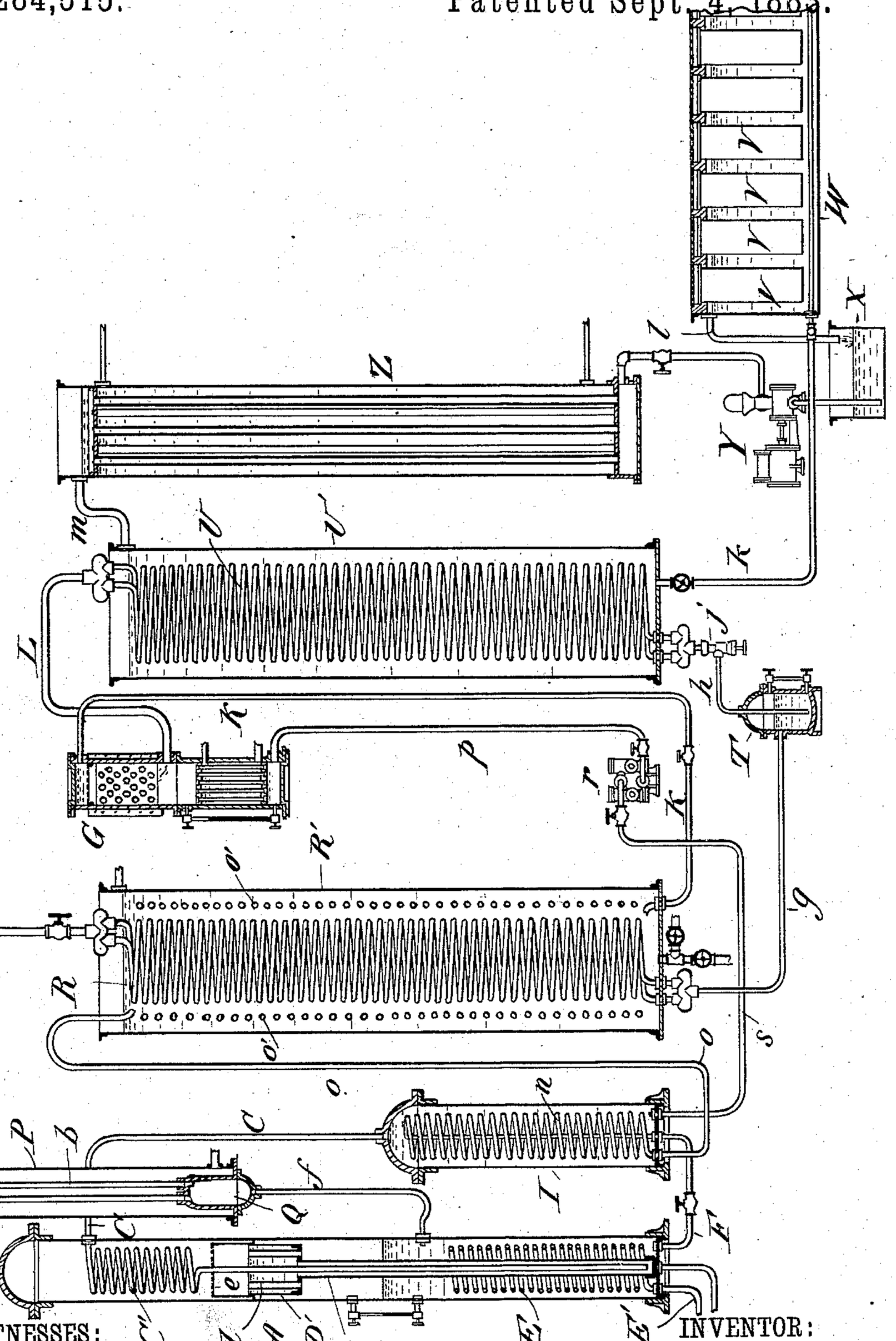
(No Model.) 3 Sheets—Sheet 1.

B. THOENS.

ICE MACHINE.

No. 284,515. Patented Sept. 4, 1883.



WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR:

B. Thoens

BY Munn & Co

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 2.

B. THOENS.

ICE MACHINE.

No. 284,515. Patented Sept. 4, 1883.

Fig. 2.

