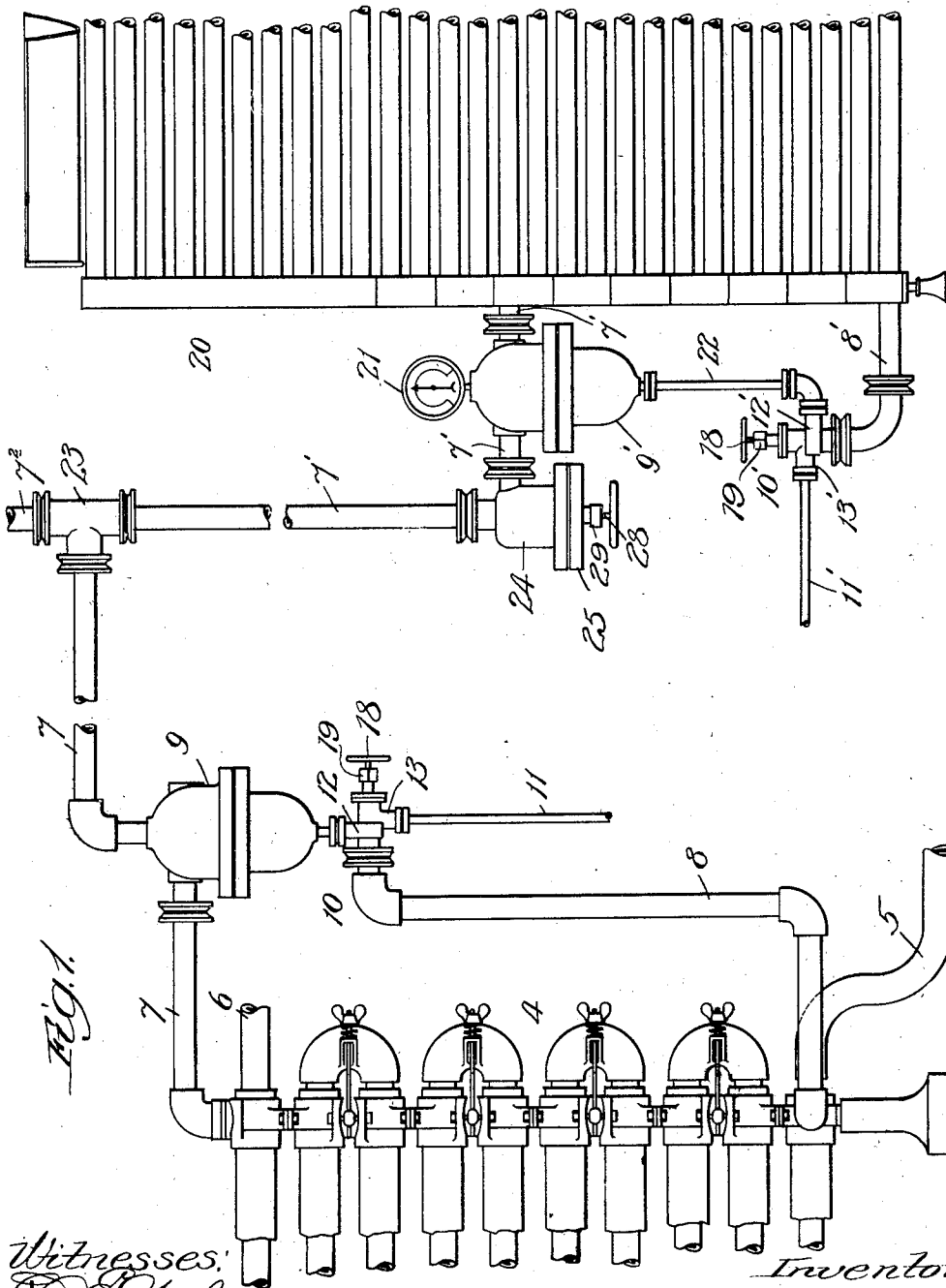


J. SCHNEIBLE.
REFRIGERATING APPARATUS.
APPLICATION FILED JAN. 19, 1912.

1,062,856.

Patented May 27, 1913.

