

(No Model.)

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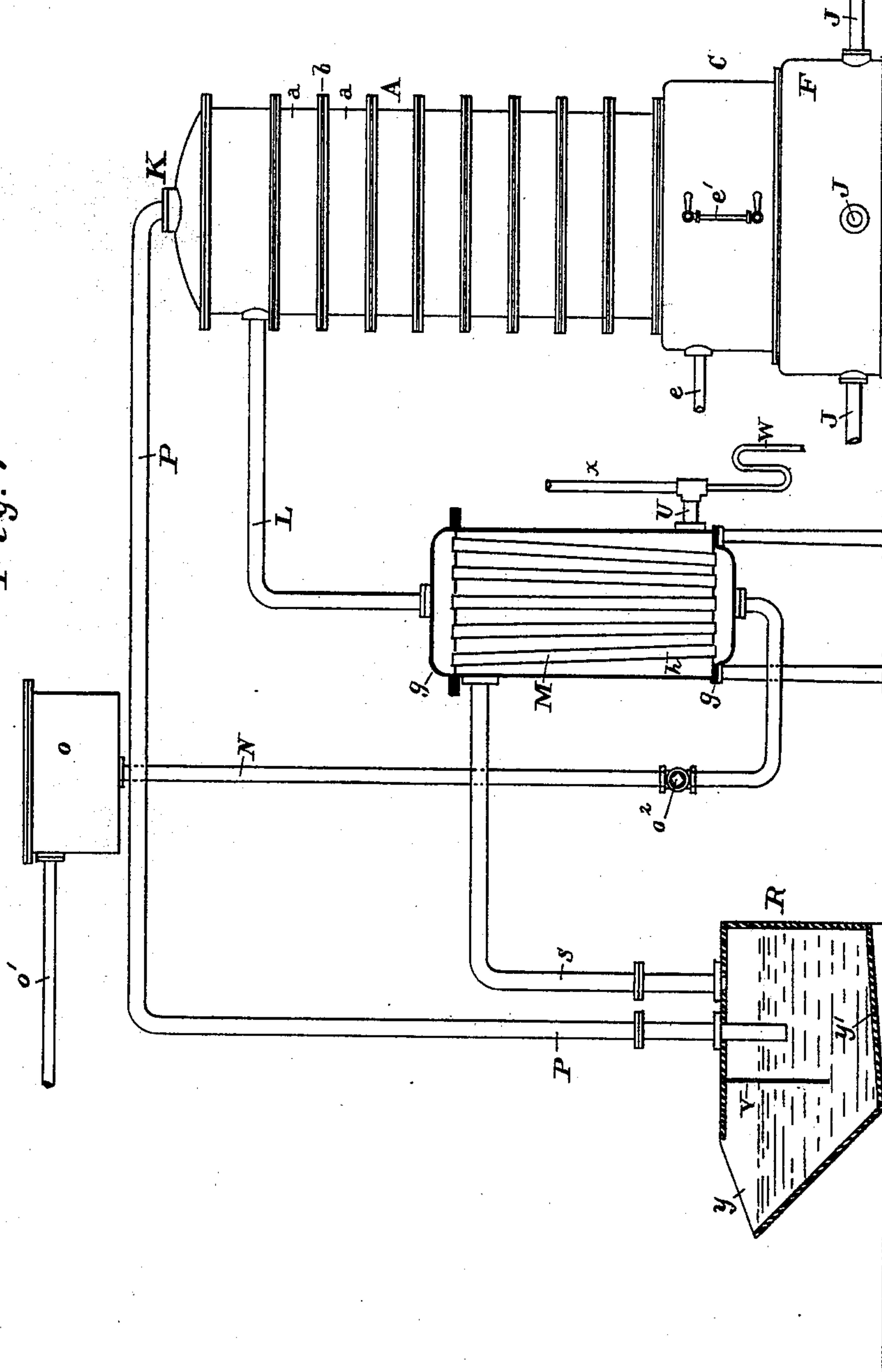
W. SIMPKIN.

APPARATUS FOR MAKING AMMONIUM SULPHATE.

