

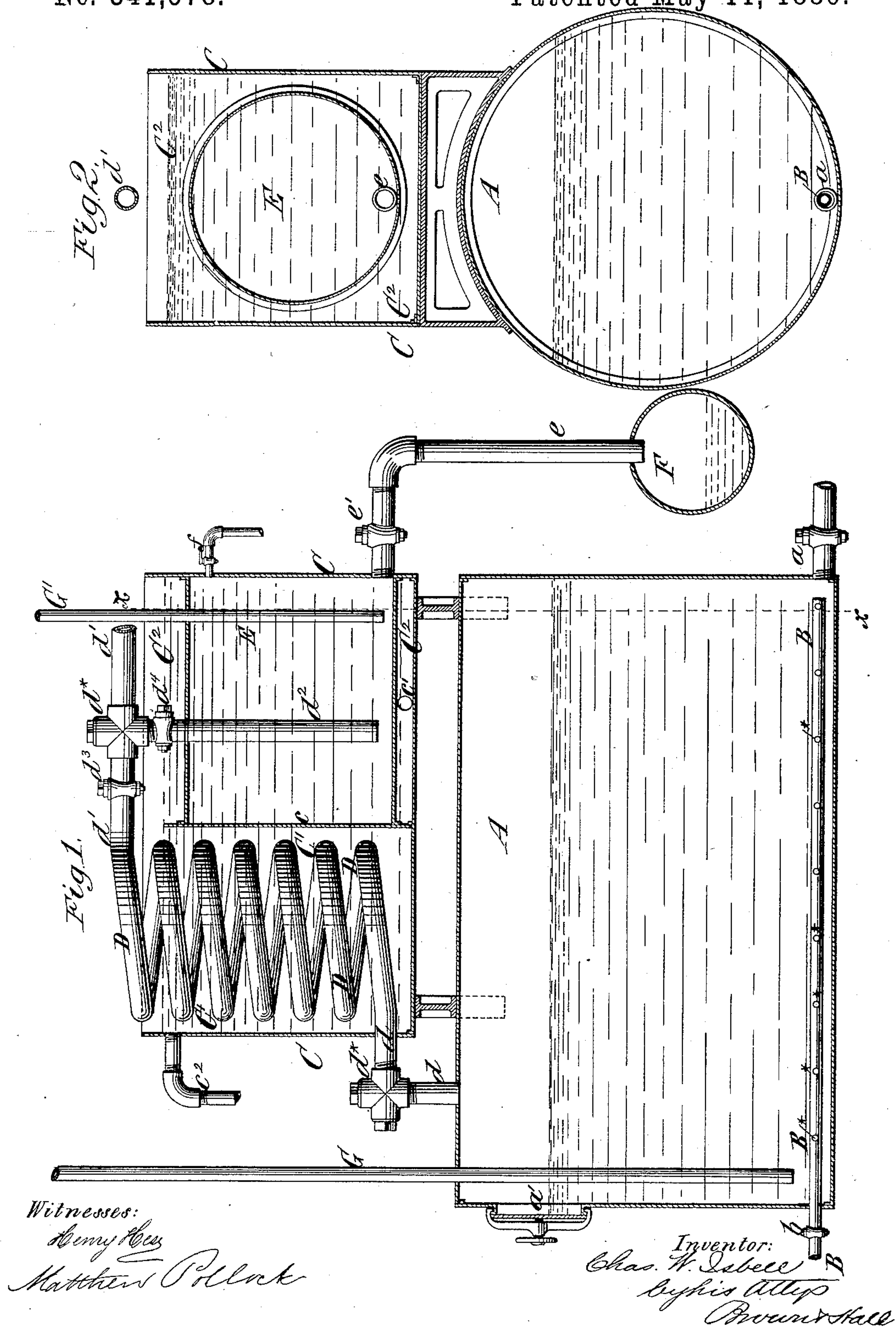
(No Model.)

C. W. ISBELL.

APPARATUS FOR CONCENTRATING AMMONIACAL LIQUOR.

No. 341,578.

Patented May 11, 1886.



UNITED STATES PATENT OFFICE.

CHARLES W. ISBELL, OF NEW YORK, N. Y.

APPARATUS FOR CONCENTRATING AMMONIACAL LIQUOR.

SPECIFICATION forming part of Letters Patent No. 341,578, dated May 11, 1886.

Application filed March 25, 1885. Serial No. 160,025. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. ISBELL, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Apparatus for Concentrating Ammoniacal Liquor, of which the following is a specification.

In my application for Letters Patent, Serial No. 160,026, filed March 25, 1885, I have described a method of concentrating ammoniacal liquor, which consists in subjecting the weak liquor in a closed vessel to the action of heat, in order to drive off the free ammonia in the form of vapor, in then passing the ammonia vapor through a worm or condensing apparatus, in order to condense any aqueous vapor which may be held in suspension, and in finally introducing the ammonia vapor into and absorbing the vapor by a portion of the weak ammoniacal liquor or by water contained in a submerged and cooled receiver until such liquor or water is raised to a strength which will admit of its being profitably shipped.

