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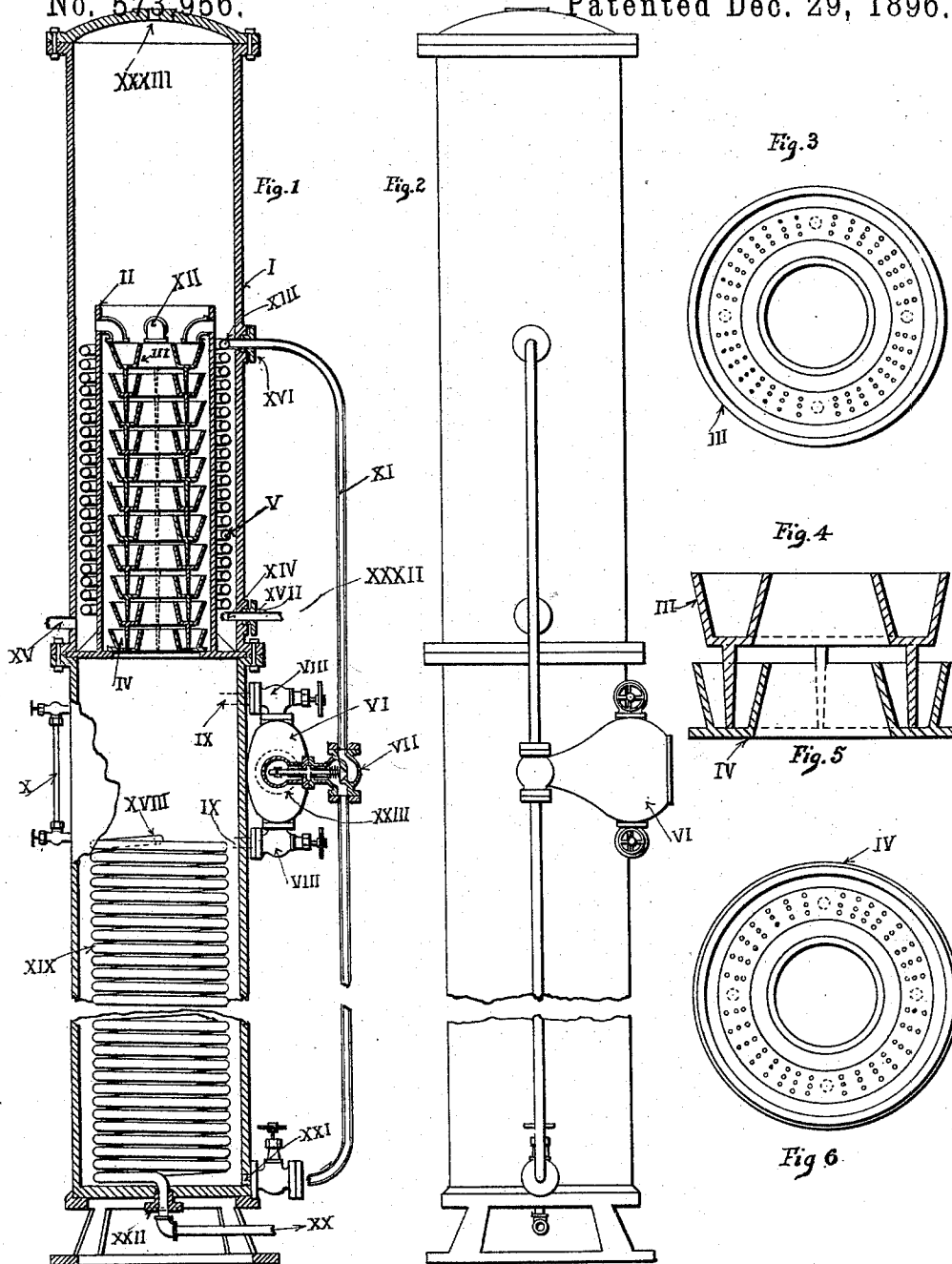
2 Sheets—Sheet 1.

L. H. BACHMANN & O. R. SULZER.

AMMONIA GAS GENERATOR.

No. 573,956.

Patented Dec. 29, 1896.



