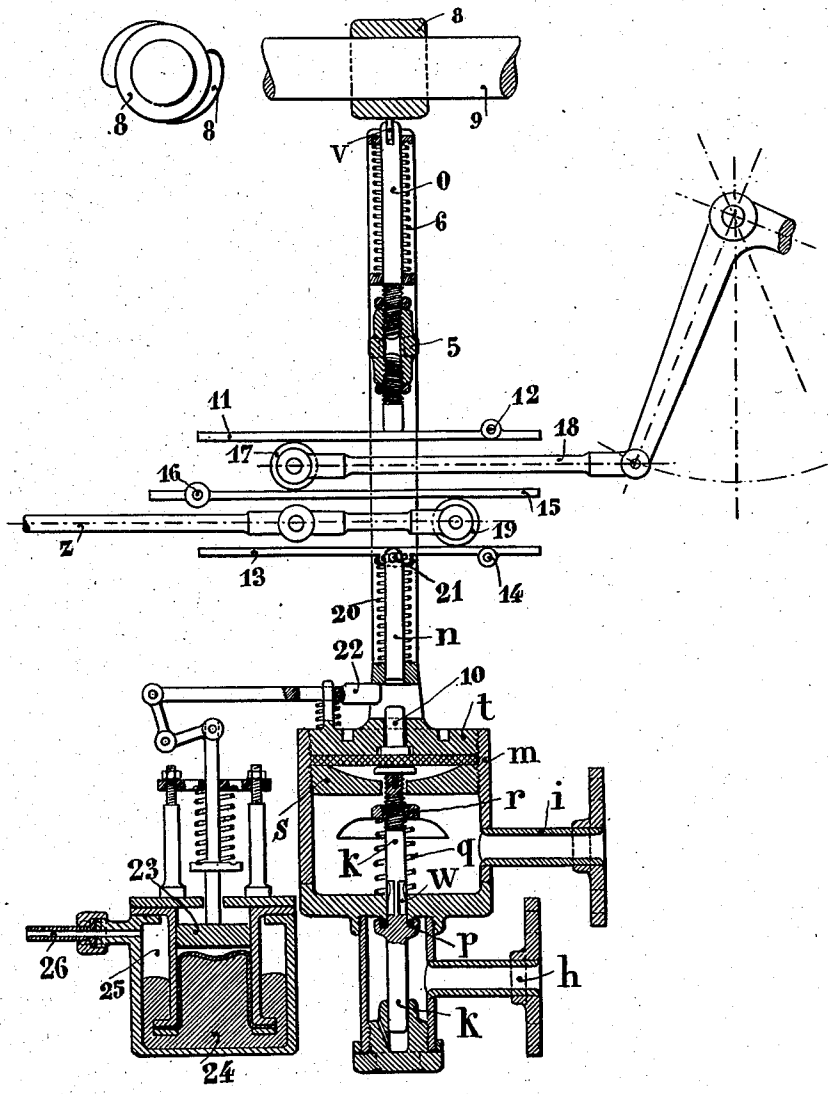
No. 893,176. PATENTED JULY 14, 1908.

O. E. LEVILLY.

EXPANSION REGULATOR FOR REFRIGERATING MACHINES.

APPLICATION FILED APR. 15, 1907.

Fig. 2. *Fig. 1.*



Witnesses

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OLIVIER EMILE LEVILLY, OF PARIS, FRANCE.

EXPANSION-REGULATOR FOR REFRIGERATING-MACHINES.

No. 893,176. Specification of Letters Patent. Patented July 14, 1908.

Application filed April 15, 1907. Serial No. 368,349.

To all whom it may concern:

Be it known that I, OLIVIER EMILE LEVILLY, citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Expansion-Regulators for Refrigerating-Machines, of which the following is a specification.

This invention relates to an expansion regulator for refrigerating machines, the construction of which is improved in such a manner that the apparatus works without successive shocks and vibrations and further that its action is made dependent—in a certain measure—on the pressure which exists in the circulatory system for the volatile liquid.

In the accompanying drawings the improved apparatus is shown in Figure 1 partly in section. Fig. 2 shows in end elevation the shaft and cam for the normal operation of the valve for the inlet of the volatile liquid.

The liquefied gas on its way from the reservoir to the expansion-radiator, (which are both not shown in the drawings,) passes through the valve chamber *m*, which is connected with the reservoir through the coupling *h* and with the expansion-radiator through the coupling *i*. The valve consists of a valve rod *k* provided with orifices *w*. The valve is kept closed through spiral spring *q*. The valve is operated from the compressor through a shaft 9 with cam 8. Said cam 8 consists of a disk with two eccentric projections and imparts one motion to the valve-rod at each half revolution of the shaft.

