(No Model.)

F. W. KALBFLEISCH.

APPARATUS FOR CONCENTRATING SULPHURIC ACID.

No. 267,221. Patented Nov. 7, 1882.

Fig. 1.

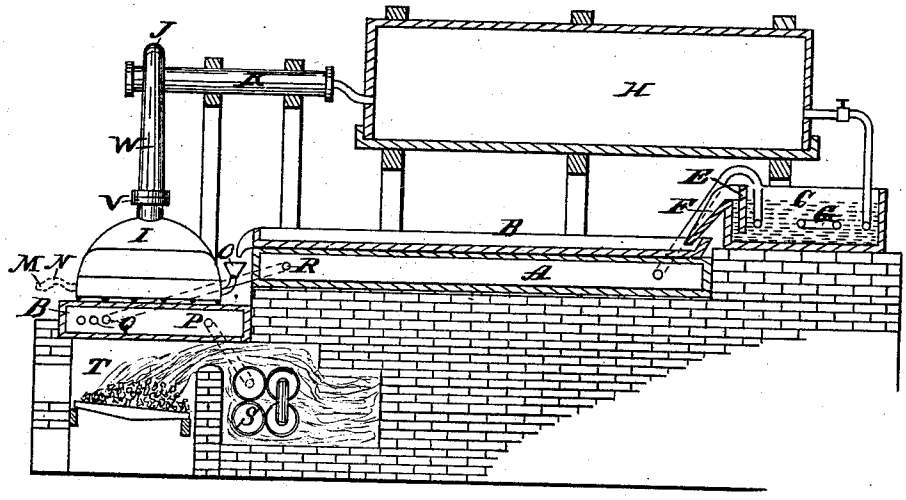


Fig. 2.

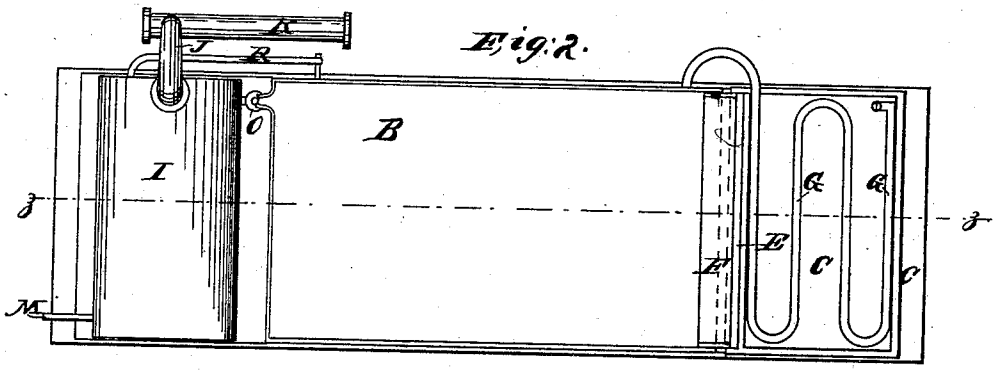


Fig. 3.

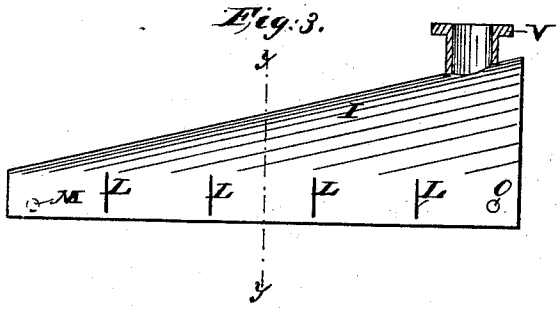
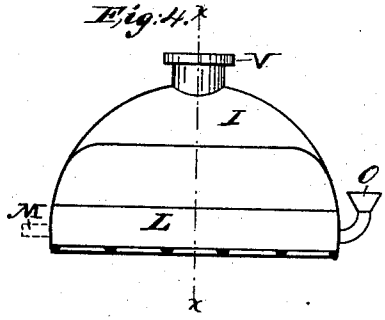


Fig. 4.



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UNITED STATES PATENT OFFICE.

FREDERICK W. KALBFLEISCH, OF BROOKLYN, NEW YORK.

APPARATUS FOR CONCENTRATING SULPHURIC ACID.

SPECIFICATION forming part of Letters Patent No. 267,221, dated November 7, 1882.

Application filed April 24, 1882. (No model.) Patented in England April 25, 1877, No. 1,618.