The object of my present invention is to provide a simple apparatus, which may be constructed at a small cost, and in which the method of concentrating weak ammoniacal liquor may be profitably carried out.

In the accompanying drawings, Figure 1 represents a sectional elevation of an apparatus embodying my invention; and Fig. 2 represents a vertical section on the plane of the dotted line *x x*, Fig. 1.

Similar letters of reference designate corresponding parts in both the figures.

A designates a closed vessel or vat, which may be of cylindric or other form, and constructed of plate metal, wood, or any other suitable material.

B designates a pipe, provided outside the vessel with a cock or valve, *b*, and extending into and nearly through the vessel. The portion of the pipe B which is within the vessel is provided with or has numerous holes or perforations *, so that steam introduced through the pipe will be discharged into the ammoniacal liquor, which is placed in the closed vessel, and will serve to heat the same. Instead of discharging free steam into the liquor, I may employ a steam-coil arranged within the vessel, which will effect the heating of the liquor by radiation.

The vessel A is provided with a discharge cock or valve, *a*, at the bottom, and has also a man-hole, *a'*, through which access can be had to the vessel for cleaning it or for any other purpose.

C designates an open tank or vat, which may be of wood or metal, and which is arranged above the vessel A, and which is provided with a partition, *c*, dividing it into two compartments, *C'* *C''*. In the compartment *C'* is arranged a worm or coil of pipe, D, one end of which is connected at *d* with the vessel A, and the other end of which is prolonged to form a pipe, *d'*, from which a pipe, *d''*, extends downward, for a purpose hereinafter described. The pipe *d''* is connected with a pipe, *d'*, by a T-fitting, *d''**, and between the T-fitting and the worm or coil is a valve or cock, *d'''*, by which the passage from the worm or coil and pipe *d'* may be controlled. In the pipe *d''* is a valve or cock, *d''**. With the pipe *d'* may be connected a supply-pipe for ammoniacal liquor, which may be taken from an elevated reservoir or tank, or supplied directly by a pump from the pipe *d'*.

In the compartment *C''* of the vat or tank C is arranged a receiving-vessel, E, which may be cylindric, and which extends from the partition *c* to the opposite end of the tank or vat C. This partition and end of the tank or vat may indeed form the ends of the reservoir, the latter consisting of an endless cylinder of sheet or plate metal, connected in a water-tight manner to the partition *c* and the opposite end of the tank or vat. From the receiving-vessel E extends a pipe, *e*, in which is a cock, *e'*, and which communicates with the shipping vessel or tank F, which may be of any suitable form and material. The receiving-vessel E is also provided with a test-cock, *f*, through which a portion of its contents may be withdrawn for testing.

The compartment *C''* of the tank or vat C is provided with an inlet, *e'*, for feed or cooling water, which surrounds the receiving-vessel E, and in which the latter is immersed. The partition *c* is lower than the walls of the tank or vat C, and hence the water after filling the compartment *C''* will overflow into the compartment *C'*, and will there serve to cool the worm or coil D, and condense the aqueous vapor carried off in suspension. In this case the

cold feed-water introduced at the inlet c' will be somewhat warmed before passing into the compartment C' , and will therefore not act to cool the worm or coil so energetically as to produce the carbonate of ammonia therein and clog the worm or coil. An overflow-pipe, c^2 , leads from the compartment C' .

It will be observed that in the pipe d , I have introduced a T-fitting, d^* , and this, as well as the T-fitting d^* in the pipe d' , provides for readily cleaning these pipes, it being only necessary to remove the screw-plugs which close the outer branches of the T-fittings.

A safety-pipe, G , extends from within the vat or vessel A to a considerable height above the same, and prevents the liability of any explosion. A similar pipe, G' , extends from the receiving-vessel E .

The operation performed in carrying out my invention is as follows: Weak ammoniacal liquor is introduced through the supply-pipe d' and coil D into the vessel A until the latter is filled to the level indicated by the dotted lines therein, the cock d^4 being then closed. The cock d^3 is then closed, and the cock d^4 opened, and the weak ammoniacal liquor is introduced into the receiving-vessel E until the latter is nearly or quite full, and the cock d^3 is afterward again opened. Steam is now introduced through the pipe B , to heat the ammoniacal liquor in the vessel or tank A , and to thereby drive off the free ammonia contained therein in the form of vapor. A certain amount of aqueous vapor will be carried in suspension by the ammonia vapor, and in passing through the worm or coil D all or nearly all of such aqueous vapor will be condensed, and will flow back into the vessel A , while the ammonia vapor will pass onward and be delivered through the pipes d' d^2 into the liquid contained in the receiving-vessel E , by which such vapor will be absorbed. When the contents of the receiving-vessel E , as drawn from the test-cock f , indicate the desired strength of liquor, the cock e' is opened and the liquor discharged from the receiving-vessel E into the shipping tank or vessel F , which is afterward closed and ready for market. Any suitable casks, vessels, or packages which will prevent the escape of ammonia may be employed for shipping this strong liquor. Those packages or vessels in which glycerine has been contained, and which are known as "glycerine-packages," will well answer the purpose.