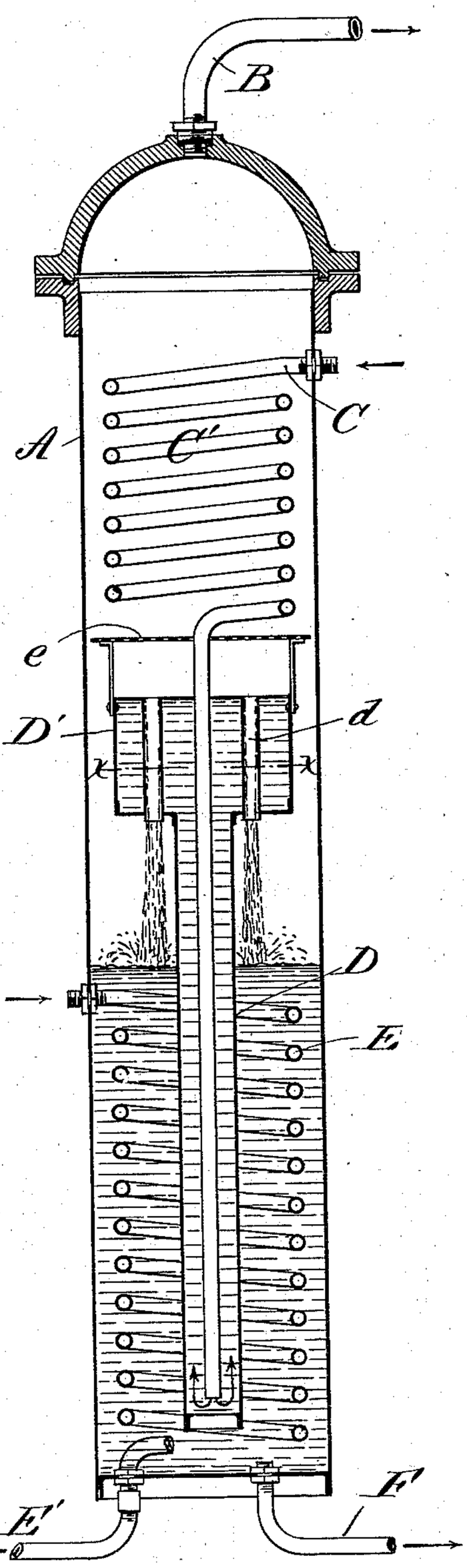
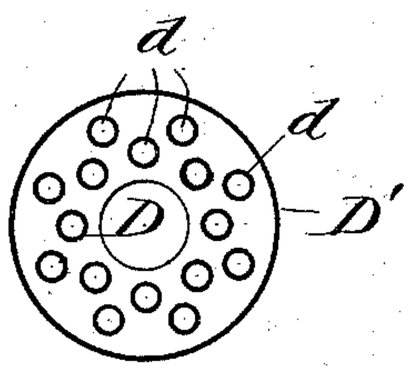


Fig. 3.



Witnesses:
Donn Twitchell
C. Sedgwick

Inventor:
B. Thoens
By Munn & Co
Attorneys.

(No Model.) 3 Sheets—Sheet 3.

B. THOENS.

ICE MACHINE.

No. 284,515. Patented Sept. 4, 1883.

Fig. 4.