To all whom it may concern:

Be it known that I, FREDERICK WILLIAM KALBFLEISCH, of Brooklyn, Kings county, New York, have invented new and useful Improvements in Apparatus for Concentrating Sulphuric Acid, of which the following is a specification.

My invention comprises, first, a contrivance whereby the apparatus for heating and partly concentrating the acid preparatory to entering the still is enabled to be constructed cheaper, and is calculated to be more durable, and also more economical of the heat used; second, a more economical construction of the platina still, both in respect to a saving of the expense of material of which the still is made and in the effectiveness of the still; third, a more economical method of supplying the steam required in the leaden chambers; and, fourth, elevating the condenser, so that the condensed vapors from the still flow directly into the chamber, thus dispensing with pumping, which is the method usually employed to return the condensed vapors back into the chamber.

Figure 1 is a longitudinal sectional elevation of my improved apparatus. Fig. 2 is a top view without the generating-chamber. Fig. 3 is a longitudinal section of the still, and Fig. 4 is a transverse section.

For the preparatory process I make a flat steam-box, A—say three feet wide by six feet long and two or three inches deep—the bottom and side being preferably of boiler-iron and the top of steel, the latter to enable the heat to pass more readily than it can through the thicker iron. On the top of this box, which may be set in asbestus, cement, or any other approved non-conductor of heat, I lay a shallow pan, B, of sheet-lead, platina, or any other suitable material. At the back of this pan, and elevated somewhat above it, I place a leaden pan or box, C, open at the top and five or six inches deep, and of the same width as the shallow pan B, and in it, near the discharging side D, is a partition, E, extending from the top nearly to the bottom, and parallel with the side over which the acid flows, said side being a little lower than the others, and having a chute or apron, F, over which the acid flows into the shallow pan B. At the back of the partition E, I arrange a horizontal coil, G, of lead pipe, elevated somewhat above the bottom of the leaden pan or box C, said coil being connected at one end with the steam-box A and at the other with the leaden chamber H, in which the said acid is generated. At the other end of the steam-box A and shallow pan B, I arrange a shallow still, I, of platina, said still being rectangular or other suitable shape on the bottom and flat, or nearly so, on the top at the discharging end, from which end it rises gradually toward the receiving end, and forms the dome, with capital V and beak W thereat for conducting the vapors into a condenser, K, usually employed with concentrating apparatus, which condenser I elevate sufficiently high, as shown in Fig. 1, so that the condensed vapors flow back directly into the leaden chamber H, said beak being extended vertically from the still to said condenser and above the bottom of chamber H. The interior of this still, which should be two or three inches deep, I divide by soldering to its sides, and also to its bottom, at intervals, one or more plates, L, of platina, traversing it from side to side and set edgewise to the bottom, said plate or plates being so arranged that they reach nearly to the bottom, except at intervals, where they touch and are soldered thereto. The plate or plates are employed for two purposes—first, to strengthen the bottom of the still, which, on account of the great expense of the material, it is desirable to make as thin as possible, and, second, to compel only the strongest acid (which by reason of its greater specific gravity settles to the bottom) to flow uniformly over the same, and to occupy the successive divisions, so that at the last division only the strongest and most concentrated acid will run off at the discharge-pipe M. By the employment of these plates in the manner described to support the bottom of the still I avoid the use of supporting-bars or other supports under the bottom, which would occupy considerable area of the bottom surface of the still and lessen the effect of the heat thereon, and I also avoid exposure of the supports to the heat, so as not to be injured thereby.

For regulating the depth of acid retained in the still I make the discharge-pipe with an arched section, N, and connect it to the still, so that it can be shifted around to elevate or depress said section, and thus make the passage over which the acid escapes higher or

lower, as the case requires. O is the inlet-pipe for the acid, which is diagonally opposite to the outlet-pipe M, thus insuring the best results in respect to the application of the heat to the acid in the still, and also enabling another still to be connected thereto, should occasion require. The still is placed on a steam-box, B′, which is similar to the steam-box A, the same being connected by a pipe, Q, with the steam-boiler S, and which is also connected with the box A by the pipe R, and under this steam-box P may be a furnace, T, for superheating the steam in it.

