

F. M. McMILLAN.
 Apparatus for Obtaining Dry Ammoniacal Gas.

No. 213,294.

Patented Mar. 18, 1879.

Fig. 1.

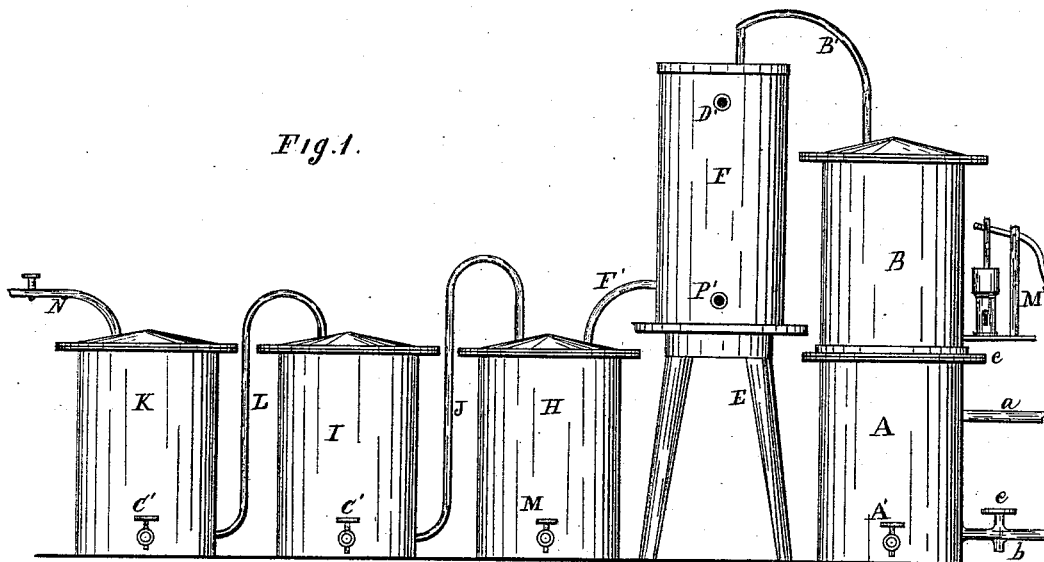
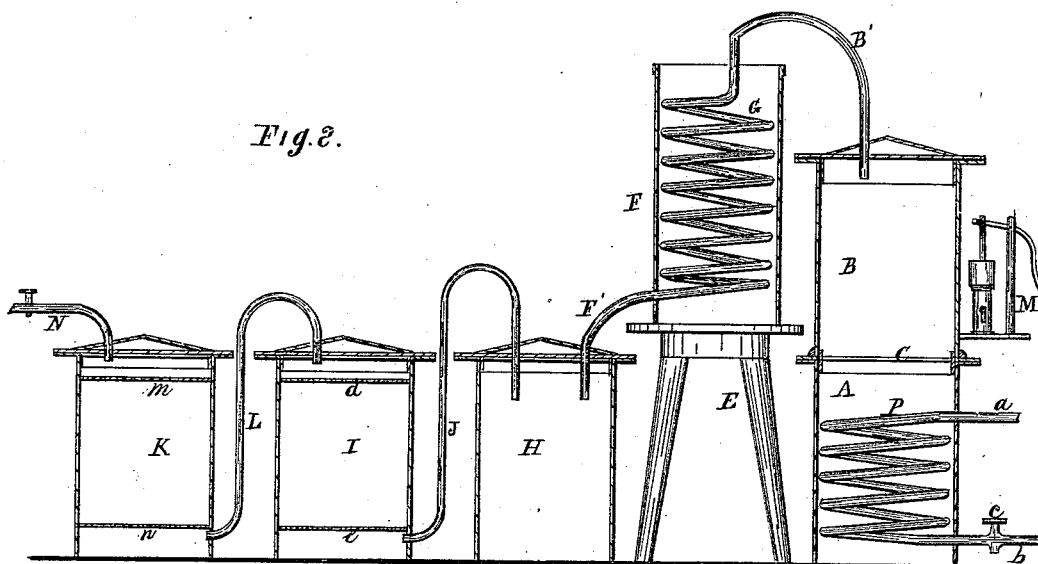


Fig. 2.



Witnesses.
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IMPROVEMENT IN APPARATUS FOR OBTAINING DRY AMMONIACAL GAS.

Specification forming part of Letters Patent No. **213,294**, dated March 18, 1879; application filed November 22, 1878.

To all whom it may concern:

Be it known that I, FRANCIS MARION McMILLAN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and Improved Apparatus for Deriving Anhydrous Ammoniacal Gas from Aqua-Ammonia; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawings, making a part of the same.

Figure 1 is a side elevation of the apparatus. Fig. 2 is also a side elevation, partially in section.

