(No Model.) 2 Sheets—Sheet 1.

W. M. WOOD & W. L. BAILIE.

COMPRESSING ENGINE OR PUMP.

No. 278,068. Patented May 22, 1883.

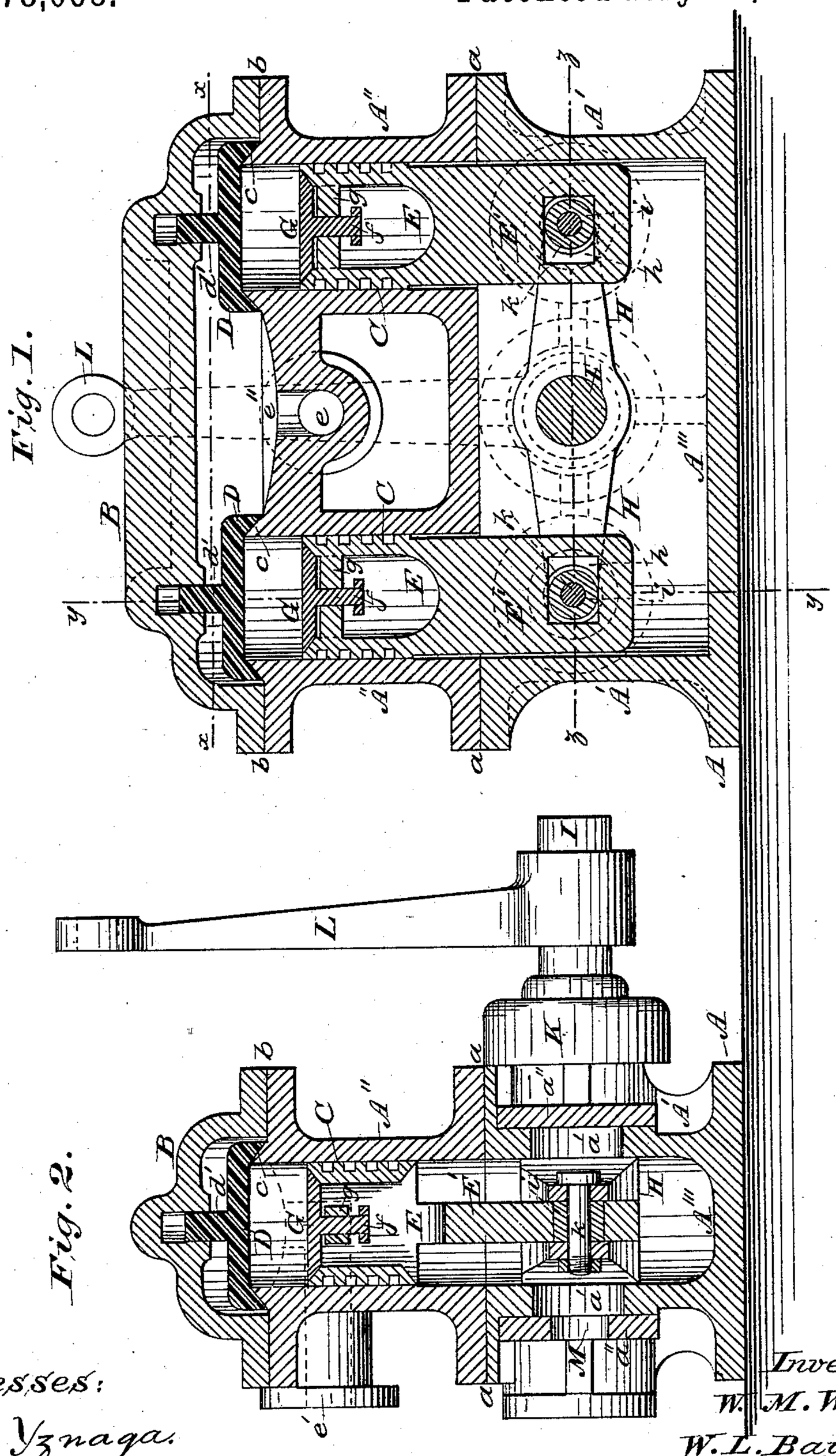

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Fig. 3.