In using the apparatus sufficient acid is run from the leaden chamber into the pan or box C to fill it and to cover the bottom of the shallow pan B and the bottom of the still I. Then the steam is let into the superheater S and a fire lighted in the furnace under the box P. From the superheater S the steam is conveyed into the box P, passing thence into the steam-box A, thence through the leaden coil of pipe G in the leaden pan or box C, and finally it discharges into the leaden chamber H, where, after being cooled in the leaden pan or box C by giving off its heat to the acid, and thus producing a useful effect by cooling, supplies the aqueous vapor required for generating the acid in the leaden chamber cheaper than when made especially for that purpose, as in the ordinary method. The acid which is first heated in the pan C passes down under the partition E, which prevents the heavier portion from remaining in the box, and so flows on to the shallow pan B, where it is concentrated to about 60° Baumé, and from thence it flows into the still I, where it is concentrated to 66° Baumé.

Heretofore the shallow pan B and still I have been placed over furnaces, and the leaden pan, being thus exposed to the fire, is often overheated and melted, as the heat required to concentrate the acid is nearly the same as is required to melt the lead, and, at best, the furnace-heat is irregularly distributed, whereas by the steam heat the distribution is uniform, according to my herein-described arrangements.

By the contrivance of the dome of the still at the end where the acid enters, and where the greater volume of vapor arises and escapes, and by contracting therefrom toward the other end, two important advantages are gained—viz., the volatile matters are more quickly separated from the more concentrated portions, so that the contact of the latter with the former is less as it flows along toward the escape or discharging passage, thus facilitating the separation, and by so tapering the top a considerable economy of material is effected as compared with the ordinary round conical dome-shaped still.

The equal application or distribution of the steam heat to the shallow pan B, together with the facility of maintaining it uniformly at the highest degree of temperature consistent with safety to the lead pan C, permits a much smaller evaporating-pan to be used than when fire heat is employed.

As compared with the cost of the ordinary apparatus of the same capacity, my apparatus can be made for about one-third of the cost of the other, while it will be much more durable and effective.

The furnace-fire may, if preferred, be used in direct contact with the still I without the steam-box B′, in which case the pipe by which the steam is supplied will be attached directly to the box A from the superheater S.

As the steam will be too hot when leaving the steam-box B′ to be used safely under the leaden pan B, air or steam of lower temperature may be introduced into the first-named box, A, along with it, which will afford means for regulating the temperature exactly as required.

In regard to the form of the still as above described, and the location of the inlet-pipe and the pipe by which the vapors are conducted to the condenser relatively to the still so shaped and to each other, I may state that very considerable advantages are obtained—first, because, by the location of the beak or pipe leading to the condenser being directly over the inlet, which is the place where the largest proportion of the vapor rises, the passage of the vapors to the beak is more direct and with less contact with the surface of the still, so that less space is required to carry it off, and there is less condensation by surface-contact; also, what does condense and drops back into the acid falls into what is less concentrated, and is therefore more readily and cheaply thrown off again; and, second, by this location of the inlet and the beak the sloping and contracting form of the still is permitted, because there is less vapor rising from the more concentrated acid passing on to its outlet, which form effects a considerable economy of the very expensive material of which the still is made.

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

1. The combination, with the leaden box C, evaporating-pan B, and the still I of a sulphuric-acid-concentrating apparatus arranged in the order described, of the steam-boxes B′ and A and the steam-coil G, the same being arranged and connected to the leaden chamber substantially as described.

2. In a sulphuric-acid-concentrating apparatus in which the evaporation is effected by steam heat, the discharge or waste pipe of the heating apparatus connected to the leaden chamber for utilizing the waste steam of said heating apparatus for supplying the aqueous vapor required in the generating-chamber, substantially as described.

3. A platinum still having the bottom flat and its top convex from side to side, but gradually sloping downward from inlet to outlet ends, and having the inlet for the acid and the beak or condensing-pipe for the vapors connected at the highest end, and the escape-pipe

for the concentrated acid connected at the lowest end, substantially as described.

4. The partition-plates, used for regulating the flow of the acid along the bottom of the still, arranged for supporting the bottom of the still by being attached at their ends to the sides of the still, and also being attached to the bottom of the still at intervals along their lower edges, substantially as described.

5. In an apparatus for concentrating sulphuric acid, a condenser placed between the still and the lead chamber, said condenser being located above the bottom of the generating-chamber to enable the condensed vapors from the still to flow into said chamber, and thereby dispense with pumping the same into the chamber, substantially as described.

6. In a sulphuric-acid concentrating apparatus, a condenser located above the bottom of the generating-chamber, in combination with a still provided with a vertical beak extending above the bottom of said chamber, all substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FREDERICK W. KALBFLEISCH.

Witnesses:

A. P. THAYER,

W. J. MORGAN.