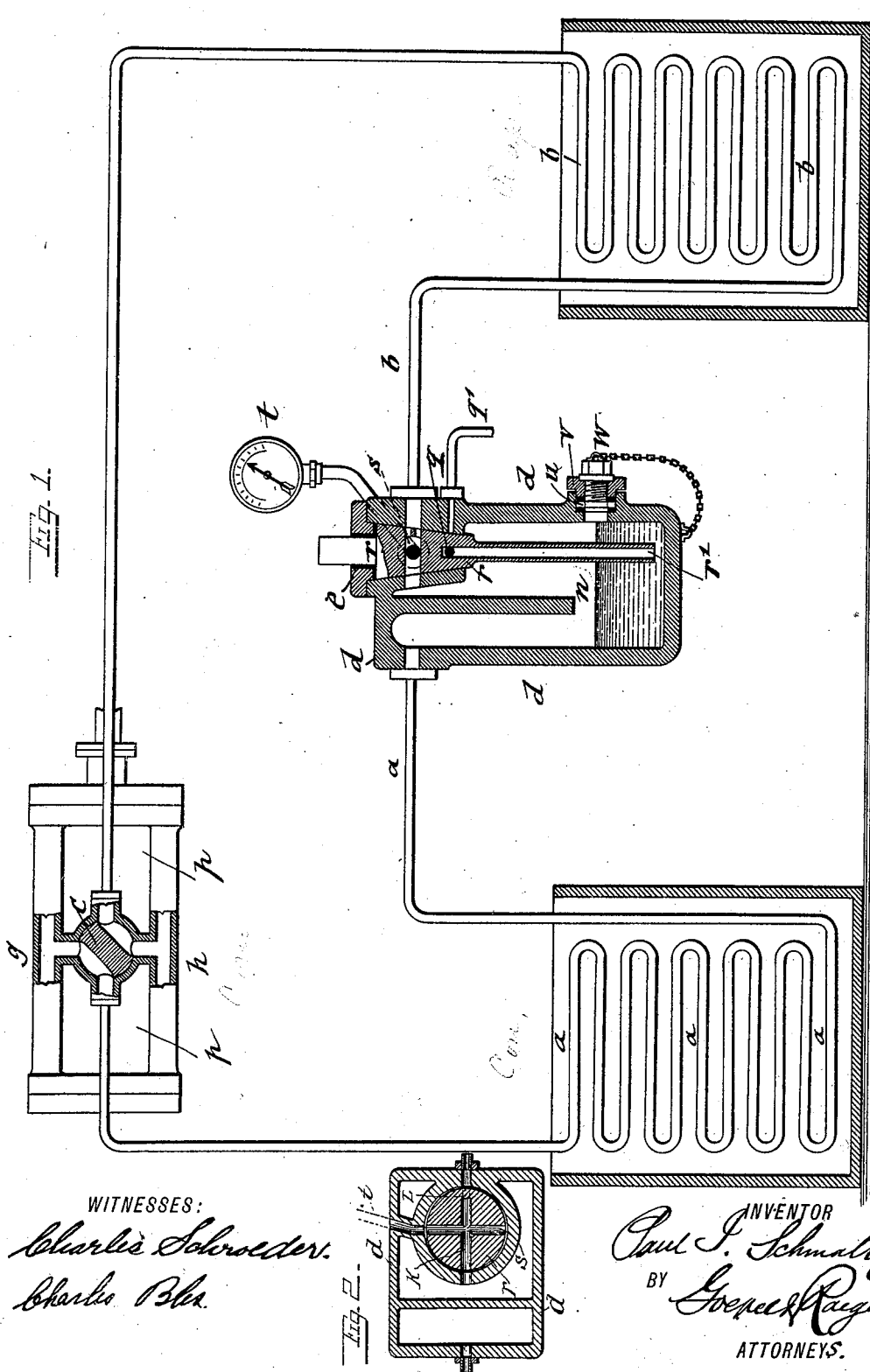


(No Model.)

P. I. SCHMALTZ.
REFRIGERATING AND ICE MAKING MACHINERY.

No. 504,091.

Patented Aug. 29, 1893.



UNITED STATES PATENT OFFICE.

