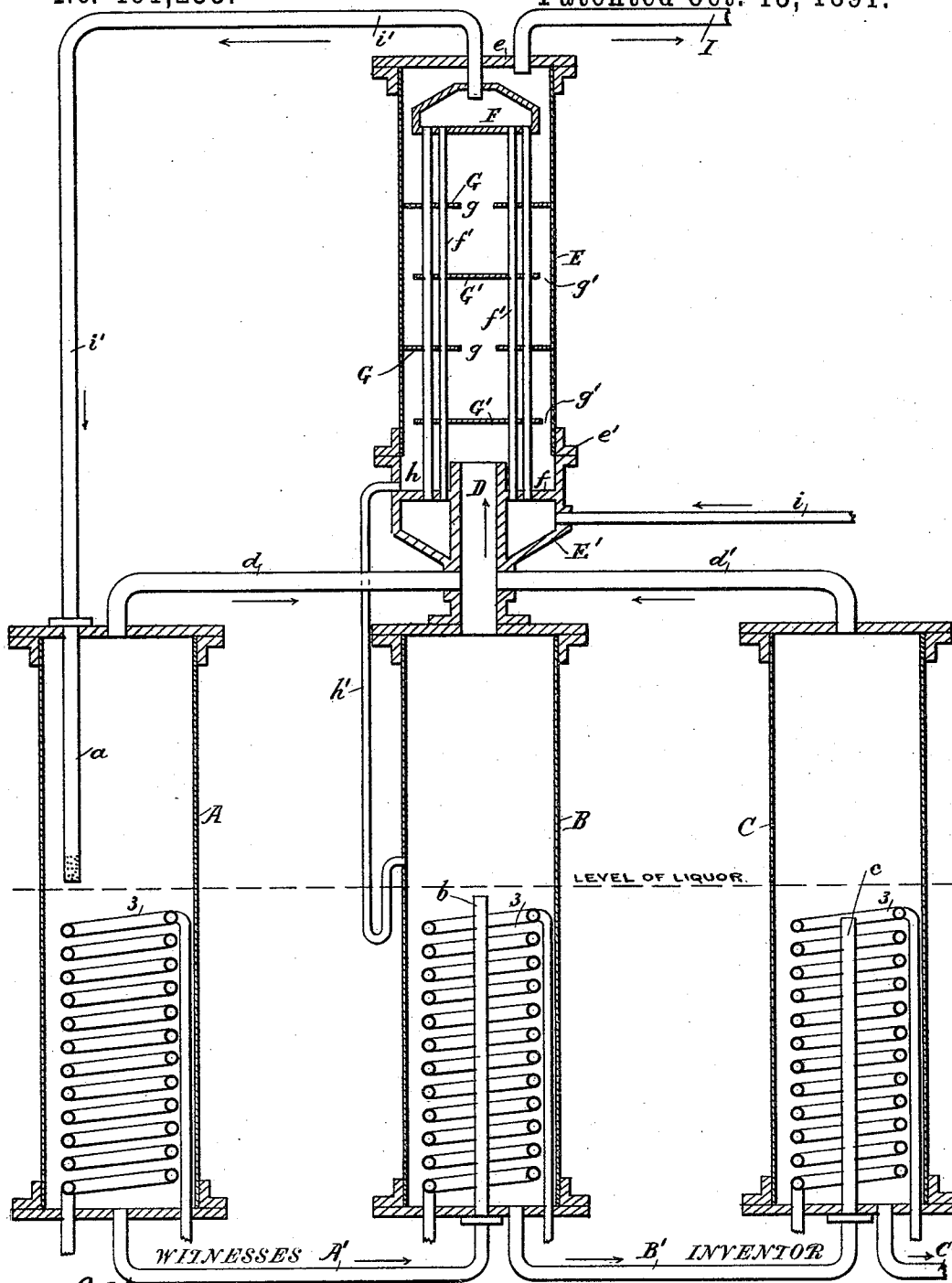


(No Model.)

T. H. BUTLER.
ICE MACHINE.

No. 461,233.

Patented Oct. 13, 1891.



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UNITED STATES PATENT OFFICE.

THOMAS H. BUTLER, OF HARRISBURG, PENNSYLVANIA.

ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 461,233, dated October 13, 1891.

Application filed December 23, 1890. Serial No. 375,589. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. BUTLER, a citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, 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.

This invention relates to ice-machines; and it consists in the novel construction and combination of the parts, hereinafter fully described and claimed, whereby the aqua-ammonia is converted into gas and freed from entrained watery vapor.

The figure in the drawing shows a front view of the retorts and the rectifier in vertical section.

A series of retorts A B C is used to convert the aqua-ammonia into gas. The series preferably consists of three retorts, but additional retorts may be added, if desired. Each retort is provided with a similar steam-heating coil 3. The strong aqua-ammonia enters the retort A through the pipe *a*, which discharges it onto the top of the coil 3.