WITNESSES:

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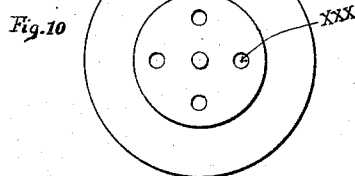
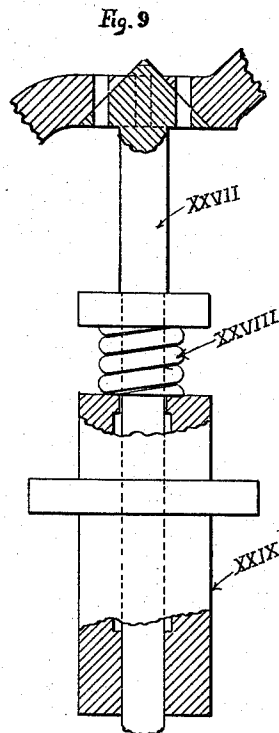
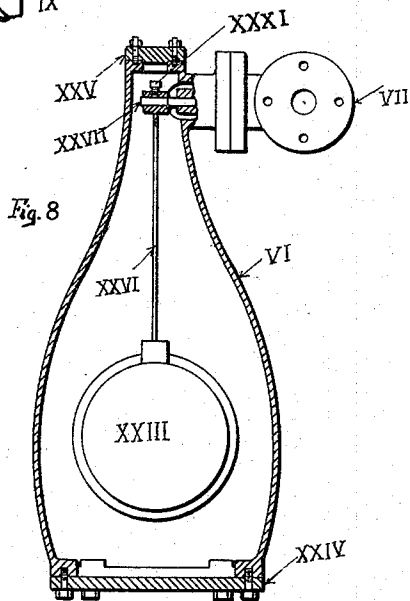
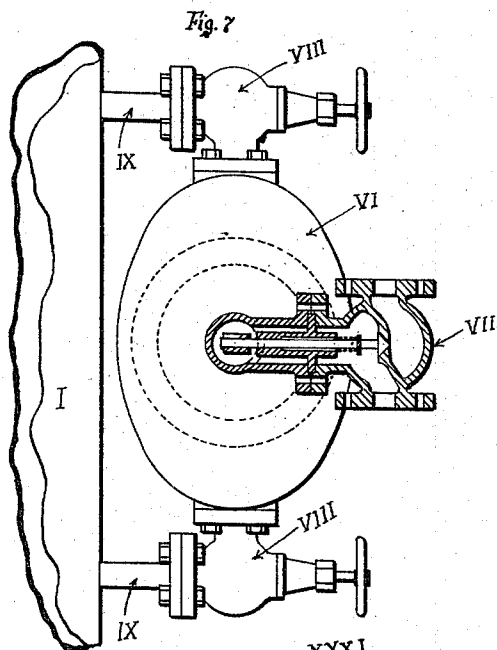
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WITNESSES:

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UNITED STATES PATENT OFFICE.

LOUIS HENRY BACHMANN AND OSCAR R. SULZER, OF LOUISVILLE,
KENTUCKY.

AMMONIA-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 573,956, dated December 29, 1896.

Application filed May 11, 1895. Serial No. 549,005. (No model.)

To all whom it may concern:

Be it known that we, LOUIS HENRY BACHMANN and OSCAR R. SULZER, citizens of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Ammonia-Gas Generators; and we 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.

Figure 1 is a vertical sectional view of our generator, and Fig. 2 is a perspective view of the same. Fig. 3 is a top view of one of the series of rectifying-pans III, and Fig. 4 is a vertical sectional view of the same. Fig. 5 is a vertical sectional view of the lowest rectifying-pan IV, and Fig. 6 is a top view of the same. Fig. 7 is a vertical sectional view of the regulating-valve VII, showing the float vessel VI connected to the cylindrical vessel I. Fig. 8 is a horizontal view, partly in section, of the liquor-regulator, consisting of the valve VII and the float vessel VI. Fig. 9 is a view, partly in section, of the valve-stem XXVII, its seat, and its bearing XXIX. Fig. 10 is a top view of the valve-stem XXVII and its bearing XXIX, showing the port-holes XXX, through which the liquor passes.

In the different figures like numerals indicate like parts.

I is a cylindrical vessel made in two sections and united by means of bolts passing through flanged ends. Its dome-shaped top is secured to the upper section by bolts passing through flanges, and we prefer to have the bottom formed in one piece with the lower section of the vessel, which is provided with a suitable base to rest upon, as shown in Figs. 1 and 2. A recess is left between the center flanges of the vessel I for the insertion of the outward flange of the stand-pipe II and of gum gaskets, whereby tight joints are made. The stand-pipe II is cylindrical in shape, flanged inwardly and outwardly at bottom, and having the outer flange strengthened with angle-ribs at intervals in its circumference, as shown in Fig. 1, in order to withstand the weight of the rectifying-pans III and IV. The inner flange of the

stand-pipe II supports the flanged bottom of the rectifying-pan IV, upon which is placed the series of rectifying-pans III. The pans III rest upon legs, preferably four to each pan, and the bottoms of all the pans are perforated.

