

F. WINDHAUSEN.

Improvement in Valves for Ice Machines.

No. 125,371.

Patented April 2, 1872.

Fig. 1.

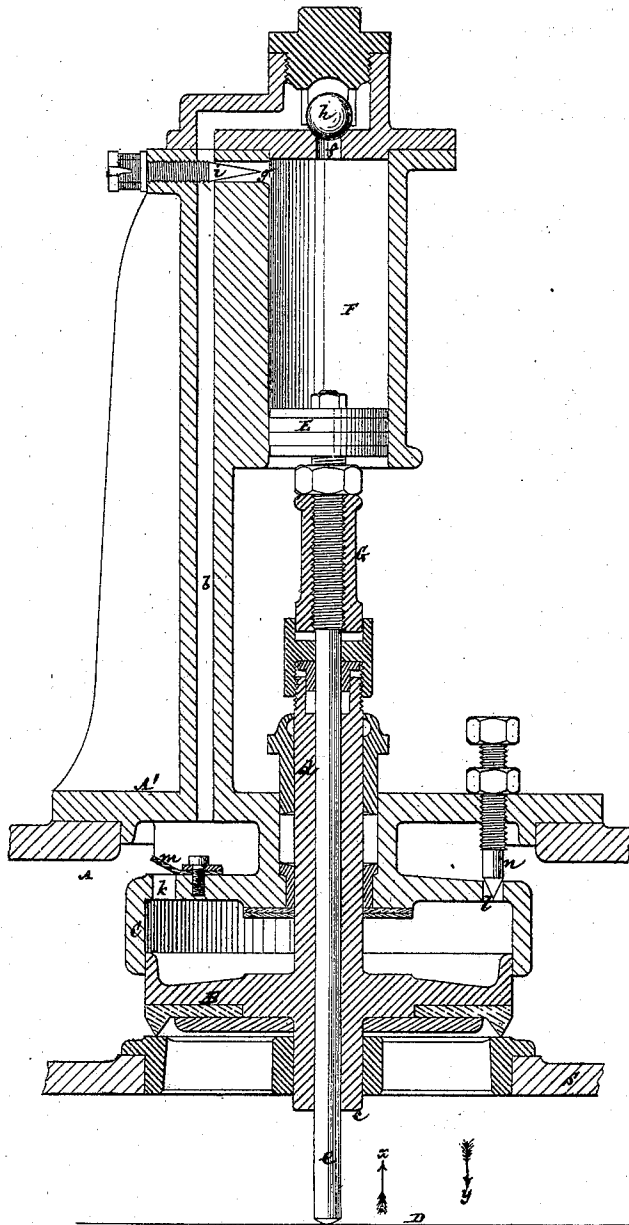
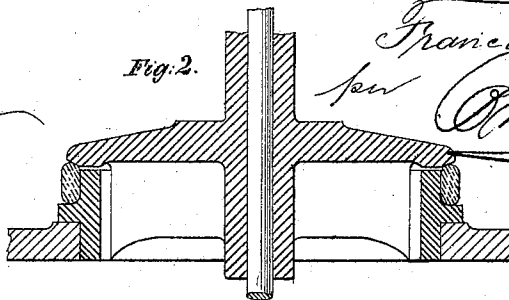


Fig. 2.



Witnesses:

Geo. Hays
R. R. Allen

Francis Windhausen
per *Chas. Combs*
Attorney

UNITED STATES PATENT OFFICE.

FRANZ WINDHAUSEN, OF BRUNSWICK, GERMANY.

IMPROVEMENT IN VALVES FOR ICE-MACHINES.

Specification forming part of Letters Patent No. 125,371, dated April 2, 1872.

To all whom it may concern:

Be it known that I, FRANZ WINDHAUSEN, of Brunswick, Germany, have invented a new and useful Improvement in Valves for Ice-Making Machines and other purposes; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a sectional view of my improved valve taken in direction of the length of its axis, and Fig. 2 a view of a modified construction of the valve proper pertaining to the device.

While this invention is applicable to various purposes, including the letting on of steam by the direct action of the piston of an engine, to work expansively in the cylinder of the latter, and the quantity so admitted may be regulated automatically by the governor of the engine, it will suffice here to describe it as designed for attachment to an ice-making or freezing machine, in which atmospheric air is compressed, then passed through a cooler, and afterward expanded again to remove the heat; or, in other words, to produce cold.

I propose to apply my improved valve to the ice-making machine patented to me March 22, 1870, in place of the valve or valves and pertaining devices there used, for controlling the admission of air to be expanded and compressed in the double-acting cylinder preferably used for such purpose.

The invention consists in a valve of novel construction, operated by the direct action of the piston in said cylinder as it approaches and reaches the one end of its stroke; and being composed, in part, of an air-compressing piston and cylinder for controlling the motion of the valve proper, and for insuring a proper supply of air to the working-cylinder of the apparatus. By this improvement I am enabled to regulate with greater nicety the admission of the air, and to economize the working power; also to obtain a more perfect refrigerating action.