I do not confine my invention to the employment of the weak ammoniacal liquor to receive and absorb the ammonia vapor and serve as the vehicle in which it is contained and shipped to market, as I may employ clear water for this purpose. It is obviously more desirable to employ the weak ammoniacal liquor, as it already contains a certain amount of ammonia and requires less to bring it up to the desired strength. To obtain from the liquor in the vessel or tank the last trace of free ammonia, I may introduce lime thereto; but this forms no part of my present invention.

After the ammonia has been driven off from the contents of the vessel A the spent liquor may be withdrawn through the cock or valve a .

It will be understood that the heat in the ammonia vapor tends to raise the temperature of the liquid in which it is absorbed, and so retard the condensation of the ammonia in the liquid. The arrangement of the receiving-vessel E in a tank of cold water, which is supplied continuously thereto, greatly facilitates the rapidity of the operation, as the heat is abstracted from the receiving-liquid in the vessel E by the cold water which surrounds it.

I am aware that many forms of apparatus have been devised for the manufacture of aqua-ammonia, muriate and carbonate of ammonia, and sal-ammoniac, and I am aware that in many apparatus for the purposes described the ammoniacal liquor has been heated or subjected to distillation in a closed vessel, and the vapors have been conducted through a worm for condensing or cooling them, and afterward the liquid resulting from condensation of the vapors has been collected in a separate vessel. I do not claim, broadly, any of the features above described as of my invention, but desire to limit my invention to combinations of parts which I believe to be novel.

It is very desirable that the lower end of the worm D should be connected with the heating-vessel A , because any aqueous vapor which may pass off with the ammonia vapor will be condensed and returned to the heating-vessel A , while the ammonia vapors will pass onto the receiving-vessel. It is also very desirable to receive and absorb the ammonia vapors in liquid in the receiving-vessel E submerged in water, because the temperature of the liquid will then be reduced, and the absorption of vapor necessary to raise the liquid to a strength which will render it profitable to ship the liquid will be greatly expedited.

It is advantageous to supply cooling water, first, to the part of the tank or vat which contains the receiving-vessel E , and then to permit the water to overflow into the compartment containing the worm or coil D , because the coldest water will first act to reduce the temperature of the receiving-vessel, and will be so warmed before it passes around the worm or coil that it will not act so energetically thereon as to produce carbonate of ammonia in the worm or coil, and so clog the same.

I do not claim as a part of my present invention the method of concentrating ammoniacal liquor, which is described herein, and which is performed by the apparatus which forms the subject of this application, inasmuch as that method forms the subject of my application, Serial No. 160,026, hereinabove referred to.

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

1. In an apparatus for concentrating ammoniacal liquor, the combination, with a closed vessel and means for heating its contents, of a condensing-worm the lower end of which is

connected with said vessel in order to return
thereinto the water resulting from condensa-
tion of aqueous vapor, a water-tank, and a
receiving-vessel for liquid, submerged therein,
5 a pipe for conducting vapor from the worm
into the receiving-vessel to be condensed in
the liquid therein, and pipes for admitting the
ammoniacal liquor to the closed heating-vessel
and the receiving-vessel, substantially as
10 herein described.

2. In an apparatus for concentrating am-
moniacal liquor, the combination of a closed
vessel and means for heating its contents, a
divided water-tank having a water-inlet in
15 one compartment, an overflow therefrom into
the other compartment, a condensing-worm in
the last-mentioned compartment and connect-
ed at its lower end with the heating-vessel in
order to return thereinto the water resulting
20 from the condensation of aqueous vapors, a
receiving-vessel for liquid, submerged in the

compartment, having a water-inlet, a pipe for
conducting ammonia vapor from the worm
into the receiving-vessel to be condensed in
the liquid therein, and pipes for admitting 25
ammoniacal liquor into the closed heating-
vessel and into the receiving-vessel, substan-
tially as herein described.

3. The combination of the closed vessel A
and its steam-pipe B, the tank C, having the 30
partition *c*, the worm D, arranged in the com-
partment C', and a pipe and T-fitting *d d**,
connecting it with the vessel A, the receiving-
vessel E, submerged in the compartment C',
the pipe *d'* and cock *d³*, the pipe *d²*, with its 35
cock *d¹*, and a T-fitting, *d**, connecting the
pipes *d'* and *d²*, all substantially as herein de-
scribed.

CHAS. W. ISBELL.

Witnesses:

C. HALL,

FREDK. HAYNES.