No. 376,351.

Patented Jan. 10, 1888.

Fig. 1



WITNESSES:

John E. Morris.
A. C. Eader

INVENTOR:

W^m Simpkin

BY Chas B. Mann

ATTORNEY.

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2 Sheets—Sheet 2.

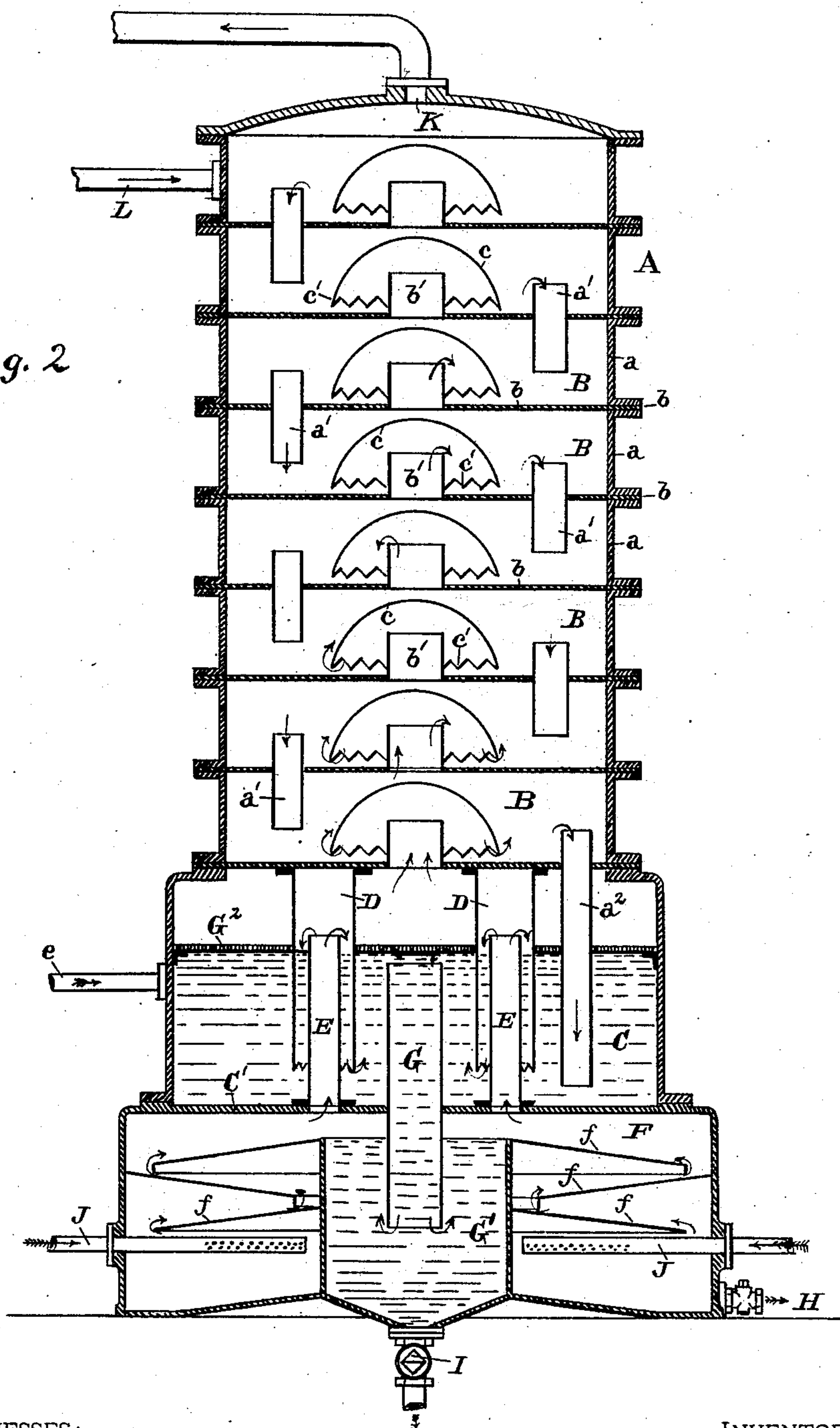
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Fig. 2



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UNITED STATES PATENT OFFICE.