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REFRIGERATING AND ICE-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 504,091, dated August 29, 1893.

Application filed November 14, 1891. Serial No. 411,883. (No model.)

To all whom it may concern:

Be it known that I, PAUL IMMANUEL SCHMALTZ, a subject of the German Emperor, residing in Hamburg, in the Empire of Germany, have invented certain new and useful Improvements in Refrigerating and Ice-Making Machinery, of which the following is a specification.

In the refrigerating machines based on the principle of the compression and expansion of a refrigerating medium, a certain quantity of lubricating material, usually oil, is used in the compressor, mainly with the view of preventing the wear of the compressor. This lubricating material shall be denominated hereinafter briefly as "oil." The lubricating oil is frequently carried along with the condensed refrigerant into the refrigerating pipes and produces, mainly in refrigerating plants in which the refrigerating pipes are used for the cooling of brine for making ice or for other purposes, certain irregularities or disturbances, inasmuch as the oil is deposited as a thin film on the interior surface of the refrigerating pipes and retards thereby the ready absorption of heat from the brine by the refrigerating medium.

Heretofore the oil was removed from the refrigerating pipes in such a manner that the refrigerating machine was run at extra-speed, so that the oil was by suction drawn from the expander into the compressor.

The object of the present invention is to remove the oil deposited in the expander by temporarily establishing a higher pressure in the expander than in the condenser, and producing the quick connection of these parts so that the oil is ejected from the expander and collected in a separating chamber, from which the oil is discharged from time to time.

For this purpose, the invention consists, primarily, of an oil-separating chamber which is interposed between the condenser and expander, the latter being connected by a reversing cock at will with the suction or discharge-sides of the compressor, so that the course of the refrigerant may be reversed and the same first supplied to the expander and then through the oil-separating chamber to

the condenser and back to the compressor whereby the oil is collected in the separating chamber.

The invention consists secondarily, in the construction of the oil-separating and collecting chamber and its accessories, which will be fully described hereinafter and finally pointed out in the claims.

Figure 1 of the accompanying drawings represents a diagram of a refrigerating system, showing the connection of the compressor by a four-way reversing cock with the condenser and expander, and with an oil-separating chamber, which is interposed between the condenser and the expander, the reversing cock and the oil-separating chamber being shown in section and drawn on a larger scale. Fig. 2 of the accompanying drawings represents an enlarged section through the oil-separating chamber and through the valve connecting said chamber with the expander, said valve section being on a line through the "gas ports."

Referring to the drawings, *a* represents the condenser of a refrigerating machine based on the principle of the compression and expansion of the refrigerating medium.

b represents the expander, *p* the compressor, and *d* the oil-separating chamber, which is interposed between the condenser and expander.

The compressor is provided with a suitable reversing cock which is preferably composed of a four-way cock *c*, that is interposed between the suction and discharge-side of the compressor and that serves to connect by the pipes *g* and *h* the discharge-side and suction-side of the compressor respectively with the condenser *a* and the expander *b*.

In place of the four-way cock, any other equivalent combination of cocks for the same purpose may be used, as I do not confine myself to the special construction of the reversing cock shown.

The reversing cock *c* is not required to be arranged directly on the compressor, nor connected directly with the systems of pipes *a* and *b*, but it can be separated from these systems by additional cocks or valves, or by

means of separating or collecting vessels with or without supply-pumps and cooling devices for the oil. Between the condenser *a* and expander *b* are interposed one or more valves or stop-cocks *e* by which the expansion is regulated and by which, when they are entirely opened, the refrigerating medium is quickly expanded in opposite direction to its normal course, so that the oil is removed from the expander and carried along by the refrigerating medium. Special cocks may be arranged for this purpose and connected by special branch-pipes with the oil-separating chamber *d*, but it is preferable to employ as the simplest form of construction the expansion-valves for this purpose.