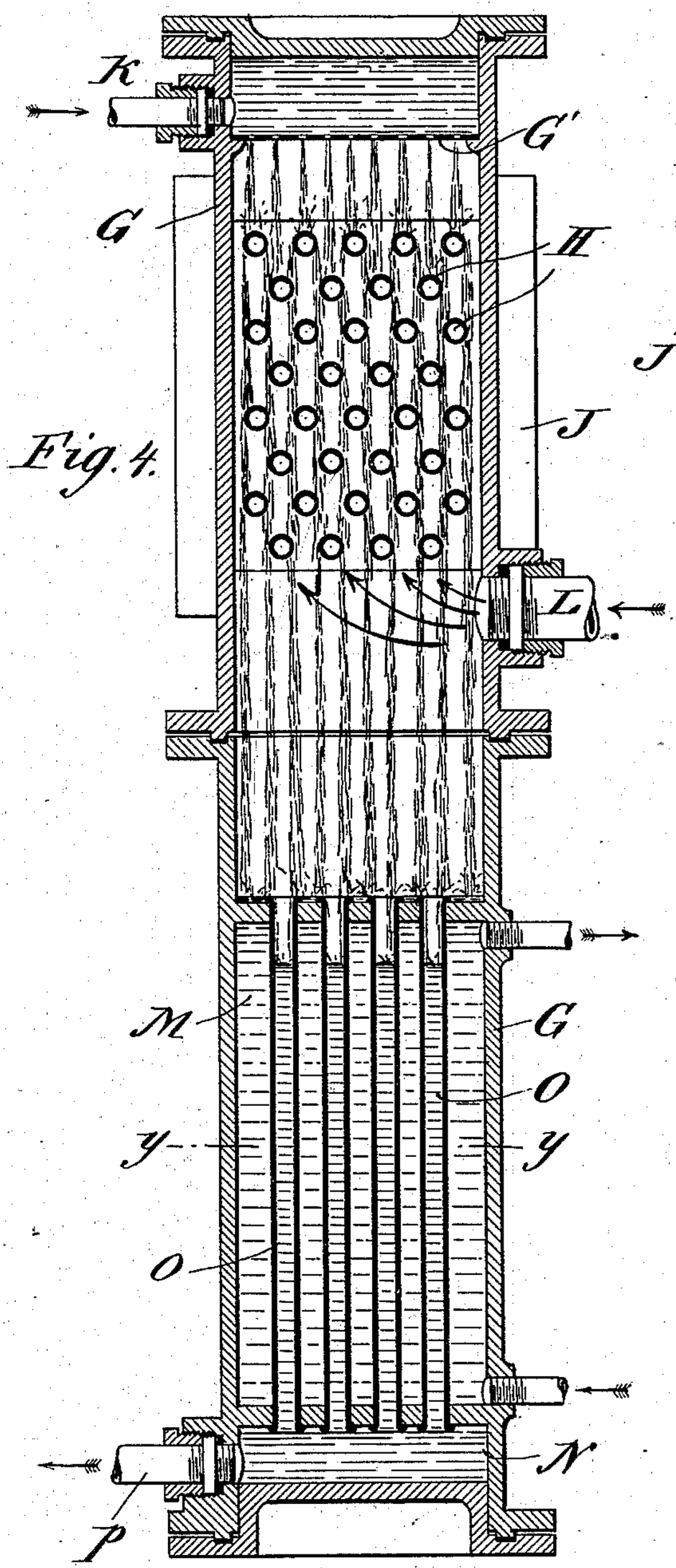


Fig. 5.

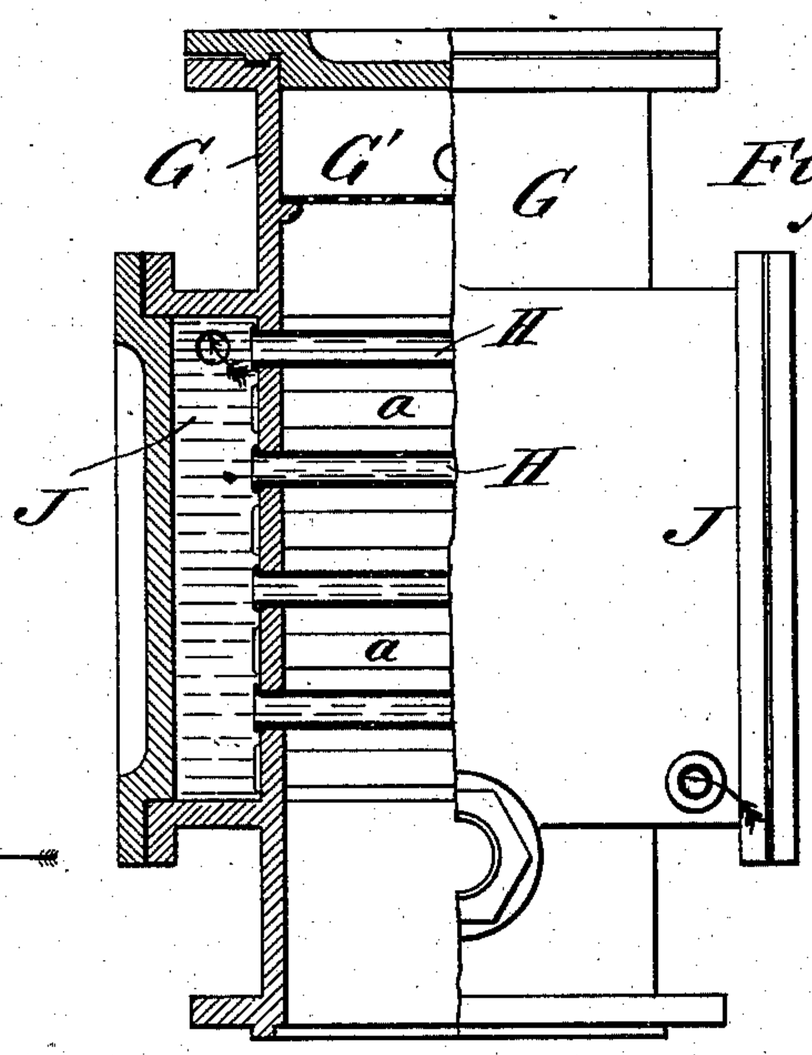
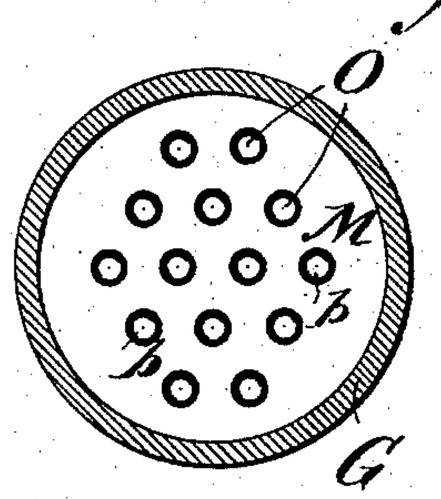