In the upper part of the stand-pipe II are the overflow elbow-openings XII, through which the strong liquor passes into the upper pan III.

V is a spiral coil of pipe through which the exhausted liquor circulates. Its upper end is connected by the elbow XIII to the pipe XI and its lower end by the elbow XIV to the outlet-pipe XXXII.

XVI and XVII are stuffing-boxes in the vessel I, through which pass the pipes XI and XXXII.

VI is a liquor-regulator vessel, and is connected to the lower section of the vessel I by the valves VIII and the circulating-pipes IX. The valves VIII, which are placed at the top and bottom of the vessel VI, and the pipes IX, which just penetrate the wall of the vessel I, allow the liquor and gases arising from it to circulate freely between the lower section of the vessel I and the regulator vessel VI.

VII is the regulator-valve, having a bevel-shaped seat, as shown in Figs. 7 and 9, and is connected with the pipe XI, through which the flow of the exhausted liquor is regulated.

X is a glass gage which shows the height of the liquor in the lower section of the vessel I.

XI is the exhausted-liquor pipe and leads from the valve XXI, near the bottom of the lower section of the vessel I, to the valve VII, and from thence to the elbow XIII at the upper end of coil V through the stuffing-box XVI. The pressure in the vessel I is about one hundred and seventy-five pounds to the square inch. It is the same in the lower part of the pipe XI below the valve VII, but in the upper part of the pipe XI above the valve VII the pressure is low, about two and one-half to ten pounds per square inch.

XV is the inlet-pipe, through which the strong liquor enters the space between the walls of the upper section of the vessel I and the stand-pipe II.

The coil of steam-pipe XIX enters the lower

section of the vessel I at XVIII through a stuffing-box (not shown) and passes out through the stuffing-box XXII and into the steam-discharge pipe XX.

5 XXIII is the floating ball of the regulator vessel VI, and XXVI is its lever.

XXV is a head to close the opening in the vessel VI, through which is manipulated the set-screw XXXI of the lever XXVI.

10 XXIV is a head to close the opening in the vessel VI, through which the ball XXIII is placed or removed.

XXVII is the bevel-seated stem of the valve VII, having, preferably, four circular ports 15 XXX, and it oscillates in its bearings XXIX so as to close or open the ports as the ball XXIII falls or rises, respectively, with the level of the liquor in the regulator vessel VI and the lower section of the vessel I. The stem-bearing XXIX is held in place in a recess between 20 the flanges of the regulator-chamber VI and the valve VII. The valve-stem XXVII is held to its seat by the spiral spring XXVIII, as well as by the pressure of the liquor in the regulator-chamber VI. The spring retains 25 the valve in position should the pressure in the regulator-chamber be removed.

XXXIII is an opening in the top of the vessel I, through which the anhydrous gas 30 passes from it.

In practice the cold strong liquor is introduced into the space between the walls of the upper section of the vessel I and the stand-pipe II through the inlet-pipe XV, where it 35 comes in contact with the heated exhausted-liquor coil V and rises to the overflow-elbows XII, through which it passes into the upper of the series of rectifying-pans III. It descends through the perforations in the bottoms of the rectifying-pans III and IV and 40 falls into the heated liquor in the lower part of the vessel I. The strong liquor is heated by the steam-pipe XIX, into which the steam enters at XVIII and from which it passes 45 through the outlet XXII into the exhaust-pipe XX. The aqueous and anhydrous ammonia gases rise from the heated liquor and mingle in their ascent with the descending cooler liquor in the pans III and IV. The gases im- 50 part their heat to the cooler liquor, extracting anhydrous gas from it, and the cooler liquor in turn condenses the aqueous gas, which falls into the heated liquor below, while the nearly pure anhydrous gas rises and passes out of 55 the generator at the opening XXXIII.

