

(No Model.)

P. BECK.  
REFRIGERATING MACHINE.

No. 464,348.

Patented Dec. 1, 1891.

Fig. 2

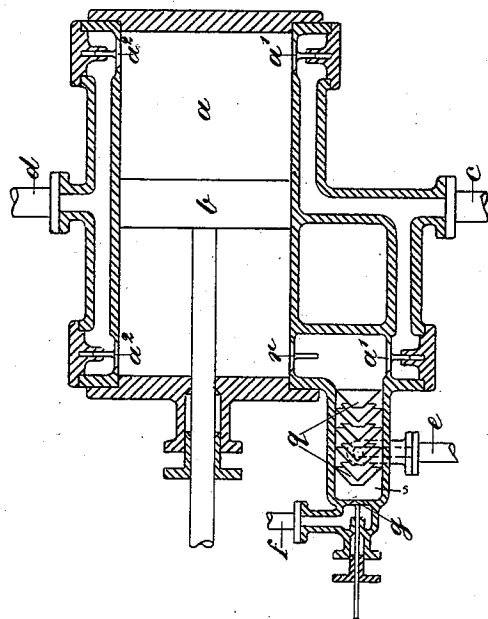


Fig. 1

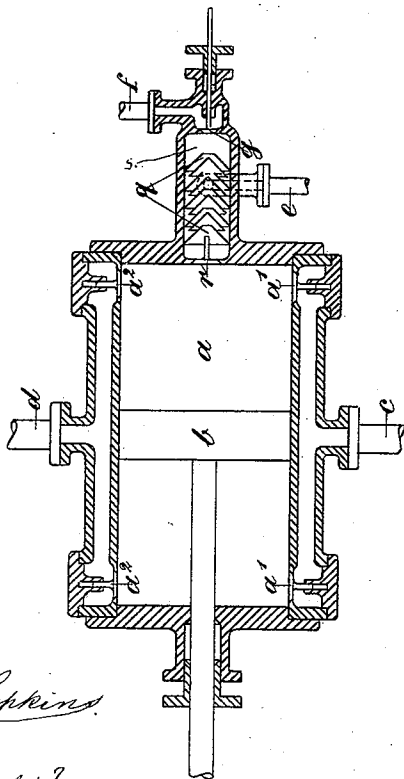
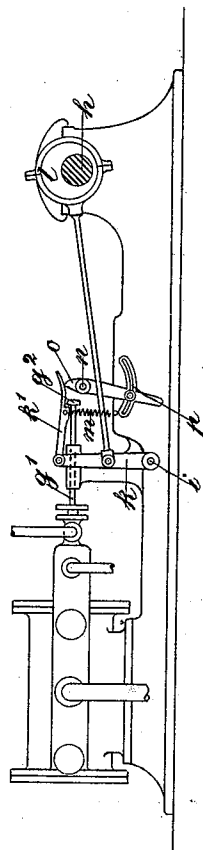


Fig. 3



Witnesses.  
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# UNITED STATES PATENT OFFICE.

PAUL BECK, OF AUGSBURG, GERMANY.

## REFRIGERATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 464,318, dated December 1, 1891.

Application filed January 7, 1890. Serial No. 336,198. (No model.) Patented in Germany November 22, 1889.

### *To all whom it may concern:*

Be it known that I, PAUL BECK, a subject of the King of Bavaria, and a resident of Augsburg, in the Kingdom of Bavaria, German Empire, have invented certain new and useful

Improvements in Refrigerating-Machines, of which the following is an exact description, and for which I have applied for a patent in Germany, dated the 22d of November, 1889.

My invention relates to improvements in refrigerating-machines; and it consists in a device for allowing an expansion of a portion of the refrigerating medium on its way to the expansion-coils in the presence of the main body of the medium to cool the same and finally into the compressing-cylinder to assist in driving the piston of the pump.

In order to make my invention more clear, I refer to the accompanying drawings, in which similar letters denote similar parts throughout the several views.

Figure 1 is a section through the cylinder of a refrigerating-machine. Fig. 2 is a section through the cylinder of a refrigerating-machine, showing a variation in the arrangement of my invention. Fig. 3 is an elevation showing the method of operating my improved valve.

$a$  is the compression-cylinder of a refrigerating-machine.

$a'$   $a'$  are the suction-valves, and  $a^2$   $a^2$  the delivery-valves.

$c$  is the pipe connection from chamber  $s$ , containing separator  $q$ .  $d$  connects the delivery-valves with the condenser. Beside these there are two other pipe connections—one  $e$  leading to the expansion-coils and the other  $f$  to the condenser—connecting these apparatus with the arrangement on the cylinder containing valve  $g$  and comprising the main point of my invention.