WILLIAM SIMPKIN, OF RICHMOND, VIRGINIA.

APPARATUS FOR MAKING AMMONIUM SULPHATE.

SPECIFICATION forming part of Letters Patent No. 376,351, dated January 10, 1888.

Application filed August 13, 1886. Serial No. 210,844. (No mode'.)

To all whom it may concern:

Be it known that I, WILLIAM SIMPKIN, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Apparatus for the Manufacture of Sulphate of Ammonia, of which the following is a specification.

This invention relates to improvements in apparatus for converting ammoniacal liquor or crude gas-liquor into sulphate of ammonia.

The improved apparatus is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of the apparatus. Fig. 2 is a vertical section of the column-still.

The letter A designates a column-still formed of rings *a*, separated from each other in the usual manner by horizontal plates *b* and forming a series of chambers, B, which are connected by pipes *a'* and *b'*. The side pipes, *a'*, are for the downflow of the ammoniacal liquor, and the center pipes, *b'*, are for the up passage of steam. Each side pipe, *a'*, projects both above and below the horizontal division-plate *b*, to which it is attached, while each center pipe, *b'*, projects only above said plate. The top level of the liquor-pipes *a'* being below the top level of the steam-pipes *b'*, causes the liquor to flow down from chamber to chamber through these pipes without interfering with the up passage of the steam. Over each of the steam-pipes *b'* is placed a deflecting-hood, *c*, having a serrated edge, *c'*, which sets lower than the top of the liquor-pipes *a'*. This hood forces the steam through the liquor in the chamber B in finely-divided streams. The liquor upon reaching the lower chamber, B, flows over and down the long pipe *a²* into the decomposing-chamber C, in which are a number of pipes, D, suspended by their upper ends from the top of said chamber and their lower ends serrated and coming near the bottom plate, C', of said chamber. A pipe, E, is fixed to the bottom plate, C', and projects up into each pipe D. The lower end of each pipe E opens through the bottom plate, C', to the lower chamber, F, for the purpose hereinafter described. A horizontal perforated plate, G², is fixed in the decomposing-chamber C. Milk of lime is introduced into the decomposing-chamber C through the pipe *e* by means of a pump (not shown) or any other suitable device. The

height of the milk of lime in this chamber can be observed through means of the column-gage *e'*.

In the center of the decomposing chamber C, and extending down through the bottom plate, C', thereof, is a pipe, G, the lower end of which opens into a receptacle, G', placed in the center of the lower steam-chamber, F. Around the receptacle G', and also attached to the walls of the lower chamber, F, are a series of inter-lapping sheds or plates, *f*, set at a slight angle, inclining downward, and having their outer edge bent down, forming a flange, so as to leave a small annular space between each flanged edge and the face of the next lower plate. An overflow-pipe, H, leads from the lower chamber, F, for spent liquor, and a valve, I, is for emptying the overflow-receptacle G'. Steam is admitted at different points in the lower chamber, F, by the perforated pipes J, which are placed directly under the lower shed-plate, *f*. An outlet, K, at the top is for the saturated steam, and an inlet, L, for the ammoniacal liquor.

An ordinarily-constructed surface condenser, M, is here shown. The heads *g*, which carry the tubes *h*, can be readily removed from the outer case for cleaning purposes. A supply-tank, *o*, has connection by pipes *o'* with the storage-tank (not shown) to give a constant and steady supply of ammoniacal liquor to the apparatus. A pipe, N, carries this crude liquor from the tank O to the condenser M. This pipe has a valve, O², which controls the supply of liquor to the condenser. A pipe, P, is connected with the outlet K of the column-still A and conducts the saturated steam therefrom to the saturator-vessel R. A second pipe, *s*, is also attached to the bell connecting the latter with the top end of the surface-condenser M. At the bottom of the surface-condenser is an outlet, U, having two connections on its outside W and X.

