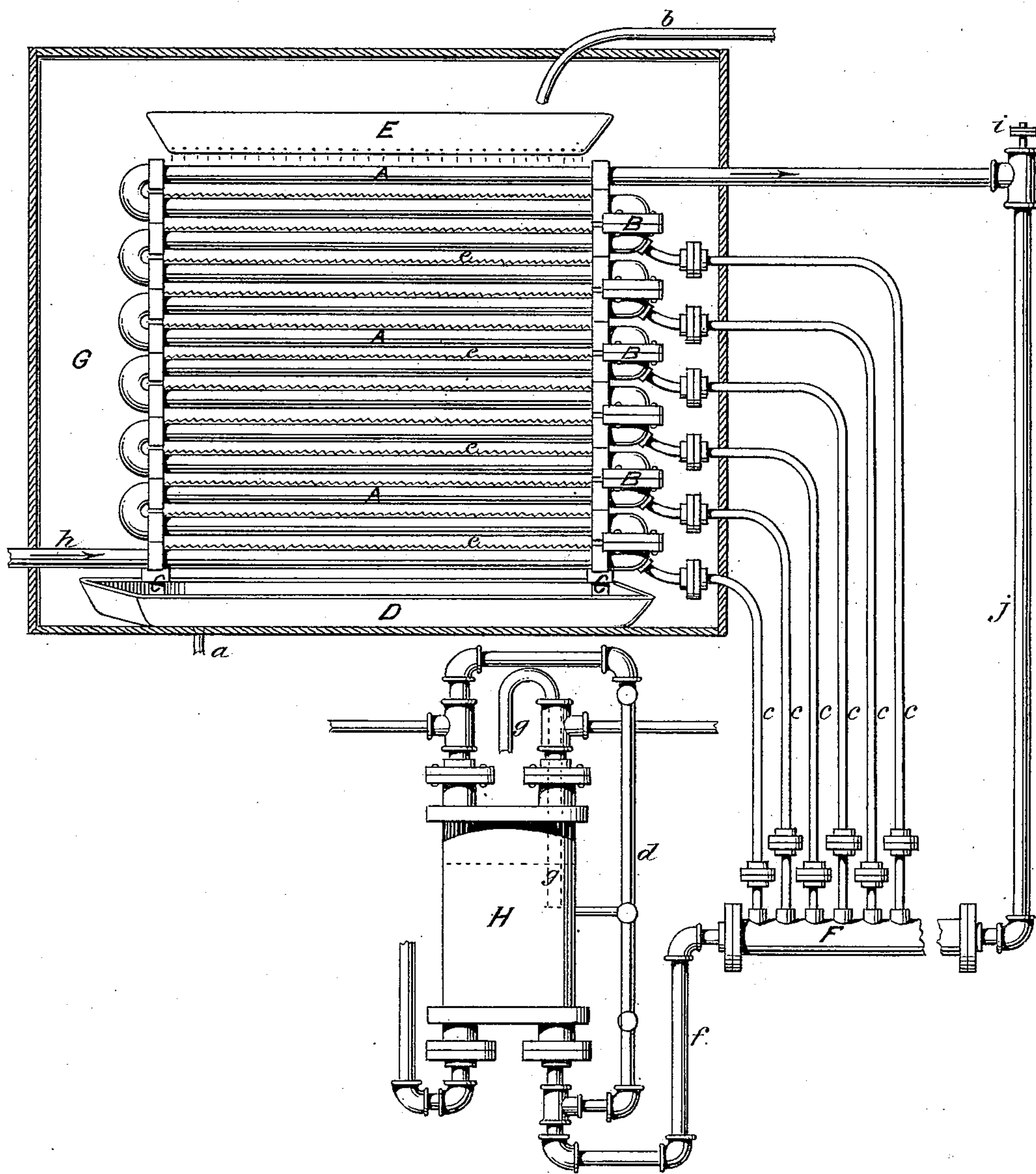


(No Model.)
J. C. DE LA VERGNE & W. M. MIXER.

APPARATUS FOR CONDENSING GASES OR VAPORS.

No. 275,367.

Patented Apr. 10, 1883.



Witnesses :

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UNITED STATES PATENT OFFICE.

