(No Model.)

G. STROH & G. OSIUS.

AMMONIA STILL.

No. 458,798. Patented Sept. 1, 1891.

Fig. 1

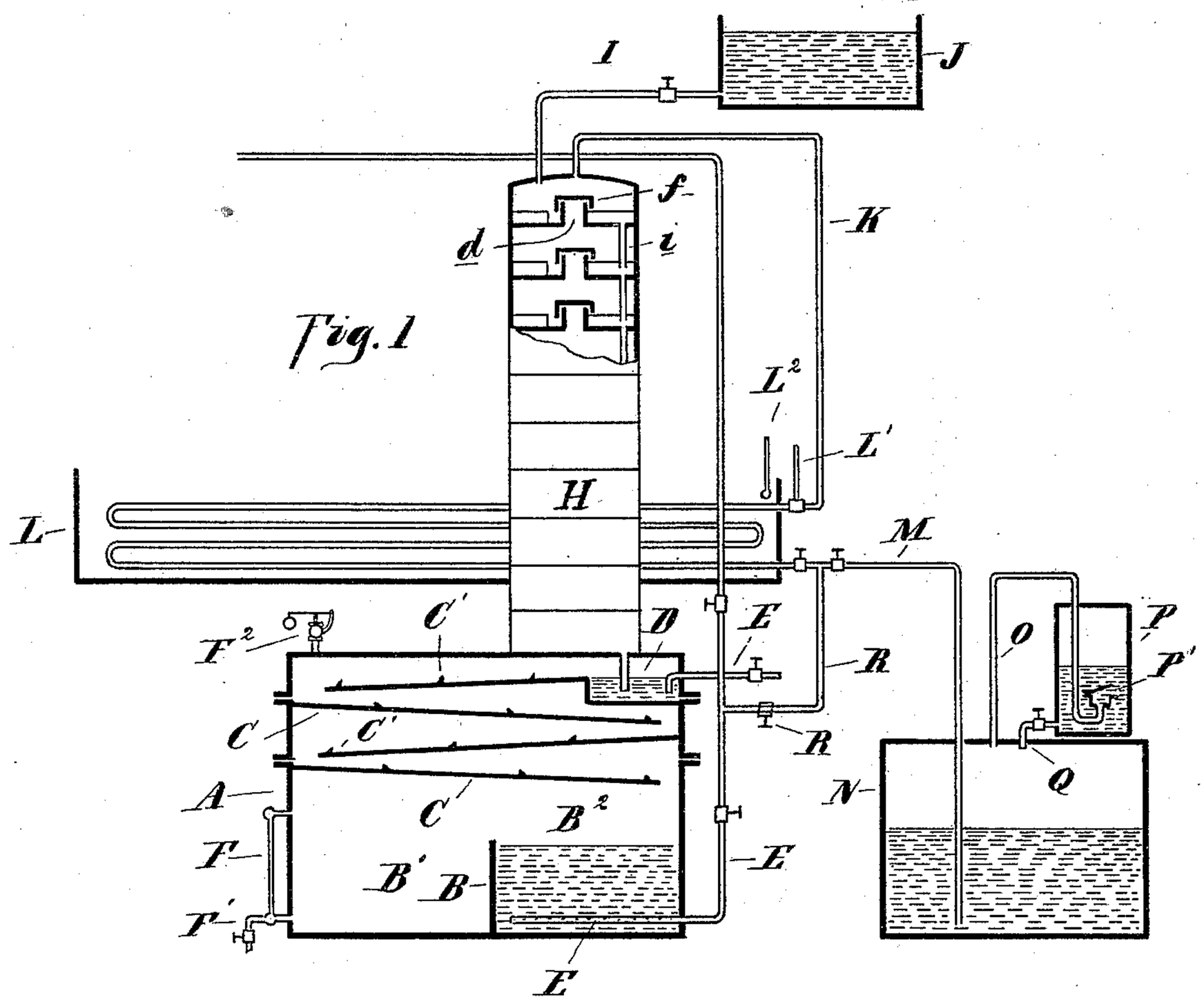


Fig. 3

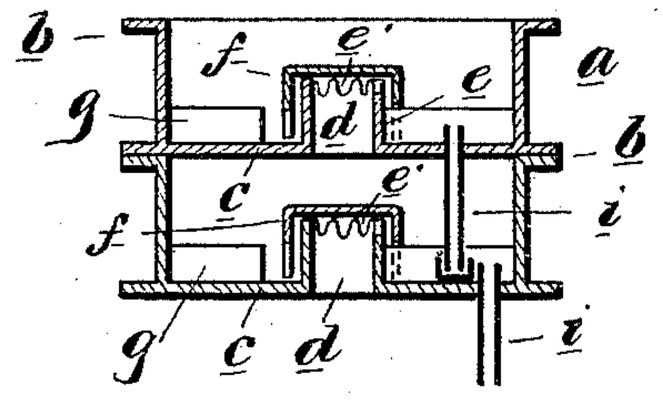
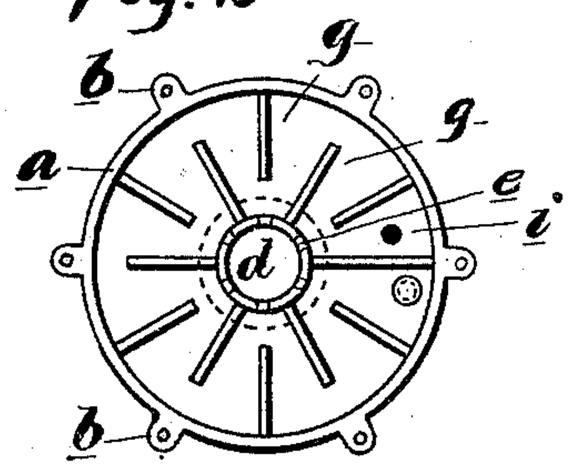


