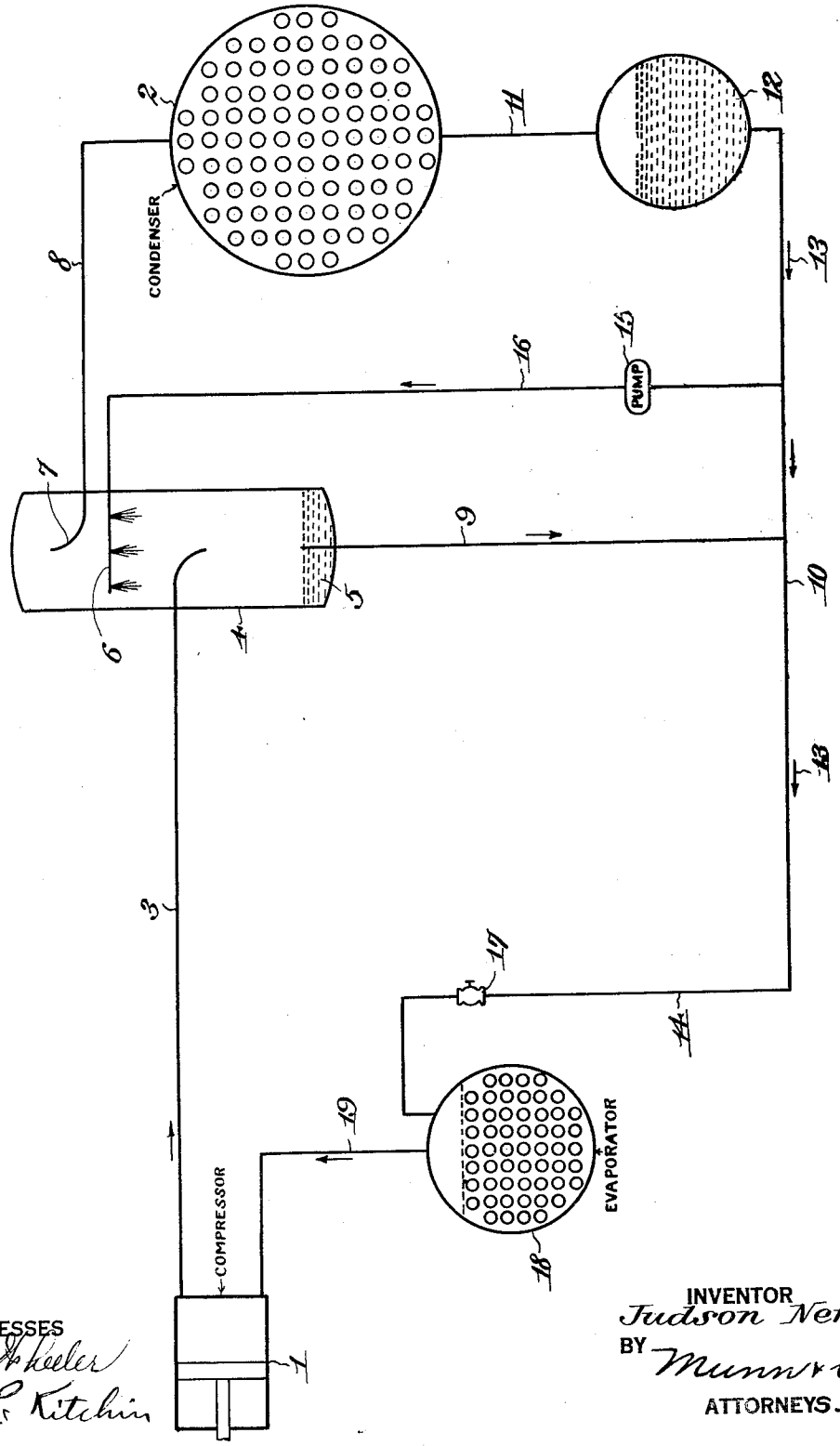
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APPARATUS FOR REMOVING SUPERHEAT FROM COMPRESSED GAS TO BE CONDENSED IN A SURFACE CONDENSER

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WITNESSES

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APPARATUS FOR REMOVING SUPERHEAT FROM COMPRESSED GAS TO BE CONDENSED IN A SURFACE CONDENSER

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1 Claim. (Cl. 62—115)

This invention relates to an improved method of improving the performance of a surface condenser used for liquefying a superheated gas by the removal of the superheat before admitting the gas to the condenser, the object being to cause the condenser to function with a gas at lower pressure and reduced temperature.

Another object of the invention is the improved method of de-superheating gas in its travel from the compressor to the condenser so that the condenser may act with a fully wetted surface and thereby produce a greater heat transfer coefficient.