Like letters of reference refer to like parts in the several views.

It is well known that water has a strong affinity for ammoniacal gas, absorbing it in large quantities, forming the water of ammonia of commerce.

To extract the ammoniacal gas from aqua-ammonia and render it anhydrous is the purpose of this invention, which consists of a retort for holding the water of ammonia to be heated by steam. The steam being conducted through the retort ~~of~~ a coiled pipe, the gas evolved from the contents of the retort escapes therefrom into a cooler, consisting of a cylindrical vessel containing a coiled pipe, through which the gas passes, the vessel being filled with water for cooling the pipe, &c. From the cooler the gas passes into a receiver, thence into a drying-vessel containing absorbents and strainers. From said drying-vessel the gas passes into a second drying-vessel, constructed as the first, and from which it escapes or is conducted to a condensing-pump for being liquefied for use in the manufacture of ice.

The following is a more complete description of the apparatus: On a suitable platform is secured the retort, (above alluded to,) consisting of two sections, A and B, connected to each other at C in any suitable manner that may be gas-tight. In the lower section, A, is arranged a coiled pipe, P, Fig. 2, of which *a* is the inlet and *b* the outlet end. The latter is provided with a stop-cock, *c*. The purpose of said pipe will presently be shown.

On a stand, E, is secured a gas-cooler, F. Said cooler consists of a cylindrical vessel, having therein a coil of pipe, G, which is con-

nected at the open upper end of the cooler with the top of section B of the retort, and terminates immediately under the cover, as shown in Fig. 2. Said cover is made gas-tight by any suitable means. The lower end of the coil of pipe G issues from the vessel, and passes to and terminates in a receiver, H, immediately under the gas-tight cover thereof. The receiver H is put in connection with a drying-vessel, I, by a pipe, J. To said vessel I is connected a similar vessel, K, by a pipe, L. The drying-vessel I is provided with two perforated diaphragms, *d* and *e*, one near the top and the other near the bottom.

The drying-vessel K is also provided with two perforated diaphragms, *m* and *n*. The arrangement of the diaphragms in the vessels is such as to form a space or chamber above the upper diaphragms, and a similar chamber below the lower ones.

The arrangement and connections of the several parts of the apparatus and their relations to each other will be fully understood on examination of the drawings. The covers of the several vessels are to be fitted gas-tight, and so also are the pipes in connection therewith.

Having described the construction and arrangement of the several parts of the apparatus, the practical operation of the same is as follows: In the retort A is poured a quantity of water of ammonia, (the aqua-ammonia of commerce,) so that the vessel is full near to the top of section B. The contents of the retort is now heated by the coiled pipe P, through which steam highly heated is passed, entering the coil at *a*, and passing therefrom through the end *b*. From the heated contents of the retort ammoniacal gas, containing more or less watery vapor, is evolved, which passes over through the pipe B' into the coil G of the cooler F. The coil being surrounded by water of low temperature, the gas, with what water it may contain, is cooled on passing down through the coil, from which it escapes into the receiver or trap H through the pipe F'.

The watery vapor that the gas may have held on passing through the condenser or cooler will be deposited in the trap or receiver, from which it may be drawn through the cock

M, while the ammoniacal gas passes on through the pipe J to the absorbent vessel I, into which it flows under the perforated diaphragm *e*. The space between the lower and upper diaphragms is filled with any suitable material having an affinity for water, as lime or caustic potash, as an absorbent.

As the gas passes upward through the absorbent, the moist vapor that the gas may contain is taken up by the absorbent material, while the dry gas passes onto the second absorbent-vessel, K, for being further dried by absorbing therefrom whatever moisture or vapor of water may still remain in the gas by the absorbent material that the vessel may contain. From the said vessel K the ammoniacal gas thus freed from water or watery vapor may now be taken through the eduction-pipe N to a compressing gas-pump for use in the manufacture of ice.

The purpose of the perforated diaphragm in the absorbent-vessels is to filter the gas so that no particles of the absorbents may pass along with it to the condensing-pump.

The watery residuum left in the retort is drawn off through the cock A', and so also that

which may be deposited in the bottom of the absorbers may be taken therefrom by the cocks *c'*. Water is conducted into the cooler through the induction-pipe P', Fig. 1, and is discharged therefrom by the eduction-pipe D'. A constant stream of water is permitted to flow into the cooler to facilitate the process of cooling the gas as it runs over from the retort to the receiving-trap.

M' is an exhaust-pump, for exhausting the air, &c., from the several vessels after the completion of one process for the initiation of another. To this end the pump is attached to the outlet at A' by a hose, for the purpose specified.

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

The combination and arrangement of a retort, A, worm or condenser F, trap-receiver H, and drying-chambers I and K, constructed substantially as herein described, and for the purpose set forth.

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Witnesses:

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