Fig. 6.



Witnesses:
Donn Twitchell.
C. Sedgwick

Inventor:
B. Thoens
By Munn & Co
Attorneys.

UNITED STATES PATENT OFFICE.

BURCHARD THOENS, OF NEW ORLEANS, LOUISIANA, ASSIGNOR OF ONE-HALF TO MOSES SCHWARTZ, OF SAME PLACE.

ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 284,515, dated September 4, 1883.

Application filed July 3, 1883. (No model.)

To all whom it may concern:

Be it known that I, BURCHARD THOENS, of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and Improved Ice-Machine, of which the following is a full, clear, and exact description.

This invention relates to that class of machines in which ammonia is used for cooling a non-congealable liquid to such an extent that water surrounded by the said non-congealable liquid will be frozen.

This invention consists in an ammonia ice-machine constructed with a retort for distilling aqua-ammonia, which distilled aqua-ammonia passes into a rectifier, and is then liquefied and collected in a suitable vessel, from which it is liberated at suitable times and permitted to evaporate, thereby cooling the uncongealable liquid surrounding the pipes through which the gases of ammonia are permitted to pass. These gases of ammonia are then collected and conducted into a vessel, in which the poor or weak ammonia-liquor is converted into drops or sprays, and thus absorbs the ammonia-gas, and is converted into rich ammonia-liquor, and is then sent back to the retort after having been heated sufficiently by the poor ammonia-liquor, all as will be fully described and set forth hereinafter.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of my improved ice-machine. Fig. 2 is a longitudinal sectional elevation of the retort for distilling the aqua-ammonia. Fig. 3 is a sectional plan view of the same on the line *x x*, Fig. 1. Fig. 4 is a longitudinal sectional elevation of the ammonia-absorber. Fig. 5 is a side view of the upper part of the same, parts being broken out and others shown in section. Fig. 6 is a sectional plan view of the same on the line *y y*, Fig. 4.

The retort A consists of a cylinder provided with a suitable head or top, in which a pipe, B, is secured for the escape of ammonia-gas and steam produced by distilling aqua-ammonia. The rich liquor is conducted into the retort A through a pipe, C, which forms a spiral, C′, in the upper part of the retort A, and then extends down vertically to near the bottom of the retort in the middle of a larger pipe, D, closed at the bottom, and projecting downward from a cylindrical vessel, D′, held in about the middle of the retort, which vessel D′ is provided with a series of vertical pipes, *d*, open at the top and bottom, through which pipes *d* the liquor can flow into the lower part of the retort as soon as the level of the liquor in the cylinder D′ rises higher than the upper ends of the said pipes. A spiral pipe, E, is arranged in the lower part of the retort A, through which pipe steam is admitted into the retort, which steam leaves through a pipe, E′, at the bottom of the retort. A pipe, F, for drawing off the poor liquor, is provided in the bottom of the retort. The vessel D′ is provided with a perforated top, *e*, to prevent any boiling over or foaming into the rectifier.