A further object of the invention is to provide a method which may utilize different apparatuses for de-superheating the gas between a compressor and a condenser in a refrigerating system, the de-superheating part of the system acting through the use of sprayed liquid formed from the same gas or through bubbling the superheated gas through a liquid of the same gas, thus evaporated some of the liquid and securing a reduction in superheat and a reduction in temperature before the gas reaches the condenser.

In the accompanying drawing,—

The figure is a diagram showing one apparatus capable of utilizing the method embodying the invention.

Referring to the accompanying drawing by numerals, 1 indicates a compressor of any desired kind, and 2 a surface condenser. In the drawing an apparatus is shown which is a refrigerating system and which utilizes the invention to secure certain desirable results.

During the use or functioning of the refrigerating system, the compressor 1, which may be of any desired type, compresses the liquefiable gas used and raises the pressure and temperature thereof so that the gas moves through the pipe or tubular conductor 3 at a comparatively high pressure and superheated. As shown in the example in the drawing this superheated high pressure gas is discharged into a tank 4. This tank has a supply of liquid 5 formed from the same gas that is being compressed. A spray device 6 continually provides a spray through which the gas must pass before it can move through the outlet pipe 7 to the line 8 and thence to the condenser 2. The liquid from the spray 6 drops down to the liquid 5 and when the level is sufficient it will overflow through the drain pipe 9 into the return pipe line 10. The liquid from the spray device 6 will evaporate in the presence of the superheated gas from pipe 3 because the superheated gas is naturally dry and at a higher temperature, and, consequently, this liquid will saturate the gas and thereby de-superheat the gas before it passes out of the discharge pipe 7. As the gas under reduced temperature moves along the pipe 8, it is finally discharged into the condenser 2, which may be of any desired kind, and by reason of the comparatively saturated condition of the gas the condenser functions efficiently to condense the gas into a liquid and this liquid passes down through pipe 11 into the receiving chamber 12. The bottom of the receiving chamber 12 is connected to the pipe 10.

The liquid from the receiving chamber 12 is adapted to pass along pipe 10, as indicated by the arrows 13, and from thence up pipe 14. If desired, a pump could be arranged in pipe 14, though, ordinarily, this is not necessary as the liquid is moving under pressure and as the gas entering the condenser 2 is under pressure. However, a pump 15 is arranged in pipe 16 so as to supply the spray 6 with liquid at the desired rate. The liquid passing through pipe 14 must pass through expansion valve 17 and thence into the evaporator 18 where it produces the desired cooling action and the gas having taken up the heat will be drawn through pipe 19 into the compressor 1. This gas in turn will be ejected under comparatively high pressure by the compressor as the compressor functions to force the gas through pipe 3. As long as the refrigerating system is in use, the compressor 1 functions in the usual manner and the cycle just described will be continued.

In devices of this kind it has been the practice heretofore to connect pipe 3 directly with the condenser 2 or with a preliminary stage of the surface condenser before entering the condenser 2 proper and this resulted in a considerable portion of the heat exchanger surface of the latter intended to cool and liquefy the gas remaining dry on the side exposed to the gas. By the present method, and as illustrated in the drawing, there is presented the idea of de-superheating the gas prior to condensing by bringing the gas into intimate contact with some of the same gas previously liquefied. It will be evident that a number of different devices, and also a number of modified ways of bringing the gas into intimate contact with liquid from the same gas are possible. For instance, the gas could be forced through a spray of liquid, as illustrated in the drawing, or the gas could be caused to bubble up through the liquid.

The drawing discloses the shell and tube type of surface condenser but the idea could be ap-

plied equally well to surface condensers of the shell and coil, multitube, submerged coil or atmospheric types.

By using the method herein described the gas is permitted to go directly from the de-superheater 4 to the condenser. This method results in a decrease of the condenser pressure because by having all of the condenser surface in contact with the saturated gas an increase in heat transfer coefficient is secured which more than offsets the effect of decreasing the temperature of the gas entering the condenser and increasing the weight of gas to be liquefied and drained in the condenser. In this way the performance of the condenser 2 is improved as the superheat is removed from the gas without using any part of the condenser.

While the drawing shows one method of applying the inventive idea to a compression refrigerating system it is evident that the invention is capable of application to not only compression refrigerating systems but to any compression system employing surface condensers to liquefy a gas.

I claim:—

In a refrigeration system using a liquefiable gas refrigerant, the combination with a condenser and a compressor, of means providing a chamber in communication with the condenser and compressor between them, and conduit means leading from the bottom of the condenser to the top of said chamber to feed some of the gas in a liquid state into the chamber to saturate the gas on its way to the condenser from the compressor to lower the pressure in the condenser and at the same time increase the heat transfer efficiency of the condenser.

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