

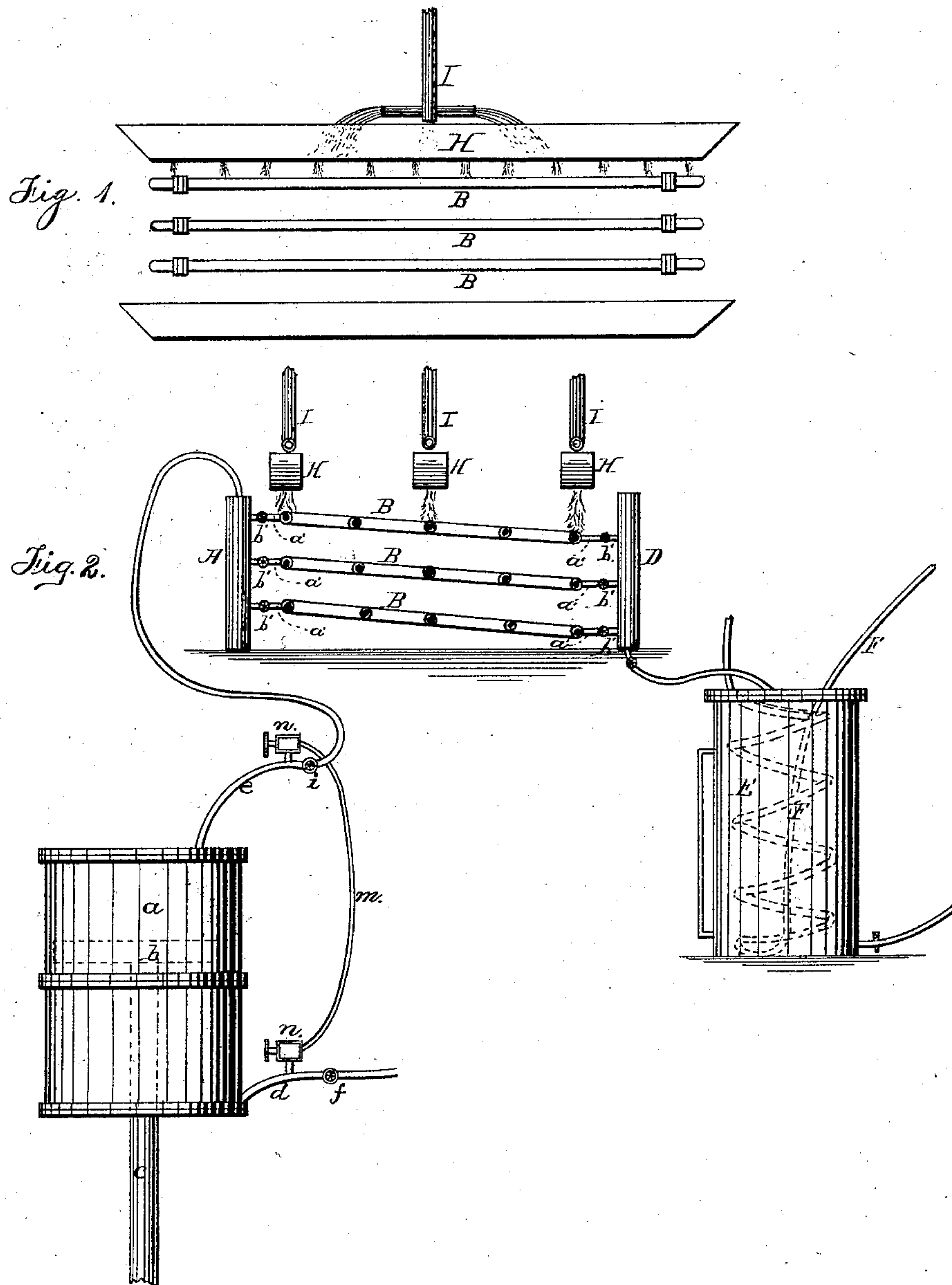
(No Model.)

W. B. BUSHNELL.

ICE MACHINE.

No. 285,460.

Patented Sept. 25, 1883.



Witnesses;  
Chas. O. Hill  
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By his Attorney,  
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# UNITED STATES PATENT OFFICE.

WILLIAM B. BUSHNELL, OF CHICAGO, ILLINOIS.

## ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 285,460, dated September 25, 1883.

Application filed August 19, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM B. BUSHNELL, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Ice-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to an improvement in ice-machines; and it consists, first, in a condenser of improved construction; second, in an attachment for the air or gas pump; and, third, in a novel liquid-receiver.

The object of the first and third parts of my invention is to provide an effective means for liquefying and cooling the ammoniacal gas with a minimum quantity of water, and that of the second part is to supply an attachment by means of which upon starting the engine the gas or air which may have passed back into the cylinder may be made to exert an equal pressure on each side of the piston-head, whereby the engine may be started without loss of time or the necessity of undue effort.

The exact nature and construction of the invention will be understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the condenser, and Fig. 2 is an end view of the condenser in connection with side elevations of the pump or engine and liquid-receiver.