JOHN C. DE LA VERGNE AND WILLIAM M. MIXER, OF NEW YORK, N. Y.,
ASSIGNORS TO THE DE LA VERGNE & MIXER REFRIGERATING COM-
PANY, OF SAME PLACE.

APPARATUS FOR CONDENSING GASES OR VAPORS.

SPECIFICATION forming part of Letters Patent No. 275,367, dated April 10, 1883.

Application filed January 11, 1882. (No model.)

To all whom it may concern:

Be it known that we, JOHN C. DE LA VERGNE and WILLIAM M. MIXER, citizens of the city, county, and State of New York, have invented
5 certain new and useful Improvements in Condensers for Condensing Gases or Vapors, and the method of condensing or liquefying gas or vapor under reduced working pressures, which are fully set forth in the accompanying speci-
10 fication and drawing.

The object of this invention is to condense or liquefy gases or vapors under reduced working pressures; to have the condensing-pipes exposed or accessible, and consequently more
15 readily cleaned and repaired; to dispense with the tank for holding water, usually used with condensers of this kind, as well as the great weight of water inclosed in such tanks; to economize in the quantity of water used by
20 bringing it all in direct contact with the tubes or pipes through which the gas or vapor to be condensed or liquefied passes; and to this end the invention consists of the method of liquefying gas or vapor under reduced working
25 pressures, which method consists, first, of the combination of a coil of pipes in a condenser placed in line vertically with one or more liquid traps, connecting-pipes, and a means of sprinkling or showering water upon the surface of
30 said pipes, as will hereinafter appear; second, of the combination of a coil of pipes in a condenser placed in line vertically when inclosed to protect them from a current of air or in an insulated chamber with one or more liquid-
35 traps, connecting-pipes, and a means of sprinkling or showering water upon the surface of said pipes, as will hereinafter appear; third, of the combination of a coil of pipes in a condenser placed in line vertically with a means
40 of sprinkling or showering water upon the surface of said pipes, one or more liquid traps, a tank or reservoir for the storage of the liquefied gas, and connecting-pipes, as will hereinafter appear; fourth, of the combination of a
45 coil of pipes in a condenser placed in line vertically with a means of sprinkling or showering water upon the surface of said pipes, one or more liquid traps, and connecting-pipes when arranged in a manner to draw away
50 from the condenser the liquefied from the unliquefied gas during the process of liquefaction,

as will hereinafter appear; fifth, and the invention further consists in the combinations of the several parts of the apparatus, as will hereinafter appear.

Reference being made to the drawing, similar letters represent similar parts.

A A A represent the pipes of the condenser, which are placed in line vertically one above the other, and are connected by flanged elbows
60 B, forming a coil, through which the gas or vapor is forced in an upward direction by means of a compression-pump or other means. The coil rests upon feet C within a large basin or trough, D, which has an outlet or pipe, *a*, for
65 carrying away the water.

E is a V-shaped trough, placed at the top of the condenser, having perforations or holes in its bottom to permit the water used in liquefying the gas to be distributed over the pipes
70 of the condenser.

b is the water-supply pipe.

c c c c are small pipes, which connect with the flanged elbows B by being screwed and soldered therein for the purpose of drawing
75 away from the pipes of the condenser the liquefied gas and preventing its descent through the coil to that portion of the coil containing heated gas. The other end of the pipes *c* are connected with a header, F, into which the
80 liquefied gas empties, and from which it is conveyed by the connecting-pipe *f* into a larger reservoir or tank, H, for storage until required.

d is a pipe connecting the top and bottom of the storage-tank with a gage upon its side,
85 and is used as an equalizing-pressure pipe.

g is a pipe extending downward in the storage-tank H, through which the liquefied gas from H passes to the expanding coils. The header F is placed below the end of the pipe
90 *g* to better insure the formation of a liquid trap and prevent the gas from passing through the smaller pipes *c*, and thus avoid passing through the pipes A of the condenser, except when introduced through the opening *h*.

j is a pipe connecting the upper condensing-pipe, A, with the header or trap F, and is for the same purpose as the pipes *c*.

i is a stop-cock on the pipe *j* to draw off air, should any enter the pipes.

G is the chamber or inclosure, in which the condensing-pipes are placed. The other pipes

shown in the drawings have no connection with the process or mechanical combination, but are pipes used in connection with other parts of a refrigerating-machine. *e e e* are serrated strips of metal, which are connected to the under side of each of the condensing-pipes to distribute the water more uniformly over the surface of the pipes A, and it is found to be advantageous to extend them downward as near to the pipe below it as possible, to prevent the water from spattering and wasting.