Fig. 2



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UNITED STATES PATENT OFFICE.

GEORGE STROH AND GEORGE OSIUS, OF DETROIT, MICHIGAN.

AMMONIA-STILL.

SPECIFICATION forming part of Letters Patent No. 458,798, dated September 1, 1891.

Application filed April 24, 1891. Serial No. 390,349. (No model.)

To all whom it may concern:

Be it known that we, GEORGE STROH and GEORGE OSIUS, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Ammonia-Stills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates specifically to the manufacture of ammonia or its products from ammoniacal liquors, such as obtained in the destructive distillation of animal or vegetable matter, in the manufacture of gas, &c., and it is designed to form an improvement on the apparatus for which Letters Patent were granted to us September 2, 1890, No. 435,464.

In our present improvement the process involved is the same—that is, the ammonia is vaporized by passing the crude liquor through a column, in which it is heated by steam, which carries the ammonia vapors into a condenser from which the ammonia liquor flows into a receiver, and in connection with the column a decomposing-chamber is provided into which milk of lime or other suitable reagent is introduced.

Our present improvement consists in the improved construction of the column of the decomposing-chamber and of the receiver, all as more fully hereinafter described, and specifically pointed out in the claims.

In the drawings, in which different parts are indicated by letters of reference, Figure 1 is a diagrammatic sectional elevation of our improved apparatus. Fig. 2 is a plan view of one of the sections of the column. Fig. 3 is an enlarged vertical central section through two superimposed sections of the column.

A is the decomposing-chamber, divided near the bottom by a vertical partition B into two compartments, B′ and B^2, and containing in the upper portion a vertical series of inversely-inclined metallic shelves C, extending from one side of the chamber to within a short distance from the opposite side. The uppermost one of these inclined shelves is provided with a well D, into which milk of lime or lime-water is introduced through a pipe E. The shelves are provided upon their upper face with dams C′, and the upper portion of this decomposing-chamber is preferably constructed in sections, whereby additional shelves may be added, if necessary, to increase the capacity.

E is a steam-pipe entering near the bottom of the compartment B^2 and terminating within said compartment into the perforated steam-nozzle or steam-pipe E′. The other compartment B′ is provided with a water-glass F and a discharge-outlet F′, controlled by a suitable valve. A safety-valve F^2 is also preferably provided on top of the decomposing-chamber.

The whole decomposing-chamber is preferably constructed of cast or boiler iron and supplied with steam through the pipe E. Above this decomposing-chamber is placed the usual column H, consisting of a vertical series of like sections of the construction shown more fully in Figs. 2 and 3, wherein *a* represents a cylindrical wall. *b* represents the flanges, by means of which the sections are bolted or secured together. *c* represents the bottom of each section. *d* represents a central aperture. *e* represents a circular wall around this aperture and provided with indentations *e′* upon its upper edge. *f* represents a flanged cover loosely supported upon the circular flange *e* and likewise indented upon the lower edge of its depending flange. *g* represents radial fins extending alternately from the wall *a* toward the wall *e* and from the wall *e* toward the wall *a*. *h* represents a radial partition extending from the wall *a* to the wall *e*, and *i* represents a discharge-pipe from one section to the other. The top of this column is closed by a suitable cover, and into this cover the discharge-pipe I leads into the top of the column. Through this pipe I the crude ammoniacal liquor is fed in a regulated stream from a suitable tank J or by a pump, and another pipe K leads from the top of the column into the condenser L, which is of any suitable or desired construction, for the purpose of condensing the ammoniacal vapors escaping from the column.

In the drawings a pipe-coil is shown inclosed in a tank, through which cold water or other refrigerating agent is caused to flow, and for the proper controlling of the apparatus thermometers L′ L^2 are suitably placed to ascertain the temperatures of the vapors and of the refrigerating agent.

The tail-pipe M connects the condenser with

a receiver N in such a manner as to conduct the products of condensation from the coil into the receiver, the pipe M extending to near the bottom of said receiver. This receiver forms a closed chamber, and is provided with an escape-pipe O, which enters into the top of the supplementary receiver P, placed above the reservoir N, and a small discharge-pipe Q connects the supplementary receiver P with the reservoir N. The discharge end of the pipe O is provided with a check or gravity valve P′, which is normally closed. A by-passage R, controlled by the valve R′, connects the steam-pipe E with the discharge-pipe M.