The ammonia-absorber shown in Figs. 4, 5, and 6 consists of a cylinder, G, closed at both ends. A short distance from the upper end a perforated plate, G′, is held transversely in the said cylinder, and below the said perforated plate a series of horizontal transverse pipes, H, are arranged in a series of rows, which connect two water-chambers, J, at the sides of the cylinder, the said water-chambers being in no communication whatever with the interior part of the cylinder, but being in communication with each other, and provided with a suitable inlet and outlet pipe for the cooling water. The inlet-pipe K for the poor ammonia-liquor is above the perforated plate or partition G′. A larger inlet-pipe, L, for the ammonia-gas, is below the transverse pipes H. A water-chamber, M, is formed in the lower part of the cylinder G, and below the said water-chamber a compartment, N, for the rich ammonia-liquor, is provided. The water-compartment M is provided with suitable inlet and outlet pipe for the cooling water. A series of vertical pipes, O, extend through the water-chamber M from the top to the bottom, and establish communication between the chamber N and the chamber above the water-chamber M. Aqua-ammonia of about twenty-eight per cent. is placed in the retort A, where it is heated by the steam passing through the coil E. The ammonia-gas is expelled, and passes off through the pipe B in the top of the retort, and passes

from the pipe B over to the rectifier P, which consists of a series of downwardly-projecting pipes, *a*, which lead to a small vessel, Q, from which another pipe, *b*, extends upward and to the condenser R. The pipes *a b* and the vessel Q are surrounded by a larger tube or tank, into which cold water is admitted for cooling the pipes. The steam condensing in the vessel Q is conducted back into the retort A through the pipe *f*. The ammonia-gas and steam pass through the pipe B into the rectifier P, and the anhydrous ammonia-gas passes from the vessel Q through the pipe *b* to the condenser, which consists of a double coil, R, contained in a cylindrical tank, R′, filled with cold water. As the gas is cooled and subjected to pressure in the condenser it is liquefied, and passes as a liquid to the receiver T, connected by a pipe, *g*, to the bottom end of the double coil R. The vessel T is connected by a pipe, *h*, with a valve, *j*, on the lower end of a double refrigerator-coil, U, contained in a cylindrical tank, U′, filled with an uncongealable liquid—for instance, such as brine. If the valve *j* is opened, the ammonia evaporates immediately and expands, and in doing so it abstracts the heat from its surrounding and reduces the temperature of the uncongealable liquid in the tank U′ very much. The upper end of the refrigerator double coil U is connected by the pipe L with the absorber, as shown in Fig. 4.

The function of the absorber will be described next. The cool uncongeable liquid is admitted through a pipe, *k*, to a tank, W, containing boxes V, filled with water, which boxes are surrounded by the brine, which rapidly freezes the water in the said boxes. The pipe *k* branches out in a number of perforated pipes inside of the tank W, so as to distribute an equal temperature all over, and at the same time agitate the brine. The surplus of brine in the tank flows off through a pipe, *l*, into a tank, X, from which it is pumped by a pump, Y, into a water-cooler, Z, through which the water to be converted into ice is circulated in suitable pipes, so that it will be quite cold when conducted into the boxes V. From the top of the water-cooler Z the brine flows through a pipe, *m*, back to the refrigerator *u′*, after the ammonia-gas has been expelled from the liquor in the retort. The now poor liquor is driven by the pressure in the retort, through the pipe F in the bottom of the retort, into a coil, *n*, in a closed cylindrical vessel, I, which coil has its opposite end connected with a pipe, *o*, extending up to the top of the condenser-tank R′, and then forming a coil, *o′*, the other end of which is connected by a pipe, K, with the upper end of the absorber-cylinder G, as shown in Fig. 4. The poor liquor passing through the pipe K passes through the perforated partition or sieve G′ in the absorber G, is converted into drops or spray, and meets the ammonia-gas entering through the pipe L, and thus the poor liquor or spray becomes saturated with the ammonia-gas and is converted into a rich liquor. The poor liquor has been cooled while passing through the tank R′, and the heat which is given out by the reabsorption of the ammonia-gas by the poor liquor is taken up by the transverse horizontal pipes H, through which cold water circulates. The liquor, which is now rich, then passes through the vertical pipes O in the lower part of the absorber G, and is also cooled by passing through these pipes. The rich liquor is kept in the compartment N in the bottom of the absorber, so that it will be kept cool, and no gas will escape. A pipe, *p*, connects the compartment N with a pump, *r*, which is connected by a pipe, *s*, with the bottom of the vessel I, which vessel I is connected with the pipe C, forming the coil in the upper part of the retort, so that the pump *r* can force the liquor through the exchange I, where it comes in contact with the pipe *n*, through which the hot poor liquor circulates, and the rich liquor is thus heated, and at the same time the poor liquor in the coil is partially cooled. The hot poor liquor and the rich cool liquor exchange temperatures as far as that is possible. The rich liquor is now partially heated, passes through the top of the exchanger I back to the retort-pipe C′, where it is heated to a higher temperature by the hot gas surrounding it. The lower end of the tube C then conducts the rich liquor to the bottom of the tube D, in which it rises, and finally passes to the bottom of the retort and is distilled, and is finally drawn off through the pipe F into the exchanger, and so on, in the manner previously described.