A' is the outlet-pipe from the bottom of the retort A, which pipe is connected to the bottom of the retort B. The retort B is provided with a stand-pipe *b*, connected with the pipe A' and extending upward to about the top of the coil 3.

B' is the outlet-pipe from the bottom of the retort B, which pipe is connected to the bottom of the retort C. The retort C is provided with a stand-pipe *c*, connected with the pipe B' and extending upward to about the top of the coil 3, but terminating a little below the level of the top of the pipe *b*.

C' is the outlet-pipe from the retort C, which pipe conducts the weak aqua-ammonia to the equalizer in the usual manner.

The aqua-ammonia is maintained at the same level in all the retorts and sinks to the lower parts of each of them as the gas is driven out of it. The addition of a small quantity of strong aqua-ammonia to the retort A causes a portion of the partially-weakened aqua-ammonia to pass to the retort B, and a portion of the still weaker ammonia

from the bottom of the retort B is transferred to the retort C.

Steam or other heating-fluid of different temperature is preferably used in the coils 3, the hottest steam being applied where it will do most service and waste steam of low temperature being used where it may be applied advantageously.

D is the central gas-pipe secured to the top of the retort B, and *d d'* are gas-pipes which connect the said central pipe with the top of the retorts A and C, respectively.

E is the rectifier consisting of a cylindrical shell provided with the top *e* and having its lower end secured by the flange *e'* to the bottom piece E'. The bottom piece E' is formed integral with or is otherwise firmly secured to the gas-pipe D, and *f* is a tube-plate below the top of the said pipe and having its periphery united to the bottom piece E'.

F is a hollow drum in the upper part of the rectifier, and *f'* are the tubes which connect the hollow spaces of the bottom piece E' and the drum F.

G are flat rings provided with central passages *g*, and G' are circular disks having the annular passages *g'* between them and the shell. The rings and disks have holes for the passage of the tubes and are arranged alternately one above the other inside the rectifier. These rings and disks oblige the gas to take a tortuous course through the rectifier and bring every portion of it into repeated contact with the tubes. The entrained watery vapor condenses on the tubes and falls into the space *h* on top of the tube-plate, and *h'* is a drain-pipe for conducting the water back into the retort B.

I is the gas-outlet pipe connected to the top of the rectifier, and *i* is the inlet-pipe for strong aqua-ammonia from the equalizer, which pipe is connected to the bottom piece E'. The aqua-ammonia from the equalizer is heated in its upward passage through the tubes *f'*, and *i'* is a pipe connected to the drum F, which pipe passes out through the top of the rectifier and has its other extremity connected with the inlet-pipe *a* of the retort A.

What I claim is—

1. In an ice-machine, the combination, with a series of vertical retorts, each provided with a steam-heating coil, of an inlet-pipe discharg-

ing onto the top of the coil of the first retort, pipes connecting the bottoms of each two next adjacent retorts, an outlet-pipe connected to the bottom of the last retort, and a stand-pipe 5 in each retort except the first, each stand-pipe being shorter than the stand-pipe in the retort next above it in the series and connected to the inlet-pipe of its own retort, whereby the gradually-weakening ammonia which 10 sinks to the bottom of each retort may be transferred to the upper part of the retorts next below in the series and a constant common level of liquor maintained in all the retorts, substantially as set forth.

15 2. In an ice-machine, the combination, with a series of retorts, of a rectifier secured to the top of one of the retorts, gas-pipes connecting the said rectifier with the remaining retorts, and a pipe connecting the strong aqua-ammonia spaces of the rectifier with the inlet-pipe of the first retort of the series, substantially as set forth.

20 3. In an ice-machine, the combination, with the cylindrical shell of the rectifier, provided with a top and a gas-outlet pipe at the top, of the bottom piece secured to the said shell and provided with a hollow space, a tube-plate and a central gas-pipe passing through the

said space and projecting above the tube-plate, the drain-pipe connected to the bottom 30 piece close above the said tube-plate, a hollow drum in the top part of the shell, the tubes connecting the hollow spaces of the said bottom piece and drum, an inlet-pipe for strong aqua-ammonia connected to the said bottom 35 piece, and the outlet-pipe connected to the said drum and passing through the top of the rectifier, substantially as and for the purpose set forth.

4. In an ice-machine, the combination, with 40 the shell of the rectifier, provided with hollow spaces at top and bottom for strong aqua-ammonia, and the vertical tubes connecting the said liquor-spaces, of the central gas-inlet pipe passing through the said bottom space, 45 the gas-outlet pipe at the top of the rectifier, and the alternating series of rings and disks provided with holes for the pipes and forming a tortuous passage for the ammonia-gas, substantially as set forth. 50

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

THOMAS H. BUTLER.

Witnesses:

R. S. CARE,
MILTON M. LEMER.