In practice the parts, being arranged and constructed substantially as described and shown, are intended to operate as follows: Steam is admitted through the pipe E into the decomposing-chamber A, where it will escape from the steam-nozzle E′ and pass up through the liquid usually contained in the chamber B′ up to the height of the partition B. After passing up between the shelves C in the decomposing-chamber it will pass up into the column and through the several sections thereof, escaping through the pipe K into the condenser. The flow of the ammoniacal liquor is in the opposite direction, passing in a regulated steam through the pipe I into the top of the column, and thence through the different sections out through the bottom into well D. Here it becomes mixed with the milk of lime, and is spread out by the sleeves C over a large surface and retarded by the dams in its flow until it passes from the lower shelf into the compartment B^2, from which it is discharged through the outlet F′. It will be seen that in its upward flow the steam will thoroughly heat the shelves C, and thereby heat the liquor spread in a thin sheet over the same to such an extent as to thoroughly eliminate the ammonia contained in the liquor, and this will be carried off by the steam through the column into the condenser. The same action of heating and vaporizing is performed by the steam in passing through the column, and it will be seen that by means of the radial partitions a circuitous path is formed in each section, the sections being also placed upon each other, so that the liquor flows into one section on one side of the partition H and flows out from said section to the next one below on the other side of the partition H, thus causing the liquor to flow in a zigzag around the radial partitions in each section. By thus delaying the flow of the liquor the steam is enabled to thoroughly heat it and vaporize the ammonia. To prevent the direct passage of steam and vapor the discharge-pipes *i* reach far enough down, preferably into a little cup, to become sealed by the liquor at the lower end, the upper end of the discharge-pipe being slightly below the radial partitions. The steam and vapor pass from one section to the other, as in the usual construction of the columns, by passing up through the apertures *d*, through the indentations *e′* below the cover *f*, and out through the indentations on the depending flanges of the cover. The indentations of the cover are made deep enough to admit of placing such cover over the radial partitions. The lower section of the column discharges into the well D, where it is mixed with the milk of lime or lime-water, the influx of which, together with the displacement caused by the inflow of liquor into the well, thoroughly agitates the contents of the well and mixes the two bodies together, while a constant overflow takes place over the well onto the inclined shelves. The dams placed on these shelves not only retard the flow, but also tend to spread the liquor evenly upon the plates, so as to thoroughly expose the liquor to the action of the heat. The ammoniacal vapors escaping from the column are carried to the condenser and pass as ammonia-liquor into the receiver N. By filling the supplementary receiver P with some water or other absorbent all waste of ammonia may be prevented, as any ammonia-vapor escaping from the receiver N is carried through the pipe O into the supplementary receiver P. The valve P′ acts as a check-valve to prevent the contents of the receiver from being siphoned or forced over into the receiver N. A less saturated solution of ammonia may thus be obtained in the receiver P, which may be either drawn off separately or let into the receiver N. The by-passage R is for the purpose of using steam in case the pipes should become clogged, and it will be seen that by proper use of the valves provided in the steam-pipes steam may be blown in the reverse way into the apparatus, and thus used to remove all possible obstructions caused by formation of crystals or otherwise.

The leading object of our improvement is to effect the greatest economy in the use of steam, to make the apparatus simple and compact, to eliminate and collect all the ammonia from the liquor, and to carry out the process of concentrating ammoniacal liquors perfectly automatic in all its parts.

What we claim as our invention is—

1. In an apparatus for the distillation of ammonia from ammoniacal liquors, a decomposing-chamber provided with a vertical series of inversely-inclined metallic shelves, a well in the upper shelf for the reception of a decomposing agent, a steam-supply into said chamber, and a column communicating with the top of the decomposing-chamber and having a discharge-pipe for the liquor extending into said well, substantially as described.

2. In an apparatus for the distillation of ammonia from ammoniacal liquors, the decomposing-chamber A, consisting of the lower section provided with the compartments B′ B^2 and steam-nozzle E, the superimposed series of upper sections, each provided with an inclined metallic shelf having dams C^2, the well D, formed in the upper shelf, and the

pipe E for supplying said well with milk of lime, substantially as described.

3. In an apparatus for the distillation of ammonia from ammoniacal liquors, the column H, consisting of a vertical series of like sections provided with the radial fins *g* and partition *h*, forming a zigzag pathway on the bottom of each section, and the discharge-pipe *i*, arranged alternately on opposite sides of the partition *h*, substantially as described.

4. In an ammonia-still, the combination of a decomposing-chamber, a column communicating with the top of the chamber, a steam-supply pipe entering the bottom of the chamber, a condenser, a pipe between the same and top of the column, a receiver, a tail-pipe connecting the same and condenser, a steam-pipe R, connected into the steam-supply and the tail pipe, and valves in the tail, supply, and steam-connecting pipe R, substantially as described.

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

GEORGE STROH.
GEORGE OSIUS.

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