The heated liquor is maintained at a certain level in the lower section of the vessel I by means of the regulator vessel VI and valve VII. The heated liquor and gases pass freely 60 through the pipes IX and valves VIII from the lower section of the vessel I into the liquor-regulator vessel VI and maintain the same level in each. A fall of liquor in the lower section of the vessel I causes the floating ball 65 XXIII to fall with the liquor in the regulator-vessel VI, which closes the ports in the valve VII by turning the valve-stem XXVII and

prevents the passage of liquor through the pipe XI until the normal level of the liquor is reached in the lower section of the vessel 70 I, when the floating ball is raised and the ports in the valve VII are opened sufficiently wide to allow the liquor to maintain its normal level. Should the liquor rise above the 75 normal level, the ball rises and opens the ports to allow a more rapid passage of the liquor through the valve VII. The heated liquor, when exhausted, is forced from the lower section of the vessel I by the pressure of the gases through the valve XXI, into the lower 80 part of the pipe XI, through the ports of the valve VII, and into the upper part of the pipe XI, from which it passes into the coil of pipe V and away from the generator through the 85 pipe XXXII. The coil of pipe V is heated by the exhausted liquor within it, which in turn heats the cold strong liquor as it enters the vessel I through the inlet XV and comes in contact with the coil of pipe V.

When it is necessary, for adjustment or re- 90 pairs, to detach the regulator vessel from the generator or to open the heads XXIV and XXV, the valves VIII, VIII, and XXI are closed, so as to prevent the entrance of the liquor into the pipe XI or into the regulator 95 vessel VI.

Among the advantages of our invention are the manufacture of pure anhydrous ammonia-gas by introducing cold strong liquor into the upper section of the generator, where it first 100 receives heat from the coil of pipe V, containing the heated exhausted liquor, and is then mingled in the stand-pipe and pans with the heated gases arising from the lower section of the generator, which drives off part of it 105 as gas and raises its temperature, thus saving fuel. The mingling of the cold strong liquor with the gases in the pans of the stand-pipe condenses the aqueous gas and allows the pure anhydrous gas to rise to the upper 110 section of the generator. The regulation of the height of the liquor keeps the steam-pipe XIX constantly submerged in the heated liquor and prolongs its duration.

Having fully described our invention, what 115 we claim as new, and desire to secure by Letters Patent, is—

1. In an ammonia-gas generator the combination of a vessel, a stand-pipe in the upper part or section thereof a series of rectifying- 120 pans within said stand-pipe, an exhausted-liquor coil around said stand-pipe, a steam-pipe in the lower part or section of said vessel, an automatic regulator connected with the lower section or part of said vessel, and a 125 valve applied to said regulator and having pipe connection with said coil in the upper section of said vessel and with the lower section or part of said vessel, substantially as set forth. 130

2. In an ammonia-gas generator, the combination of a vessel, a stand-pipe in the upper part or section thereof, a series of rectifying-pans therein, an exhausted-liquor coil around

said stand-pipe, and the overflow elbow passages or pipes between the top of said stand-pipe and the uppermost pan, substantially as set forth.

5 3. In an ammonia-gas generator the combination of a vessel, a stand-pipe in the upper section thereof, a series of rectifying-pans in said stand-pipe, an exhausted-liquor coil around said stand-pipe, and the steam-pipe
10 coil or pipe in the lower section or part of said vessel for heating liquor in said lower section of said vessel, substantially as set forth.

4. In an ammonia-gas generator, the combination of a vessel, the stand-pipe in the upper section or part thereof, the exhausted-liquor coil around said stand-pipe, and the series
15 of rectifying-pans having perforated bottoms, to cause the descending strong liquor to finely divide and fall rapidly whereby a large percentage of anhydrous gas is released by the
20 heat supplied to the pans by ascending gases substantially as set forth.

5. In an ammonia-gas generator, the combination of a vessel, a stand-pipe in the upper
25 section or part thereof, a series of rectifying-pans in said stand-pipe and an exhausted-liquor

coil around said stand-pipe and a steam or heating coil in the lower section or part of said vessel, said heated lower section having
30 pipe connection with the upper section of said vessel, to heat the liquor therein, substantially as set forth.

6. In an ammonia-gas generator, the combination of a vessel, a stand-pipe therein, a series of rectifying-pans in said stand-pipe,
35 an exhausted-liquor coil around said stand-pipe, a steam-heating pipe in the lower section of said vessel and an automatic regulator comprising a chamber connected to said lower
40 section of said vessel and containing a float connected by a stem to a valve arranged in a separate chamber, connecting with the afore-said chamber and with said lower section of
45 said vessel and with said exhausted-liquor coil, substantially as set forth.

In testimony whereof we affix our signatures in the presence of two witnesses.

L. HENRY BACHMANN.
OSCAR R. SULZER.

Witnesses:

F. W. SULZER,
EDW. W. NOLTE.