The mechanism for working valve  $g$  is represented in Fig. 3 and operates in the following manner: The valve is operated from the crank-shaft  $h$  of the machine by means of an eccentric  $l$ , which works the lever  $k$ , pivoted to the machine-bed at  $i$ . To the upper end of lever  $k$  is hinged the arm or catch  $k'$  under influence of spring  $m$ . This catch operates valve-rod  $g'$  by means of the button  $g^2$  on the end of the latter. As soon as the valve  $g$  has

been opened the required distance, the lever  $c$ , pivoted at  $n$ , releases the rod from catch  $k'$  by knocking the catch upward. The point at which the valve is released may be varied by regulating the position of end  $c$  of the lever by means of segment  $p$  and screw.

The apparatus works in the following manner: When the refrigerator is working and piston  $b$  goes back, the progressive rarefaction of the vapor in the compression-cylinder  $a$  diminishes its pressure, and as the valve  $r$  remains at first closed the pressure of the vapor in the chamber  $s$  of the separator  $q$  becomes greater than that in  $a$ . The valve  $r$  is now opened and the vapor of the separator can enter into the compression-cylinder  $a$ . At the beginning of the backward stroke of the piston  $b$  the valve  $g$  will be opened by the catch  $k'$  and held open during a certain time, but not to the end of the return movement of the piston  $b$ . If the piston now continues to go back after the opening of the valve  $r$ , because of the diminished pressure in the chamber  $s$  and the cylinder  $a$ , the liquid is sucked from the condenser along pipe  $f$  into the chamber  $s$ . This liquid cannot enter in the cylinder  $a$  because of the metallic cones or infundibuliform parts in the separator  $q$ . The first funnel next to the valve  $q$  has an opening at its top, and it is connected throughout at its base with the wall of the chamber  $s$ . The following cone is closed at its top and its base does not reach to this wall. It is connected by thin supports next to its base with the inner side of the first funnel. Several other pairs of such funnels or cones follow to the first pair. Into the side of the separator  $q$  leads the pipe  $e$ , which connects with the expansion-coils. The liquid can only pass the opening of the first cone, then the space between its inner side and the second cone, and so on, till it enters in the pipe  $e$  and comes to the expansion-coils. This fluid expands now because of the continual rarefaction of the vapor in  $q$  and  $a$  accompanying the backward movement of the piston  $b$ , and it is cooled thereby more and more. When the pressure in the cylinder  $a$  becomes equal to that of the vapor in the expansion-coils and when it is then diminished further, the valve  $a^2$  is opened and remains so and vapor

streams from the expansion-coils through the pipe *c* and valve *a'* into the cylinder *a*, causing now refrigeration as well as expansion in the expansion-coils. By the advancement of the piston the vapor in *a* is compressed, and  
5 by the greater pressure thereby produced in *a* and by the impulse of the vapor streaming in the separator the valve *r* is closed. When the piston now advances farther, the pressure  
10 becomes greater and greater, till it can open the valve *a''*, through which the vapor then streams along pipe *d* to the condenser.

By this application of the separator *g* the liquid coming into the expansion-coils is  
15 cooled before its final expansion in the expansion-coils, and by the expansion of a portion in the cylinder power is gained, because the force necessary to repel the piston is diminished through it.

20 Fig. 2 shows a construction where the valve-rod *g* projects from the same end of the cylinder as the piston-rod and the modification necessary in the position of the valves. The working is, however, exactly the same as in  
25 Fig. 1.

I do not claim the specific construction shown in Figs. 1 or 2, as I may reserve to myself the right of placing the arrangement constituting my invention in any position with  
30 regard to the cylinder which any peculiar or

particular circumstances in the construction of the refrigerator in question may demand.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

35 In refrigerating-machines, the combination of a chamber *s* upon the compression-cylinder having pipe connections *e f* leading to the expansion-coils and to the condenser and having valve *r* communicating with the compression-cylinder, and a positively-operated  
40 valve *g* for closing the inlet from condenser, with a separator *g*, containing cones and infundibuliform parts or the like, said parts preventing the medium in chamber *s* from  
45 entering the compression-cylinder, whereby a portion of the refrigerating medium may expand within the separator and into the compression-cylinder so as to cool the refrigerating medium on its passage to the expansion-coils and also assist in driving the piston  
50 of the pump.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

PAUL BECK.

Witnesses:

RICHARD VAUNDORF,  
OTTO FRANCKE.