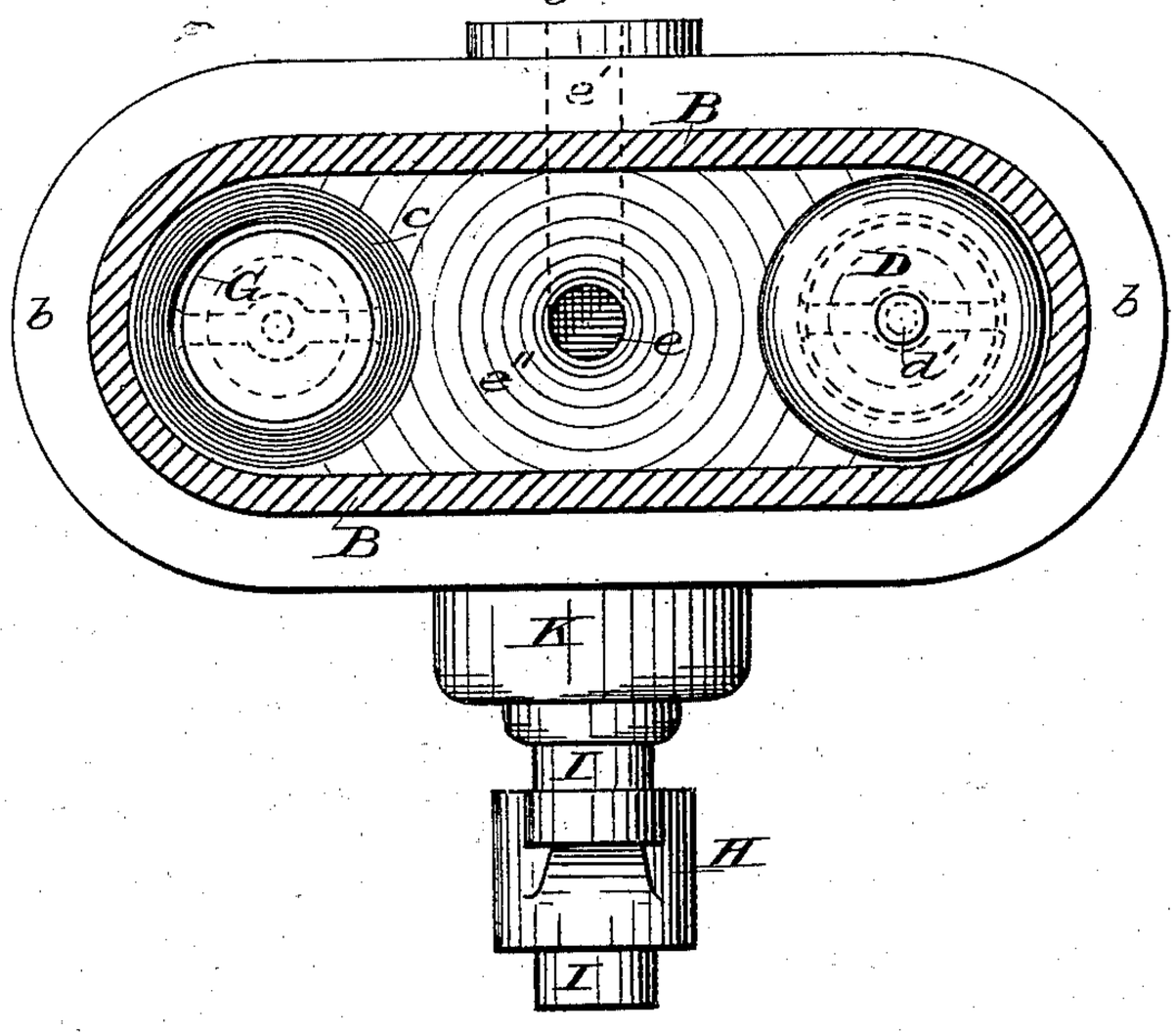
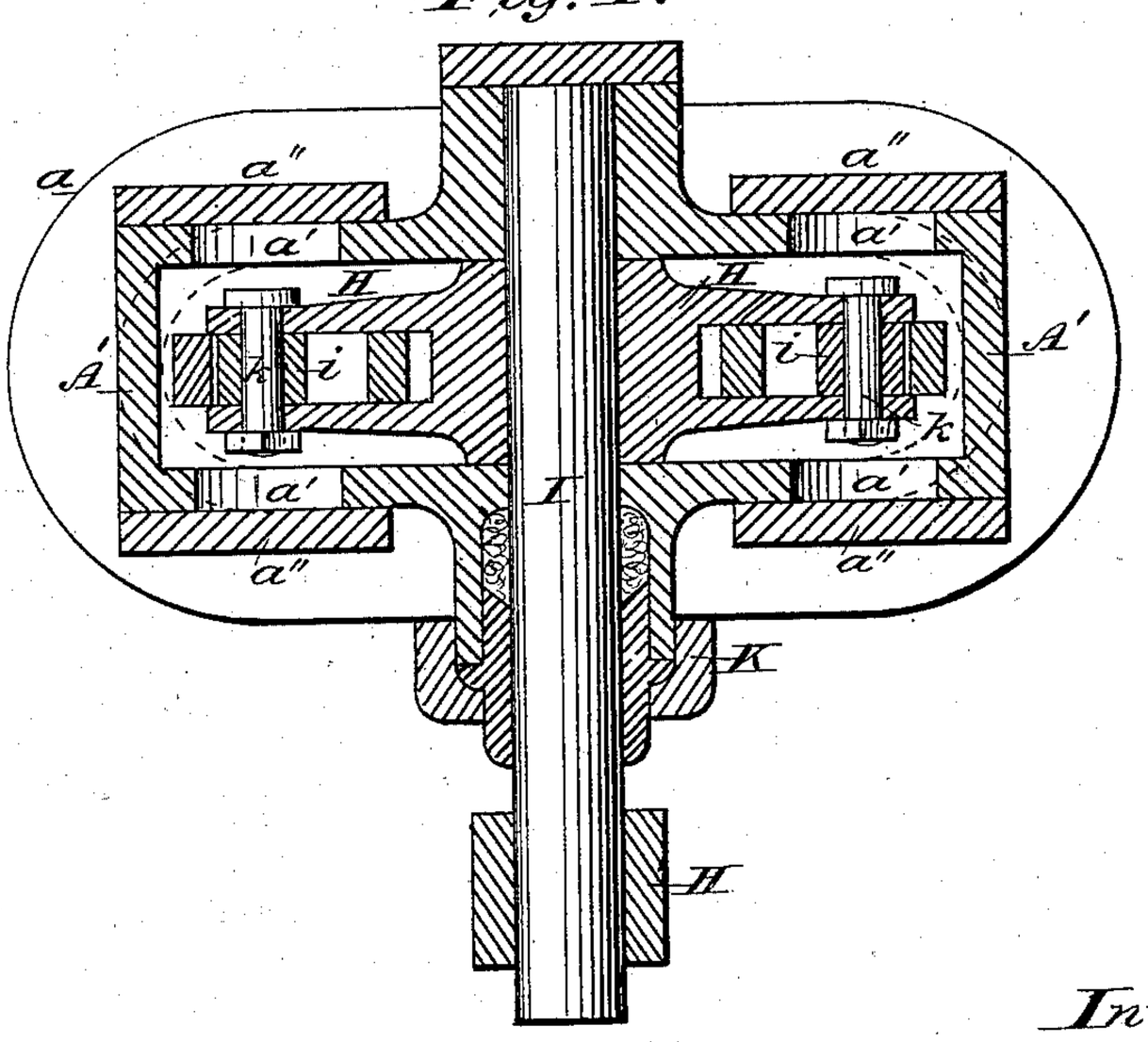