Referring to Figs. 1 and 2, which illustrate the first part of my invention, A denotes the manifold supply leading to a series of condensing-pipes, B. The condensing-pipes B may be of any suitable number and size, and will be arranged on an incline, as indicated, their highest point being immediately adjacent to the manifold supply A, from which the pipes will gradually incline on parallel planes. Each layer of pipes B will be independent of the rest of the series, and the sections thereof will be connected to the manifold supply and the delivery by joint-pipes *a'*, supplied with valves *b'*, by means of which joint pipes and valves any one or more of the sec-

tions B may be removed or their operation suspended without interfering with the remaining sections. On the side opposite to the manifold supply A will be provided a manifold delivery, D, whereby the ammoniacal or other gas which enters the series of pipes B from the manifold supply A will pass through the sections of each separate layer of pipes and find an outlet in the manifold delivery D, which will be in communication with a suitable liquid-receiver, E, wherein is arranged a cooling-coil, F, to assist in the effectuation of the objects of the invention. Above each section of the series of pipes B is arranged a pan or receptacle, H, having a perforated bottom and arranged to receive a liquid-cooling agent from the supply-pipes I. The pans H will be equal to the length of the sections B, and will be of only sufficient width to permit the cooling agent to pass through its perforated bottom on the section above which it is placed. The supply-pipes I will pass from any suitable pump or receptacle containing the cooling agent, whereby a continuous stream may be caused to flow into the pans H, and issue thence through their perforated bottoms upon each section of the upper series of pipes, B. The flowing of the cooling agent upon each separate section of the inclined pipes B operates to lower their temperature and to cool and condense the gas which is passing through them. The particular arrangement of the pans H and the inclined pipes B insures the effectual cooling of the pipes and of the liquefaction of the gas. The liquid-receiver E will be of usual construction, the only novel feature being the addition of the cooling-coil F or other device which will assist in cooling the receiver. In lieu of the coil F, a cold-water jacket may be placed about the receiver or a hollow lining provided. Any means which will permit the circulation of a cooling agent to lower the temperature of the receiver or its contents may be employed with satisfactory results, the object being to secure the greatest possible amount of condensation before the liquid leaves the receiver, whereby the liquid is caused to perform an increased amount of work when it enters the pipes. Thus I am able to secure a given result by the employment of less liquid than has heretofore been



used for the same purpose, and other incidental advantages are derived which will be readily appreciated by persons skilled in the art to which the invention pertains. I have  
 5 found it very advantageous to connect one end of the coil F with the evaporator-coils of the ice-machine, and the other end of the coil F with the pump, and by this means employ the expanded gas after it has passed out of  
 10 the evaporator-coils for the purpose of lowering the temperature of the liquid-receiver E and its contents.

The second part of the invention is illustrated in Fig. 2, in which *a* indicates the cylinder; *b*, the piston-head; *c*, the piston-rod; *d*, the supply-pipe leading to the lower side of the piston, and *e* the delivery-pipe passing from the cylinder above the piston, the supply-pipe being provided with a valve, *f*, and  
 20 the delivery-pipe with a valve, *i*. My improved attachment to this engine or pump consists of the by-pass pipe *m*, provided at one or both ends with valves *n*, and connected with the supply and delivery pipes *d* *e* between  
 25 the valves *f* *i* and the cylinder. It is frequently the case in the employment of engines of this class that after the work has ceased the gas will leak back through the valve *i* in the delivery-pipe *e*, and by expansion produce  
 30 pressure at the upper side of the piston-head *b*; and in this event when it is desired to start the engine the pressure forms a serious obstruction to the movement of the piston, and by the removal of this pressure the engine can  
 35 more readily be put in operation. It is plain that if only one valve, *n*, is employed the passage of the gas to each end of the piston may be accomplished; but I prefer to employ both valves, since by their use I can keep the by-

pass pipe empty, except when it is called into use.

By my invention I produce a means of readily getting rid of the pressure formed as aforesaid above the piston-head, and I accomplish it by simply opening the valves *n*, which will  
 45 permit the gas to pass to the lower side of the piston-head, whereby an equality of pressure on each side thereof is produced, and the engine may be easily started.

The attachments for ice-machines above described are so simple that a further description will be unnecessary.

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

1. In combination with an air or gas compressing pump, a by-pass pipe provided with one or more valves, *n*, and forming a means of communication at will between the upper and lower side of the pump-piston head, substantially as set forth.

2. In an ice-machine, a receiver for the liquefied ammonia as it runs from the condenser, supplied with a means for permitting the circulation of a cooling agent to lower the temperature of the liquid while within the receiver,  
 65 substantially as set forth.

3. In an ice-machine, the receiver for the liquefied ammonia as it passes from the condenser, provided with a coil in which a cooling agent may be circulated to lower the temperature of the liquid, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM B. BUSHNELL.

Witnesses:

CHAS. C. GILL,  
 HERMAN GUSTOW.