, because the water is coolest and most effective to condense the refrigerant when it passes into the hood. For the purpose of insuring this course of the water, the receiver and condenser are placed in a tank 50, having an open top and the inlet pipe 49 delivers water into the bottom of this tank. The water overflows from the top of tank 50 into the chamber in which the compressor is located and is carried off by a pipe 51 into which the water at the highest point of the column in the case overflows, so that the warmest water will be carried away by said pipe. It will be understood that any suitable or automatic controlling means for the operation of the com-

pressor and the water supply, as well understood in the art, may be employed. It will be observed, in the construction described, that the receiver, condenser and the compressor in its entirety, are surrounded by water in the case, and thereby the efficiency in compression and condensing is attained. The tank 50 serves as a baffle or guide which causes the water to be initially applied to the receiver and condenser. Besides increasing the efficiency of the apparatus by submerging substantially all of the parts in water, any leakage of gas will be absorbed by water so that there will be no danger incurred from escape of the gas.

A safety valve for a high-pressure refrigerant is provided whereby, when the pressure exceeds the desired predetermined maximum, the refrigerant will escape into the suction or low pressure side of the refrigerant line. To simplify the apparatus and avoid pipe-connections, so far as possible, the invention provides for disposing this valve in the cylinder casing, so that the escape duct may be located directly in the casing, as exemplified by the escape duct 54 and check valve 55, which is mounted in a plug 56, which is screwed into one side of the cylinder casing and permits the refrigerant of excess pressure to escape into duct 30.

In practice, it sometimes occurs that gas escapes from the compressor-cylinders, around the lower portion of the pistons into the crank-case and for the purpose of permitting this gas to escape from the crank-case, a check-valve 57, which is mounted in a plug 58, permits gas to pass through a port 59 into a duct 60, leading to the duct 28 on the suction side of the refrigerant-line.

Head 22, through which one portion of the crank-case is journaled, is provided with a boss 61 which extends through one side of the hood 12. Suitable packing 62 is disposed in this boss and around the crank-shaft. A drive-pulley 63 is secured to the outer end of said shaft. A follower 64 fits in the end of the boss to hold the packing in place and is provided with a metallic bearing 65. A screw-cap 66 is adapted to force the follower into and secure it in the boss.

To permit the hood to be removed, it is provided with an opening in one side which is closed by a plate 67, secured to the hood by screws 68. Nuts 69 and 70, which are screw-threaded to the boss 61, provide a tight joint between the plate and the boss, so that water will not escape from the hood. If it is desired to remove the hood, it is only necessary to remove the screws 68 and screws 11* when it will be free to be lifted off the bottom-plate to expose or give easy access to the apparatus.

A perforated lubricating ring 72 is held

between the packing rings 62 and lubricant is supplied to the shaft through a pipe 73, which is connected to boss 61 adjacent ring 72, and to a reservoir 74, containing a supply of lubricant. By placing this lubricant chamber in the hood, as shown, the structure of the apparatus is simplified and the necessity of making provision for pipes extending through the hood is avoided. The upper end of the reservoir 74 is provided with a filling plug 75.

The invention thus exemplifies a refrigerating apparatus, in which the compressor, including its crank case, the condenser coil and the receiver are surrounded by the condensing water and in which the water flows successively around the receiver and condenser and the compressor, so that its greatest cooling effect will be upon the refrigerant in the receiver and condenser, in which all of these parts are submerged in a body of water so that any gas escaping from any portion of these parts will be absorbed by the water and will not escape into the atmosphere. The construction set forth is simple and can be produced at a low cost. Simple provision is made for preventing excessive pressure in the high-pressure side of the refrigerant-line and for the escape of gas from the crank-case.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a case adapted to contain water having walls completely inclosing the contents of the case, the compressor, condenser and receiver being disposed within the closed case so that the water in the case will flow around them, means for delivering water into the case for circulation therethrough, a water outlet leading from the case, a connection between the refrigerant line and the compressor extending through one of the walls of the case, and a connection from the receiver to the refrigerant line extending through one of the walls of the case.

2. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line connected to the compressor and the receiver, a case for containing water, extending around the receiver, compressor and condenser and having a closed top, and means for delivering water to the case, the case comprising a bottom-plate upon which the compressor and receiver are mounted, the refrigerant line and the water-delivery means being ex-

tended through the bottom plate, the remainder of the case being removable from the bottom plate without disconnecting the refrigerant line or said delivery means.

3. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a case containing the receiver, compressor and condenser, means for delivering water into the case, and means for causing the water to initially flow around the receiver and condenser and then around the compressor.

4. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a case inclosing the receiver, compressor and condenser, means for delivering cooling water into the case, and a baffle in the case for causing the water to initially flow around the receiver and condenser and then around the compressor.

5. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a tank in which the receiver is located, a case inclosing said tank and the condenser and into which water will overflow from said tank, and means for delivering water into said tank to cause it to initially flow around the receiver.

6. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a tank in which the condenser and receiver are disposed, a case inclosing said tank and the compressor and into which water will overflow from the tank, a pipe for delivering water to the bottom of said tank and an overflow pipe for the water in the case.

7. In refrigerating apparatus, the combination of a compressor comprising a crank-case, a cylinder, a piston working in the cylinder, a condenser, and a crank-shaft, a refrigerant line, a case adapted to contain water comprising a bottom plate and a bonnet having a closed top, and in which the compressor, including its crank-case is disposed, the crank-case being provided with a shaft-bearing extending through one side of said case, and means for delivering water into the case, said bonnet being removable without removing the crank-case.

8. In refrigerating apparatus, the combination of a compressor, comprising a crank-case, a cylinder, a piston working in the cylinder, a condenser, and a crank-shaft, a refrigerant line, a case adapted to contain water and in which the compressor, including its crank-case is disposed, the crank-case being provided with a shaft-bearing extending through one side of said case, the casing comprising a plate separable from the case through which said bearing is extended, and means for delivering water into the case.

9. In refrigerating apparatus, the combination of a compressor, a condenser, a refrigerant receiver, a refrigerant line, a case containing the receiver, compressor and condenser, means for delivering water into the case, and means for causing the water to initially flow around the receiver and condenser and then around the compressor.

6 nation of a compressor comprising a crank-
case, a cylinder, a piston working in the cyl-
inder, a condenser and a crank-shaft, a re-
frigerant line, a case adapted to contain wa-
ter and in which the compressor, including
its crank-case is disposed, the crank-case
being provided with a shaft bearing extend-
ing through one side of said case, the casing
comprising a bottom-plate, a bonnet sepa-
10 rable therefrom and a plate through which
said bearing extends separable from the bon-
net, and means for delivering water into the
case.

15 10. In refrigerating apparatus, the combi-
nation of a compressor, comprising a crank-

case, a cylinder, a piston working in the cyl-
inder, a condenser and a crank-shaft, a re-
frigerant line, a case adapted to contain wa-
ter and in which the compressor, including
its crank case, is disposed, the crank-case 20
being provided with a shaft bearing extend-
ing through one side of said case, a lubri-
cant reservoir in the case, and connected to
the bearing in the case, and means for de-
livering water into the case.

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Witnesses:

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