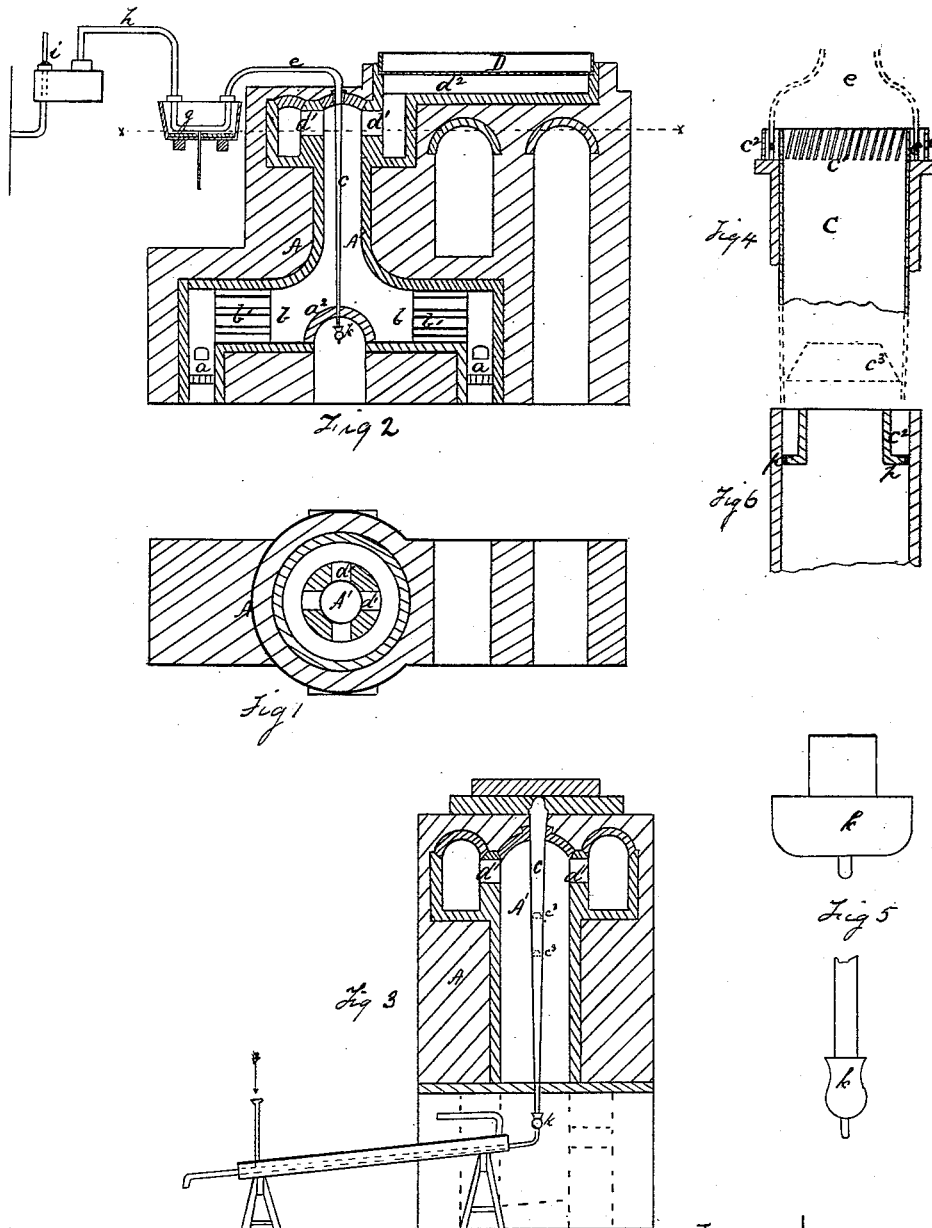


G. A. HAGEMANN.

Apparatus for Concentrating Sulphuric-Acid.

No. 165,567.

Patented July 13, 1875.



WITNESSES.
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UNITED STATES PATENT OFFICE.

GUSTAV A. HAGEMANN, OF COPENHAGEN, DENMARK.

IMPROVEMENT IN APPARATUS FOR CONCENTRATING SULPHURIC ACID.

Specification forming part of Letters Patent No. 165,567, dated July 13, 1875; application filed May 21, 1875.

CASE A.

To all whom it may concern:

Be it known that I, GUSTAV A. HAGEMANN, of Copenhagen, Denmark, have invented a new and useful Improvement in Apparatus for the Concentration of Sulphuric Acid; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a horizontal section of a furnace for concentrating sulphuric acid. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a section at right angles to Fig. 2. Figs. 4 and 5 are enlarged views of the conical evaporating tube or pipe; and Fig. 6 is a view of the preferred form of pipe when of cast-iron or similar material.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of apparatus for the concentration of sulphuric acid; and it consists, first, in combining with a furnace-flue one or more conical evaporating pipes or tubes, extending through the flue, and in communication with the cooler and condenser; second, in combining an injector or similar device with the vapor-pipe leading from the evaporating-pipe, whereby a current of air may be induced in the evaporating pipe or tube to facilitate the concentration of the acid, and to carry off the vapors; third, in providing the interior of the evaporating-tube with a series of rings or checks to distribute the acid evenly over the interior surface of the tube, and to regulate the flow.