The separating chamber *d* is preferably constructed in the form of an upright cylinder which is divided by a downwardly-extending partition *n*, of straight or curved shape, into two spaces, that communicate at the lower part of the chamber so as to form one space for the collection of the oil that is carried along by the liquid refrigerant. To the upper part of the separating chamber *d* is connected a pipe which leads to the condenser *a*, while the other side is connected with the expander *b*. In the upper part of the space next to the expander *b* is arranged the expansion-valve *e*, the upright conical spigot *r* of which is provided with a downwardly-extending tube *r'*, the lower end of which terminates near the bottom of the chamber *d*. A small hole *q* bored in the lower part of the spigot *r*, communicates with an oil-discharge pipe *q'* and is connected therewith by the partly turning of the spigot *r*. The discharge pipe *q'* can also be connected with the reservoir from which the lubricating oil is supplied to the interior parts of the compressor. The spigot *r* is provided with a diametrical channel *k* to connect the expander with the oil separating chamber. One end of said channel opens the full size of the channel and the other end has two smaller openings one above and the other below a central partition *l*. The spigot *r*, by which the expansion is regulated, is further connected by a diametrical opening *s* with a pressure-gage *t*, which may, by the turning of the spigot, be connected with the condenser or the expander, so as to indicate alternately the pressure in either. The bore of the spigot *r* is made smaller at the discharge-end, as shown in the drawings, in which position the opening *s* communicates with the gage and indicates the pressure on the condenser-side of the expansion-valve. When, on the other hand, the oil is to be removed from the expander, the spigot *r* is turned on its axis through an angle of one hundred and eighty degrees, so that the contracted end of the bore is at a diametrically-opposite point to its former position and faces the condenser. In this case the opposite-end of the hole *s* communicates with the tube leading to the gage *e* and

indicates thereby on the gage the pressure in the expander.

In the wall of the chamber *d* is arranged on a level or nearly so with the lower end of the partition *n*, a gage-glass *u* which is preferably made of a flat glass-plate that is tightly secured by suitable packing rings and pressed on its seat by a screw-collar *v*, and protected by a screw-plug *w*. By removing the plug, the level of the oil in the chamber *d* can be readily ascertained.

For removing the oil from the interior surfaces of the system of expanding pipes, the four-way cock *c* is reversed so that the discharge-side of the compressor *p* is connected with the expander and the suction-side of the compressor with the condenser. The compressed gases are forced into the expander, the oil in the same being dissolved by the heat of compression of the gases, and carried along by the same as soon as the spigot *r* is turned to bring the channel *s* in connection with the expander, said oil being conducted into the separating chamber *d* and collected at the bottom of the same, while the gases pass through the condenser back to the compressor. When the lower part of the chamber *d* is nearly filled, which is indicated by the gage-glass *n*, the oil is discharged from the chamber by turning the spigot *r* until its bore *q* is in line with the discharge-pipe *q'*. When all the oil is removed from the expanding system, the expansion-valve *e* is closed, the four-way cock returned to its normal position and the refrigerating machine operated in the regular manner. The removal of the oil deposited in the expanding system is accomplished from time to time and thereby the efficiency of refrigerating machines of this class considerably enhanced.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a refrigerating machine, the combination of a compressor, a condenser, an expander, means for reversing the course of the refrigerating medium whereby it is condensed in the expander, an oil-separating chamber connected with the condenser, and a valve connecting said oil-separating chamber with the expander whereby when said refrigerating medium is condensed in said expander and said valve is opened, a sudden expansion takes place from the expander to the oil-separating chamber, substantially as set forth.

2. An oil-separating chamber for refrigerating machines, having a downwardly-extending partition, and an expansion-valve or stop-cock at the upper part of the chamber at that side which is connected with the expander, substantially as set forth.

3. An oil-separating chamber for refrigerating machines, provided with a downwardly-extending partition, an expansion-valve or stop-cock at the upper part of the chamber,

and a pressure-gage connected with the valve or stop-cock, the spigot of which is provided with a lateral bore or opening communicating with the pressure-gage, substantially as
5 set forth.

4. An oil-separating chamber for refrigerating machines provided with a partition *n*, an expansion valve or stop-cock, *e*, the spigot of which has a downwardly-extending tube *r'*
10 and a lateral discharge-hole *q*, a discharge-

pipe *q'*, and a glass-gage *u*, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

PAUL IMMANUEL SCHMALTZ.

Witnesses:

M. F. SCHMALTZ,

MAX WISS.