The process is as follows: Water is permitted to flow from the water-pipe *b* into the perforated V-shaped trough E, and thence over the outer surface of the pipes A of the condenser, and trickle downward to absorb the heat and liquefy the gas within the pipes over which it passes. It is uniformly distributed over the surface of the pipes by the serrated metal strips *e* upon the under side of the pipes A. The gas, being compressed by the compression-pump or by other means, is forced through the opening *h* into the condenser in an upward direction and follows the course of the coil, communicating its heat to the pipes, from which it is absorbed by the water passing over them. As the gas ascends it gradually loses its heat by contact with the pipe surface cooled by colder water and condenses. When condensed (the pressures in the pipes being equalized) the liquefied gas would of its own gravity follow the course of the coil downward and be again brought in contact with the heat of the unliquefied gas in the lower pipes of the condenser, which would again expand the liquid, convert it into gas, and produce more resistance to the action of the pumps by increasing the working pressures, requiring a greater consumption of coal and water, to say nothing of the loss by friction while working under largely-increased working pressures. This condition of affairs is obviated and the working pressures greatly reduced by preventing the liquefied gas from coming in contact, after liquefaction with the heat of the unliquefied gas due to compression, by permitting the liquefied gas to escape from the condensing-tubes A as rapidly as liquefaction takes place, and conveying it through the small pipes *c*, header F, and pipe *f* to the tank H for storage until required for distribution to the expanding coils. By this method gas or vapor under pressure can be liquefied under working pressures of twenty or thirty pounds per inch less than formerly.

This invention is especially adapted to be used in connection with ice-making or refrigerating machinery; but can also be applied for many other purposes.

It is evident that the invention might be used by placing the pipes of the condenser side by side horizontally, with a slight incline or ascent, the gas be driven in an upward direction, liquefied, and drawn away from the heat of the unliquefied gas, as already described; but this would involve the construction of a large and expensive chamber or tank to inclose the pipes of the condenser, an equal-

ization of the temperature of the water, an extravagant use of water, an accumulation of great weight, and many other objections. In consequence we prefer the method described.

The object of the inclosed or insulated chamber G is to prevent the warm atmosphere from coming in contact with the water used for condensing or the condensing-pipes when the atmosphere is at a higher temperature than the water used for condensation, and thus reducing the power of the water to absorb the greatest number of heat units from the gas to be condensed. It is covered with non-conducting material to keep out the heat, and is provided with windows or doors, which may be opened to expose the condenser and the water to the atmosphere when the temperature of the atmosphere is lower than that of the water.

Having described our invention, what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a coil of pipes in a condenser placed in line vertically, with one or more liquid traps, connecting-pipes, and a means of sprinkling or showering water upon the surface of said pipes, substantially as described.

2. The combination of a coil of pipes in a condenser, placed in line vertically, when inclosed, to protect them from a current of air, or in an insulated chamber, with one or more liquid traps, connecting-pipes, and a means of sprinkling or showering water upon the surface of said pipes, substantially as described.

3. The combination of a coil of pipes in a condenser, placed in line vertically, with means of sprinkling or showering water upon the surface of said pipes, one or more liquid traps, a tank or reservoir for the storage of the liquefied gas, and connecting-pipes, substantially as described.

4. The combination of a coil of pipes in a condenser, placed in line vertically, with a means of sprinkling or showering water upon the surface of said pipes, one or more liquid traps and connecting-pipes, when arranged in a manner to draw away from the condenser the liquefied from the unliquefied gas during the process of liquefaction, substantially as described.

5. The combination, in a vertical condenser, of the pipes A, elbows B, frame C, discharge-pipes *c*, and trap F, substantially as described.

6. The combination, in a vertical condenser, of the pipes A, elbows B, frame C, discharge-pipes *c*, trap F, and a trough E, or its equivalent, substantially as described.

In testimony whereof we have hereto set our hands and affixed our seals in the presence of two witnesses.

JOHN C. DE LA VERGNE. [L. S.]
WILLIAM M. MIXER. [L. S.]

Witnesses:

O. H. REED,
J. H. MACY.