I will now proceed to describe my invention, so that others skilled in the art may apply the same.

In the drawing, A represents the furnace-walls, forming a vertical flue, A', which receives the products of combustion from two or more fire-places, a a, connected with flues A' by the flues b, the latter being partially closed by fire-bricks or tiles b¹, which serve to break the force of the flame and products of combustion, and regulate the heat in flue A'. Flue A' is closed below by an arch, a², but communicates above, by means of flues d¹

d¹, with the space d² beneath the lead pans D, so that the waste heat is utilized in evaporating the chamber-acid. Within the flue A' is arranged one or more conical evaporating-tubes, c, the ends of which extend outside the furnace, the upper passing through an iron collar or collars secured in the furnace-walls, and which support the tube, the lower terminating in or above a cup leading to the cooler. The upper end of pipe c, Fig. 4, is provided with cuts c¹, of exactly equal length and width, made in either a perpendicular or oblique line, and extending downward from the edge, and is surrounded just below these cuts by a ring or collar, forming a cup, c², for the reception and distribution of the acid to the interior surface of pipe c, and also to form a seal-joint for the pipe leading to the condenser. c³ are a series of rings or checks, of platinum or other suitable material, arranged within the pipe c, to insure the even distribution of the acid over the inner surface of the pipe, and to regulate its flow. These rings or checks are frustums of hollow cones, formed from strips of platinum, the base of the frustum corresponding in diameter with the part of the pipe where it is to lodge. These checks may be simply dropped, base downward, into place in the pipe in such numbers as found necessary or desirable. Pipe c, at its lower end, which extends outside the furnace, discharges into a platinum-cup, k, connected with the usual platinum cooler, and this cup k may be placed either so as to close the pipe as shown in the drawing, or at a distance below the pipe, so as to permit the entrance of air into pipe c, which latter is the preferred arrangement when a current of air is induced to assist the concentration of the acid.

From the upper end of conical pipe c a lead or other suitable pipe, e, (having its end sealed in cup c²,) leads to a condenser, g g, which may be of the form shown, a simple worm, or other form, as preferred; and from the condenser a second pipe, h, conducts off the uncondensed vapors, preferably to the acid-chamber, as shown, where they may be utilized.

Somewhere in the length of pipe h I intro-

duce a jet or injector, *i*, for the purpose of creating a current of air in pipe *c*, when desired, and for drawing off the vapors.

The pipe *c* may be made of cast-iron, glass, glazed stoneware, or similar material, though platinum is the material generally employed by me, as it may be made thin, transmitting the heat readily, and saving fuel in heating the furnace, and the acid is not affected, as is the case where iron is used. However, when an iron pipe is to be employed, I prefer to form the cup *c*² upon the inside thereof, as shown in Fig. 6, and with perforations *p* for the distribution of the acid over the inner surface of the pipe.

The taper given to the conical pipe will depend to a certain extent on the temperature, so that if the temperature of the furnace surrounding the pipe exceed the boiling-point of the acid, then the relative taper of the pipe must be increased in proportionate ratio to counteract the repulsive force of the applied heat.

The operation of these devices is as follows: The furnace having been brought to the desired temperature a properly-regulated stream of acid, of about 60° Baumé, is conducted from lead pans *D* to the collar or cup *c*² of the conical tube *c*, and is distributed in an even film over the interior surface of the pipe by means of the slots *c*¹, and flowing down the entire inner surface of the platinum tube, is exposed to the heat of the furnace, which causes a rapid evaporation to take place, which may be expedited by induced air-currents, caused by the injector *i*. The vapors given off escape by pipe *e* to the condenser,

and any uncondensed vapors passing worm *g* may, by means of the injector *i*, be directed either to the usual lead-cooler or to the acid-chamber.

If the stream is properly regulated, and a steady fire is kept in the furnace, the acid becomes concentrated in passing the pipe, and will discharge into the cooler below at the proper strength—66° Baumé.

The advantages arising from the use of an apparatus as above described are, saving in fuel, rapidity of operation, and the simplicity of the devices.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with a vertical flue, *A'*, fire-places *a a*, one or more conical evaporating-tubes *c*, placed vertically within the flue, substantially as and for the purpose specified.

2. In combination with the conical tube *c*, within a suitable furnace, the eduction-pipe *e*, and a jet or injector, *i*, substantially as and for the purpose specified.

3. The conical evaporation-tube *c*, provided with a series of removable rings or checks, *c*³, substantially as and for the purpose specified.

4. The combination of the flues *A' d'*, evaporating-tube *c*, and the evaporating-pan *D*, substantially as and for the purpose specified.

In testimony whereof I, the said GUSTAV A. HAGEMANN, have hereunto set my hand.

G. A. HAGEMANN.

Witnesses:

J. V. ROODAMME,
AUG. TRHAG.