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM M. WOOD AND WILLIAM L. BAILIE, OF THE UNITED STATES NAVY.

COMPRESSING ENGINE OR PUMP.

SPECIFICATION forming part of Letters Patent No. 278,068, dated May 22, 1883.

Application filed March 9, 1883. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM M. WOOD and WILLIAM L. BAILIE, both of the United States Navy, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Compressing Engines or Pumps; and we 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.

Our invention relates to improvements in compressing engines or pumps, more especially those adapted for refrigerating-machines, although useful for other purposes.

The object of the invention is an improvement in pumps employed in forcing by mechanical means a circulation of volatile refrigerants, especially ammoniacal gas, into machines intended for the manufacture of ice, and for other refrigerating or cooling purposes, and thereby aiding in subsequent liquefaction of said gases; and our apparatus is so constructed as to avoid the defects and inconveniences now found objectionable in such pumps. Among some of these defects which we wish to overcome may be named the liability of leakage of gas, the introduction of air and water into the pump, the inability of the pump to force out all the gas at every stroke of the pistons, and liability of the pump to heat in use, all of which arise from a faulty construction and arrangement of the pump, its valves and valve-seats, and its packing.

Our invention consists, mainly, in the construction and arrangement of the valves and seats; in the peculiar construction of the pistons and the operating devices, and in inclosing them in a perfectly air-tight manner; in the means employed to relieve the pump of any condensed or liquefied gases, and in certain details of construction, as will be more fully described hereinafter, and specifically pointed out in the claims, reference being had to the accompanying drawings and the letters of reference marked thereon.

Referring to the drawings, Figure 1 is a longitudinal vertical section of our improved pump. Fig. 2 is a vertical cross-section on line *y y*. Fig. 3 is a horizontal section on line *x x*. Fig. 4 is a horizontal section on line *z z*.

Like letters denote corresponding parts in each figure.