2 SHEETS-SHEET 1.



Witnesses:
Edw. Payson
Chas. H. Buell

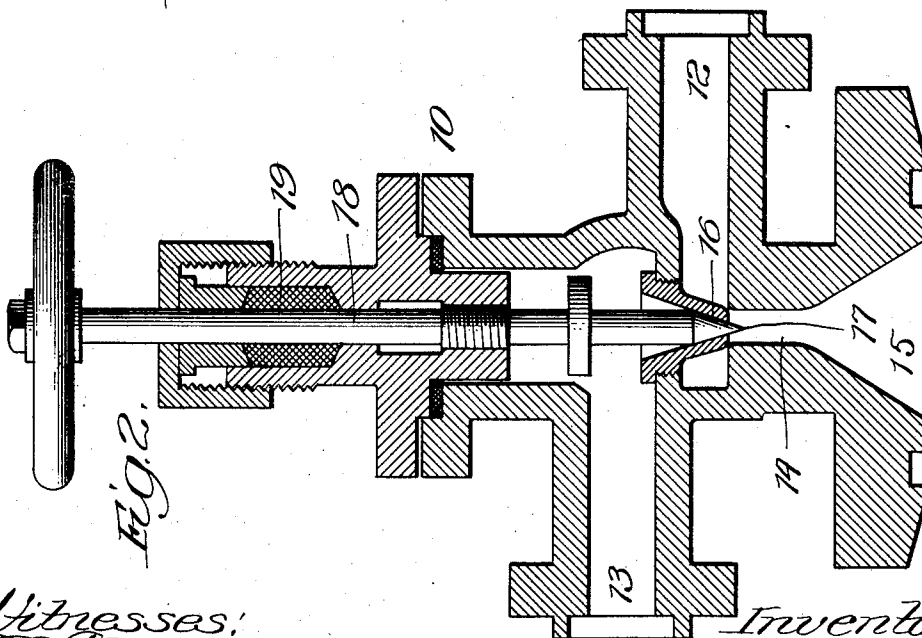
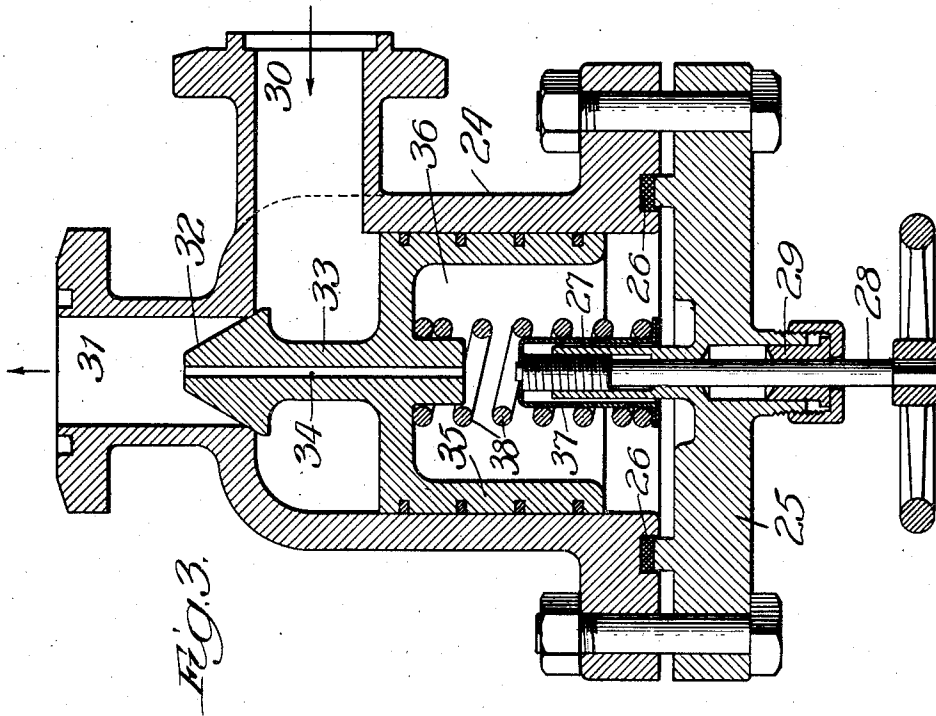
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2 SHEETS—SHEET 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH SCHNEIBLE, OF CHICAGO, ILLINOIS.

REFRIGERATING APPARATUS.