Having described the construction and arrangement of the parts composing the apparatus, I will now describe the method of working the same.

Steam at about ten pounds' pressure is admitted to the apparatus through the pipes J. The ammoniacal liquor flows from the supply-tank O, and thence down pipe N to the base of the surface-condenser M. It passes up

through the tubes *h* of the surface-condenser and through the inlet-pipe *L* and into the top chamber, *B*, of the column *A*. The liquor flows down from chamber to chamber through the pipes *a'* until it reaches the bottom chamber, *B*, where it flows down the long pipe *a''* into the decomposing-chamber *C*. Milk of lime is introduced into this chamber, to effect the separation of the lime combinations. The mixed ammoniacal liquor and milk of lime, upon rising to the level of the overflow-pipe *G*, passes down into the receptacle *G'*. Here the sediment is deposited, and may be removed by opening the valve *I* in the bottom. The liquor then flows over the edges of the receptacle *G'* in the steam-chamber and down the sheds or inclined plates *f*, where it spreads out into a thin layer, meeting in its flow the incoming steam. The spent liquor, which is freed from ammonia, runs off by the outlet *H*. The steam, after being intimately brought in contact with the liquor on the sheds or plates, passes up through the inclosed pipes *E* and over these edges and down the annular spaces in pipes *D* in the decomposing-chamber. This action of the steam brings it most intimately in contact with the mixed lime water and ammoniacal liquor, and here the decomposition begins to take place. The freed steam passes up through the perforations of the plate *G''*, and then from chamber to chamber *B* through the pipes *U'*. Thus the steam becomes saturated with ammonia, and from the top of the column *A* the steam, now surcharged with ammonia, passes off by the outlet-pipe *K*, through pipe *P*, and into the top of the saturator *R*, and is immersed in the sulphuric acid, and here the sulphate of ammonia is formed by a well-known chemical action. The gases--such as sulphureted hydrogen--that have no affinity for sulphuric acid pass up the pipe *S* to the top end of the surface-condenser *M*, where the vapors, passing through the body of the condenser, are condensed and pass out the outlet *U* and connected trapped pipe *W*. The vapors that are not condensed pass off by the connected pipe *X*, and may be carried under a boiler-furnace and burned, or may be carried to a purifier charged with oxide of iron. The surface-condenser *M* operates to serve two purposes: it condenses the waste acid and other gases

from the apparatus, and the waste gases heat the incoming ammoniacal liquor which is flowing up through its tubes *h*, whereby said liquor enters the column *A* at an elevated temperature.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In an apparatus for the production of sulphate of ammonia, the combination of the column-still, the decomposing-chamber *C* below said column, the suspended pipes *D*, having their lower ends near the bottom plate of the decomposing-chamber, the vertical pipes *E*, projecting up into the said suspended pipes and having their lower ends open through the said bottom plate, for the purpose set forth, the steam-chamber *F*, inlets and outlets *J* *H*, the settling-receptacle *G'*, the overflow-pipe *G*, and the inclined sheds, all constructed and adapted to operate substantially as described.

2. In an apparatus for the production of sulphate of ammonia, the combination, with a decomposing-chamber, *C*, of a steam-chamber, *F*, below it, a settling-receptacle, *G'*, in the center of the steam-chamber, a series of interlapping sheds or downwardly-inclining plates attached both to the walls of the steam-chamber and the central receptacle, for the purpose set forth, the surface-condenser communicating with the still, the reservoir *O*, and the saturator, and the pipe forming a direct communication between the said still and saturator, substantially as specified.

3. In an apparatus for the production of sulphate of ammonia, the combination of the column-still, the surface-condenser, a saturator having an open mouth, *y*, an inclined bottom, *y'*, and a diaphragm, *v*, a pipe, *L*, for crude liquor connecting the condenser with the column, a pipe, *P*, connecting the column with the saturator, and a pipe, *S*, connecting the condenser and saturator, as and for the purpose set forth.

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

WILLIAM SIMPKIN.

Witnesses:

JULIUS STRAUS,
J. ADAIR PLEASANTS.