I do not abandon or dedicate to the public any patentable features set forth herein and not hereinafter claimed, but reserve the right to claim the same either in a reissue of any patent that may be granted upon this application or in other applications for Letters Patent that I may make.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. An ice-machine constructed with a retort for distilling ammonia, connected with an apparatus for rectifying the ammonia-gases, from which rectifier the ammonia-gases are conducted to a refrigerator which is connected with a receptable for receiving the liquid ammonia, which is permitted to evaporate, and thus reduce the temperature of the uncongealable liquid contained in the refrigerator, which is connected with a device for mixing the gases with the poor ammonia-liquor, whereby the said liquor will be enriched, and is then conducted back to the retort, substantially as herein shown and described, and for the purpose set forth.

2. In an ice-machine, the combination, with the retort A, of the rectifier P, the condenser R R′, the ammonia-chamber T, the refrigerator U U′, the absorber G, the water-cooler Z, and the heat-exchanger I, substantially as herein shown and described, and for the purpose set forth.

3. In an ice-machine, the combination of the retort A, connected with the chamber Q of the rectifier, the coil C′ in the retort, connected with the heat-exchanger I, the coil *n* therein, which is connected with a coil, *o*′, in the refrigerator, which coil *o*′ is connected with the top of the absorber G, which absorber G is connected at its lower end with the pump *r*, which pump *r* is connected with the heat-exchanger, the pipe *b*, connecting the rectifier-chamber Q with the double spiral R in the refrigerator-vessel R′, the ammonia-chamber T, connected with the spirals R, the spiral U in the vessel U′, which spiral is connected with the ammonia-vessel T, the freezing-tank W, into which the uncongealable liquid can be conducted from the vessel U′, and of the pipe L, connecting the spiral U with the absorber G, substantially as herein shown and described, and for the purpose set forth.

4. In a retort of an ice-machine, the combination, with the cylindrical vessel A, of the coiled pipe C′, for conducting the rich ammonia-liquor into the retort, the pipe D, surrounding the downwardly-projecting part of the pipe C, and of the steam-pipe coil E, substantially as herein shown and described, and for the purpose set forth.

5. In the retort of an ice-machine, the combination, with the cylindrical vessel A, of the spiral C′, the pipe D, closed at the bottom and surrounding the downwardly-projecting part of the pipe C′, the vessel D′, formed at the upper end of the pipe D, and the downwardly-projecting tubes *d* in the vessel D′, substantially as herein shown and described, and for the purpose set forth.

6. In the retort of an ice-machine, the combination, with the cylindrical vessel A, of the spiral C′, the pipe D, closed at the bottom and surrounding the downwardly-projecting part of the pipe C′, the vessel D′, formed at the upper end of the pipe D, the downwardly-projecting tubes *d* in the vessel D′, and the sieve *e*, held above the vessel D′, substantially as herein shown and described, and for the purpose set forth.

7. In an ice-machine, an absorber constructed with a perforated plate or sieve a short distance from the top, transverse pipes through which water is conducted below the said sieve *e*, and with an inlet-pipe for the gas below the transverse pipes, and an inlet-pipe for the poor liquor above the sieve, substantially as herein shown and described, and for the purpose set forth.

8. In an absorber of an ice-machine, the combination, with the cylinder G of the perforated plate or sieve G′, the transverse pipes H, connecting the water-chambers J J at the sides of the cylinder G, the gas-inlet pipe L below the pipes H, and the inlet-pipe K for poor liquor above the sieve, substantially as herein shown and described, and for the purpose set forth.

9. In an absorber of an ice-machine, the combination, with the cylindrical vessel G, of the sieve G′, the transverse pipes H, connecting the two water-chambers J at the sides of the cylinder G, the vertical pipes O, extending through the water-chamber M, and the ammonia-chamber N below the said water-chamber, substantially as herein shown and described, and for the purpose set forth.

BURCHARD THOENS.

Witnesses:
A. GERDES,
J. BENDERNAGEL.