1,062,856.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed January 19, 1912. Serial No. 672,104.

To all whom it may concern:

Be it known that I, JOSEPH SCHNEIBLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Refrigerating Apparatus, of which the following is a specification.

My invention relates to an improvement in refrigerating systems employing the expansion of a refrigerant, such as anhydrous ammonia, from a liquid form into gaseous form; and I have more especially devised it for use in systems wherein means are provided for automatically separating from the gaseous refrigerant, in its course to undergoing compression, the ungasified portion thereof, and for returning such separated portion for expansion to the system with the liquid refrigerant being supplied thereto.

My invention is applicable to systems of the kind referred to wherein a plurality of cooling apparatus or coils are employed for cooling liquid to varying temperatures. For the present purpose the system may be considered to employ but two such coils, one for cooling to a relatively lower and the other to a relatively higher temperature; though the invention is equally useful in a system where a greater number of cooling devices are employed, the purpose being to maintain a uniform condition throughout the system of all expanded gas returning to the compressor from the different coils.

In the accompanying drawings, Figure 1 is a broken view in elevation of a refrigerating system embodying my improvement, the view showing only sufficient of the apparatus of the system to enable my invention to be understood by those skilled in the art. Fig. 2 is an enlarged sectional view of a valve-device for controlling the admission of liquid refrigerant into the expansion-coil, and Fig. 3 is a similar view of a valve-device for automatically controlling the boiling point of the refrigerant in the coil for cooling to the relatively higher temperature.

For the purpose of the following description, anhydrous ammonia is named therein as the refrigerant employed, though it is to be understood that my invention contemplates the use of any other suitable lique-

fiable gas, and is applicable to refrigerating and ice-making systems employing such refrigerants.

Fig. 1 of the drawings shows an end view of a double-pipe coil 4 of ordinary construction, such as is used in breweries for cooling the beer, provided with a lower inlet-pipe 5 for the beer to be cooled and an upper outlet-pipe 6 for the same, a gas-discharge pipe 7 leading from the upper end of the coil to a compressor (not shown), and a supply-pipe 8 leading to the opposite end of the coil for introducing liquid anhydrous ammonia therein from a reservoir (not shown) which receives its supply from the condenser (not shown) connected, as usual, with the aforesaid compressor. Interposed in the discharge-pipe 7 is a separator 9, which may be the same as that of Letters Patent of the United States No. 928,546, granted to me July 20, 1909, and need not, therefore, be herein shown or described in detail; and this separator is connected, at its lower, discharge end for the liquid ammonia which it separates from the gas coursing through the pipe 7, with the casing of a valve-device 10 (Fig. 2), with which the pipe 8 is connected and through which the latter communicates controllably with the aforesaid reservoir through a pipe 11 leading to the valve-device, which is constructed as follows: The casing of this valve-device has branches 12 and 13 respectively connected with the discharge-end of the separator and the pipe 11, and an outlet-port 14 at the inner end of a flaring chamber 15, at which the casing is connected with the pipe. In a tapering valve-seat 16 interposed in the casing between the branches and alining with the port 14, works a needle-valve 17 with its stem 18 supported in suitable bearings on the casing, including a stuffing-box 19.

The device 20 (Fig. 1) represents an ordinary Baudelot cooler with a supply-pipe 8' for the liquid refrigerant leading into the lower ammonia-section at its bottom and a discharge-pipe 7' leading from its upper end to a separator 9', in all respects like the separator 9 but shown to be equipped with a pressure-gage 21. A valve-device 10', like the valve-device 10, has its branches 12' and 13' connected, respectively, with the dis-

charge-end of the separator 9', by a pipe 22, and a pipe 11' leading from the condenser.