Referring to Figure 1 of the drawing, A represents the valve-chest, designed to be arranged at the end of the double-acting cylinder through which the air is admitted; and B, the valve proper, by which the air to be expanded and

compressed is admitted. S is the cylinder-cover, and D represents the face of the piston which acts upon the valve. Said valve proper B is of a piston construction, working within the open end of a cylinder, C, formed at the inner end of the valve-chest cover A', which latter is extended backward and made hollow, as by a duct, *b*, so as to form part of the chest. Such valve or valve proper B is provided with a projection, *c*, in front, arranged, when the valve is shut, to enter within the working-cylinder, and so that it is struck by the face D of the piston as the latter reaches the end of its stroke, thereby opening the valve. The latter is furthermore provided, at its back, with a tubular extension or stem, *d*, which passes out in a close-fitting manner, by the aid of stuffing-boxes, through the cylinder C and valve-chest. Through this tubular stem *d*, valve B, and front projection *c*, is fitted a free rod, *e*, arranged to enter within the working-cylinder beyond the projection *c*, and the outer end of which is connected with a small piston, E, that works in a cylinder, F. This cylinder may be cast in one and the same piece with the valve-chest. The duct or opening *f* is closed in an automatic manner by a valve, *h*, while the duct *g* is more or less closed, when the apparatus is at work, by a hand-valve, *i*, or valve under the control of a governor when the improvement is applied to an engine. The cylinder C is in communication with the valve-chest by openings *k* and *l*, the one, *k*, of which is automatically closed at intervals by a valve, *m*, while the other opening, *l*, is more or less closed, as required, by a hand-valve, *n*.

Supposing the piston of the double-acting cylinder to be traveling in direction of the arrow *x*—that is, toward the rod *e*—its face D, toward the close of the stroke, will first strike said rod and push it, together with its piston E, backward, compressing the air in the cylinder F, lifting the valve *h*, and, by the ducts *f*, *g*, and *b*, charging the valve-chest; and, by the opening *l* in the cylinder C, acting upon the valve B to keep it closed. Toward the end of the working-piston's stroke, however, in the same direction, the face D thereof strikes the projection and slightly opens the valve proper B, and the compressed air in the valve-chest enters past the valve B to fill the space between the working-piston and the cylinder-

cover S with air of the same pressure as was delivered to the valve-chest by the piston E, thus filling what otherwise would be lost space. The valve B then becomes self-acting, and further opens under an excess of pressure on its inner side, due to the exposure of the projection *c* to the compressed air in the main cylinder and relief of the outer end of the stem *d* from a like exposure or pressure, the valve *m* opening as the valve B is thus lifted. Upon the main or working-piston of the apparatus making its return stroke—that is, in direction of the arrow *y*—the piston E and rod *e* follow up such motion till the nut G is arrested by the stem *d* or socket fitted thereon, after which the valve B shuts. In this way, or by these means, the working-cylinder of the apparatus is charged with air of full pressure to the extent or depth of the entry of the rod *e* therein. By appropriately setting the valves *i* and *n* the motion of the piston E may be retarded, or otherwise have its velocity controlled and thus the filling of the working-cylinder be increased or varied. This change in the filling of said cylinder may also be effected by appropriately adjusting the nut G. The expanded air is exhausted from the double-acting cylinder of the apparatus by a separate valve, having a suitable or positive motion, which it is not necessary here to describe.

In Fig. 1 of the drawing the valve B is supposed to be faced with soft copper, and of a sharp or inverted V-shape where it rests upon its seat, which construction answers in ice ma-

chines in which the temperature averages about 60° below zero, or thereabout; but for machines in which a higher pressure is used, and the temperature is different, I prefer the construction of valve represented in Fig. 2, in which the valve in closing first strikes upon a ring of gutta percha or other suitable yielding material secured to the seat, and, under a high pressure, comes to a bearing on its seat before the gutta percha or rubber is fatigued or compressed to its limit of elasticity. By this construction, hammering or slamming of the valve is prevented, and a close or tight fit is obtained.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The combination of the valve B, formed with a tubular projection, *c*, and stem *d*, the cylinder C, having a valve, *m*, the valve-chest A and its cover A', the rod *e*, with its piston E, and the cylinder F, provided with a valve, *h*, and in communication by a duct, *b*, with the valve-chest, substantially as described.

2. The combination of the regulating-nut G, with the rod *e*, the valve-stem *d*, and piston E of the cylinder F, essentially as specified.

3. The combination of the regulating-valves *i* and *n*, or either, with the elements recited in the first clause of the claim.

FRANZ WINDHAUSEN.

Witnesses:

A. HILLEBRAND,
W. DETOR.