The valve rod is made in four parts, the bottom-part *k*, with the orifices *w* for the passage of the volatile liquid, the top part *o* which has a roller *v* at its upper end upon which the cam 8, acts, said roller being kept in contact with cam 8 through the spiral spring 6; the part *n* which receives the motion of the part *o* and a supplementary part 10 which serves for transmitting the motion of part *n* to part *k*. Between the parts *o* and *n* of the valve rod the regulating device is inserted which forms the object of the present invention and which is influenced on the one hand from the centrifugal regulator of the compressor and on the other hand from the thermometer indicating the temperature of the cooling room. The regulating device consists of three horizontal bars 11, 13 and 15, which are movably mounted each on a pivot 12, 14 and 16 respectively. The pivots 12 and 14 of the upper and lower bars 11 and 13 are arranged near the right hand end of said bars, while the pivot 16 of the middle bar 15 is arranged near the left hand end of said bar; a roller 17 is placed between bars 11 and 15 which by means of a rod 18 and of a suitable lever system is connected with the centrifugal regulator of the compressor, which is not shown in the drawings. A roller 19 is placed between the bars 15 and 13 which is operated from rod Z of the thermometer. A spring 20 below bar 13 maintains the bars in good contact with the rollers and presses the bar 11 against the lower end of the part *o* of the valve-rod. The part *n* of the valve-rod is hinged to the bar 13 through an axle 21.

The part *n* of the valve-rod must obviously make the same motions as part *o* with the difference however that the amplitude of the displacements of part *n* is variable and depends, on the one hand, on the position of roller 17 and consequently on the varying speed of the compressor, and, on the other hand, on the position of roller 19 and consequently on the temperature of the room to be cooled. The amplitude of the displacement of part *n* will be the greater, the nearer to pivot 16 is the roller 17 and the nearer to pivot 14 is the roller 19, and the position of the two rollers, which are entirely independent the one from the other, determines the amplitude of the displacement of part *n* and consequently the degree of opening of the valve which establishes the communication between the couplings *h* and *i*. For some reason it may however happen that there is nevertheless an excess of liquefied gas contained in the expander. In this case the supply of fluid to the expander must be absolutely and securely stopped and with this object in view the lower part 10 of the part *n* of the valve-rod is separated into two parts and a sliding bar 22 is interposed between 10 and *n*, and acted upon by piston 23 which is operated through mercury. The mercury 24 which is contained in the annular space 25 of the piston cylinder is exposed to the pressure existing in the expander with which the cylinder is connected through channel 26.

To prevent leakage the mercury is inclosed in an india-rubber bag which is pressed against the walls of the cylinder when the pressure exerted upon the mercury

increases; thus tearing of the india-rubber bag is prevented.

As long as the pressure in the expander is normal, the piston 23 will remain in its lowest position but it will rise as soon as the pressure increases abnormally and through the upward motion of the piston the sliding-bar 22 will be displaced to the left, whence it follows that part *n* does not come in contact with part 10 and the inlet valve *p* remains on its seat and is not influenced by the motion of rod *o* and rollers 17 and 19 until the normal pressure is reëstablished in the expander.

As the pressure in the expander assists in regulating the opening of the inlet-valve for the admission of the ammonia to the apparatus it would not be absolutely necessary to use the speed of the compressor for the regulating of the valve because the pressure of the ammonia itself is regulated by the speed of the compressor.

What I claim is:—

1. In an expansion regulator the combination of an ordinary cam with two projections with the valve-rod made of an upper and of a lower part and of three parallel oscillating bars interposed between the upper and the lower parts of the valve-rod, of a roller between the upper and the middle bar, said roller being connected with the centrifugal regulator of the compressor, and of a roller between the middle bar and the lower bar, said roller being connected with a thermometer in the cooling room, substantially as described and shown and for the purpose set forth.

2. In an expansion regulator for refrigerating machines the combination of the valve-rod consisting of four separate parts with a sliding bar interposed between the upper two parts and the lower two parts of the valve-rod and a piston connected with said sliding bar, mercury in the cylinder of the said piston and a channel connecting the mercury chamber with the expander for disconnecting the two parts of the valve-rod when an over-pressure occurs in the expander, substantially as described and shown and for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

OLIVIER EMILE LEVILLY.

Witnesses:
H. C. Coxe,
Alfred Frey.