A pipe 7', corresponding to the pipe 7, leads from the separator 9' and is united with the pipe 7 at 23 to connect both pipes with a pipe 7² that goes to the compressor; and the pipe 7' has interposed in it a valve-device 24 (Fig. 3) for controlling the boiling-point of ammonia within the Baudelot cooler. A valve-device for this purpose constitutes the important feature of my present improvement; and it comprises the following-described preferred construction: The casing, having a head 25 bolted to it, with interposed packing 26, is provided centrally on its inner face with an internally-threaded sleeve 27 for the threaded inner end of a stem 28 working through a stuffing-box 29 on the outer face of the head. Branches forming inlet and outlet ports 30 and 31, at which the casing is connected respectively with the horizontal and vertical sections of the pipe 7', form the inlet and outlet, communication between which is controlled by a valve 32 seating against the entrance to the outlet-branch 31 and having a stem 33 provided with a central bore 34 extending through it and the valve-head; and the stem is formed with an expanded hollow base-section 35 to fit, piston-like, within the casing and produce a pressure-equalizing chamber 36 into which the bore opens. A thimble 37 caps the sleeve 27 in spaced relation thereto, and the inner reduced end of the stem 28 is journaled in its upper end, the opposite end of the thimble being flanged, as shown, for seating it and confining a spiral spring 38 against the valve to adapt the spring-tension to be regulated by turning the stem.

With the system thus described in operation, the gaseous refrigerant from the coils 4 and 20, in going to the compressor through the pipes 7 and 7', passes through the respective separators, which separate the wet or mist-like refrigerant in each case from the gas carrying it, thereby leaving the gas which goes to the compressor in dry condition. The pressure of the liquid ammonia from the supply-reservoir thereof forces it past the valves in the devices 10 and 10' through their outlet-ports and thence through the pipes 8 and 8' into the respective coolers 4 and 20 to perform therein its work by expansion. The force of the supply-pressure of the liquid ammonia in discharging past the valves 16 draws with it the liquid discharging from the separators and thus introduces it, as part of the supply, into the respective coils through the pipes 8 and 8'. Thus, as will be apparent, any ungasified portion of the refrigerant, after performing its work by expansion, is intercepted against access to the compressor, leaving only dry gas to enter the latter, and is

directly returned to the expansion-coils to enter the latter with the regular supply to each.

My present improvement has to do with the automatic handling of the gas of expansion, after the aforesaid separation, to reduce the pressure of that coming from the coil or coils of higher pressure, as the coil 20, into the common return-conduit 7², to or approximately to that of the gas coming from the coil of lowest pressure, as the coil 4. This result is accomplished by the device 24. With the gas-pressure from the cooler 20 entering the branch 30 at, say, sixty pounds, and that from the cooler 4 through the pipe 7 at, say thirty pounds, the union of these different pressures in the return-pipe 7² to the compressor would, obviously, produce detrimental disturbances in the coil 4 and thence throughout the system. The spring 38 need be of only just sufficient power to close the valve 32, at the respective pressures, the valve being balanced by admitting through the bore 34 substantially the same pressure behind it, in the chamber 36, that is ahead of it. The excess of pressure coming through the branch 30 opens the valve to regulate, in the manner of a governor, the pressure of the gas passing it to that ahead of the valve.

By means of the valve-device 24, therefore, the gas of higher temperature from the coil 20 cannot detrimentally interfere with the action of the coil operating under the lower temperature. In other words, it maintains in the coil, wherein the expansion of ammonia occurs in the presence of higher temperature, a sufficient pressure to obtain the best results from the expanding gas, and controls the pressure within the coil to permit the expanded gas coming therefrom to expand to a correspondingly lower pressure and thus lower the temperature of that gas to deliver the re-expanded gas under conditions uniform with those in the expanded gas coming from the coil under relatively low pressure.

I realize that considerable variation is possible in the details of construction thus specifically shown and described, and I do not intend by illustrating a single, specific, or preferred form to limit my invention thereto; my intention being in the following claim to claim protection upon all the novelty there may be in the system as broadly as the state of the art will permit.

I do not herein claim the construction of the valve-device for maintaining the predetermined difference in pressure in the cooler 20, but reserve the same for a future application for Letters Patent.

What I claim as new and desire to secure by Letters Patent is—

In a refrigerating apparatus, the combination of a cooler operating under rela-

tively-low pressure, and a cooler operating under relatively-high pressure, of the refrigerant expanded in each, a discharge-pipe on each cooler for taking the expanded gas to
5 the compressor, a suction-pipe into which said pipes discharge, and automatic means for maintaining a predetermined difference

of pressure in the suction-pipe and said high-pressure cooler, for the purpose set forth.

JOSEPH SCHNEIBLE.

In the presence of—

L. HEISLAR,
R. SCHAEFER.