In the drawings, A represents the main casting, containing the pump-cylinders C C; and it is cast in two parts, A′ and A″, and is closed by a cover or bonnet, B, and these are provided with flanges *a b*, between which suitable packing is placed to form perfectly-tight joints. At the upper end of the cylinders are arranged the valve-seats *c c*, which are annular and inclined outwardly, and the outlet-valves D D are made to conform and fit perfectly to the said seats, so that in the ascent of the pistons any liquefied or condensed gases will flow down over the seats and toward the central vertical outlet, *e*, which is formed in the center of the dished part, *e″*, of the upper part, A″, so that the liquefied gases will all pass toward the said center. An opening, *e′*, extending sidewise from the opening connects with a suitable pipe to the condenser. The valves D are guided at their upper sides by stems *d′*, which fit into a recess or hole in the bonnet B. The pistons E are properly packed with a series of rings, and in the upper end thereof are arranged the inlet-valves G, which are guided to their seats by suitable stems, *f*, and guides *g*. The lower part, E′, of the pistons is made flat or oblong, and, extending downward, is connected to the ends of a vibrating lever, H, which is secured to the central shaft, I. The lever H vibrates in an air-tight space, A‴, formed in the lower part, A′. The lower ends of the pistons are provided with an oblong slot, *h*, in which a roller, *i*, on the pin *k*, secured to the lever H, can freely slide, so as to allow for the vibration of the lever, and also to prevent excessive wear. The end of the shaft I extends through the side of the lower part, A′, and, passing through a stuffing-box, K, is by it made perfectly tight. At each side of the part A′ is arranged a hole, *a′*, which is covered by a bonnet, *a″*, to afford access to the pins *k*, connecting the lever and pistons together for adjustment. On the extended end of the shaft is secured an upright lever, L, which is attached by a suitable connecting-rod or pitman to the engine or other motive power.

The inlet-opening M is arranged in the central part of the space A''' and connects with the congealer.

The operation is as follows: The alternate upward stroke of the pistons E creates a vacuum behind them, which draws in the gas through the inlet-pipe M, connecting with the congealer, (not shown,) and on the alternate descent of the pistons the inlet-valves G are opened and allow the gas to pass up above them. The pistons, in ascending, force the gas upward and open the outlet-valves D as they come in contact with them, and, passing out with any condensed gas, it runs over the inclined valve-seat *c*, down the dished part *e''*, and through the outlet-openings *e* and *e'* into the pipe leading to the condenser, (not shown,) which may be a coil of pipe immersed in running water, or any other kind suitable for the purpose, and there the absorbed heat is made sensible. By the action of the pistons on the gas it is carried off, and under the forced pressure of the pump and in contact with the cooling-surface of the condenser the gas is liquefied. It is then carried to the receiver, (not shown,) and from thence it is conducted to the congealer, where the main effect of refrigeration through evaporization is to be produced.

When the receiver is not in use the anhydrous ammonia can be allowed to escape into a receiver provided with a coil in connection with a steam-boiler, and which is filled with water, converting the anhydrous into the aqua ammonia.

The advantages of our pump will be apparent to those skilled in the art, and some of them are: Great economy in space. There is no possible chance for leakage, as there are no joints which cannot be thoroughly packed. The parts are not liable to get out of order, as they are very simple in construction. There is no possible chance of any condensed or liquefied gas running back, as the pistons raise the outlet-valves and permit the said gas to pass over the edge and down the sides of the valve-seats. All the internal parts are easily accessible in case of needed repairs or replacement of any parts. There is comparatively little loss by friction, and consequently no loss of power. All the parts are incased in a perfectly-tight casing, and the most exposed part, where the driving-shaft enters the pump, is subjected to the low exhausted pressure of the gas, which can easily be made tight by an ordinary stuffing-box, as described.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a pump, the annular valve-seats *c*, having outwardly-inclined faces, combined with the automatic valves D, having faces conforming thereto, and the pistons whereby the valves are operated, substantially as and for the purpose specified.

2. In a pump, the annular inclined valve-seats *c* and automatically-operating valves, in combination with dished part *e''*, provided with openings *e* and *e'*, arranged substantially as and for the purpose set forth.

3. The combination of the lower part, A', forming a space, A''', in which the vibrating lever H operates, with the upper part, A'', containing the pump-cylinders, and the bonnet B, all arranged substantially as shown and described.

4. In combination, the automatic outlet-valves D and the pistons E, provided with inlet-valves G, and said pistons having extension E', provided with slots *h*, in which the pins *k*, having friction-rollers *i*, are arranged for operating the vibrating lever H, all as shown and specified.

5. The combination of the pistons E, provided with inlet-valves G, with the automatic outlet-valves D, provided with annular inclined faces and the annular inclined seats *c*, all arranged for operation substantially as specified.

6. In a pump, the lower casting, A', formed with the space A''', and provided with hand-holes *a'* and bonnets *a''* for gaining access to said space, substantially as set forth.

7. The pump-casing A, made in two parts and containing the pump-cylinders, the bonnet B, the pistons E, provided with inlet-valves G, the automatic valves D, having annular inclined faces fitting on the seats *c*, and the vibrating lever H, connected to said pistons and secured to the shaft I, in combination with the operating-lever L, all constructed substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM M. WOOD.
WILLIAM L. BAILIE.

Witnesses:
J. M. YZNAGA,
W. B. HALE.