

(No Model.)

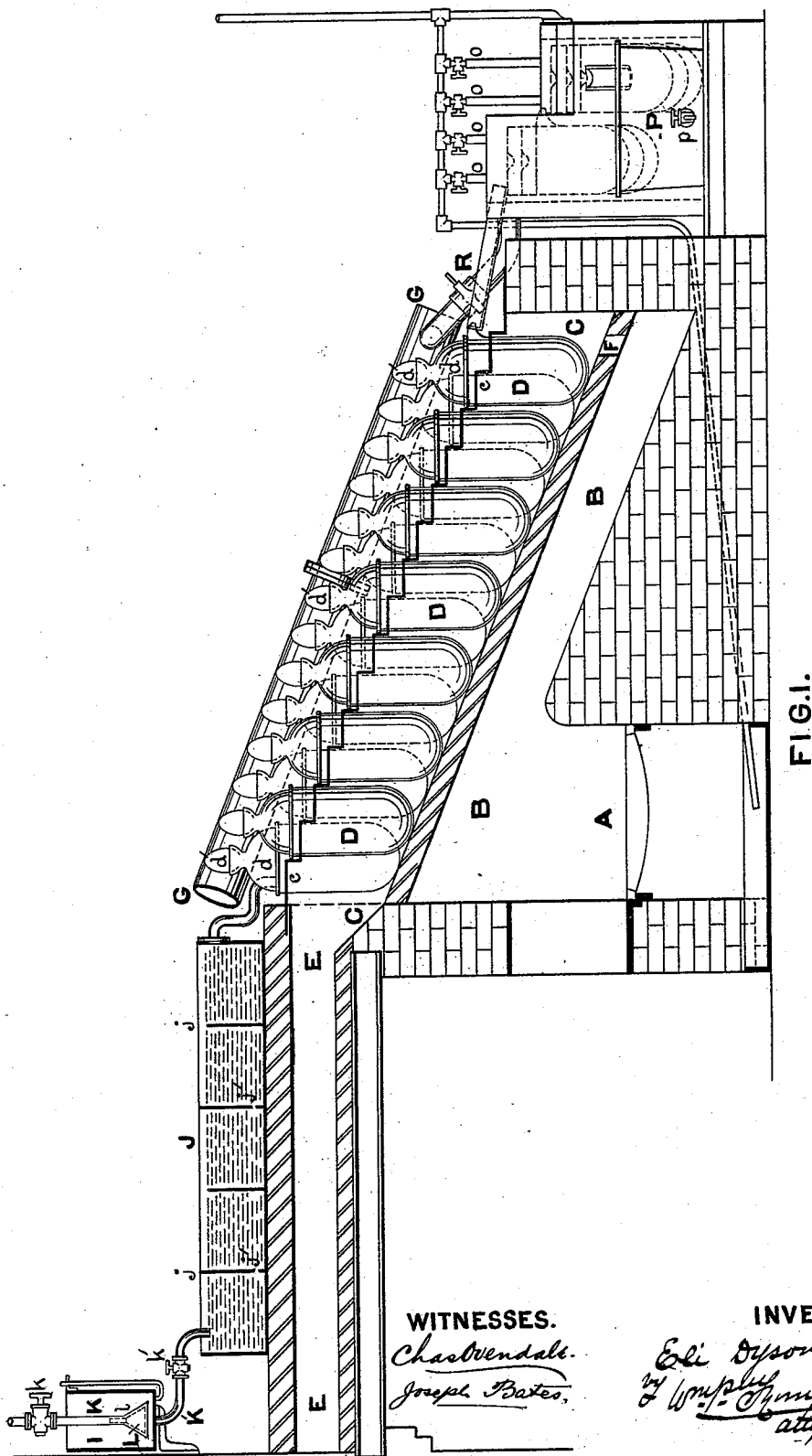
3 Sheets—Sheet 1.

E. DYSON.

APPARATUS FOR CONCENTRATING SULFURIC ACID.

No. 548,303.

Patented Oct. 22, 1895.



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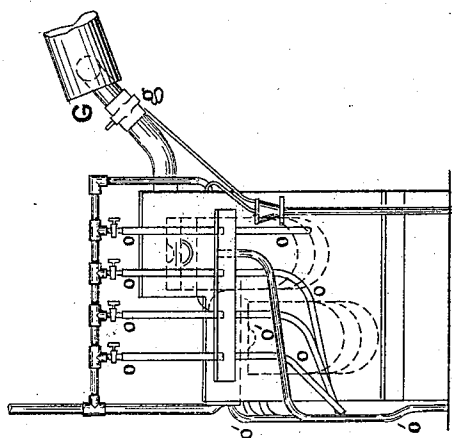


FIG. 7.

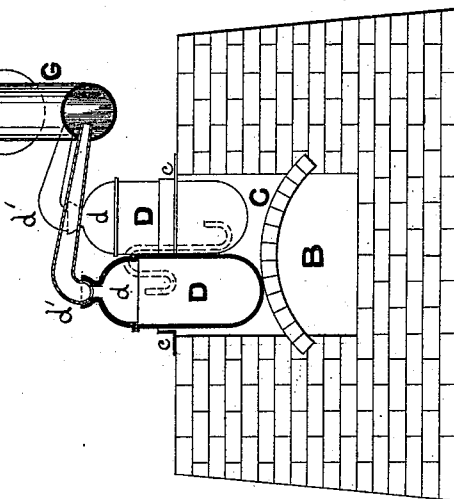


FIG. 4.

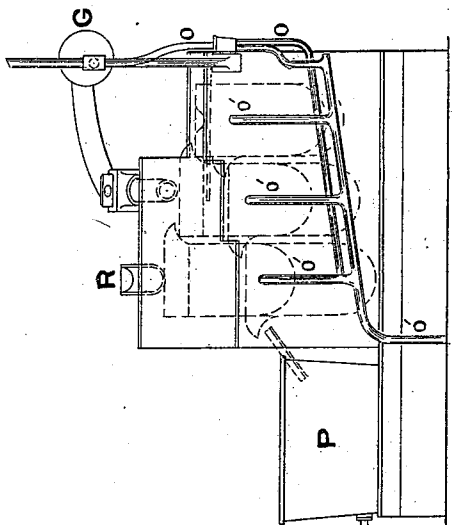


FIG. 6.

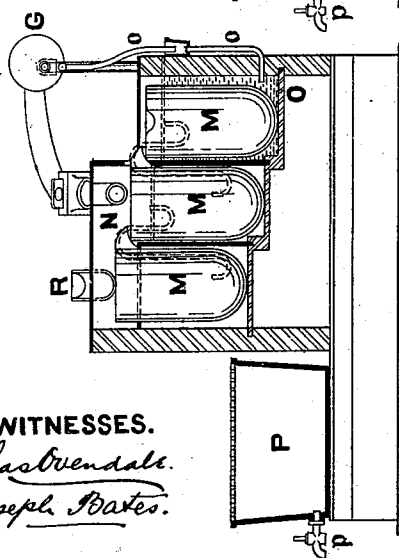


FIG. 5.

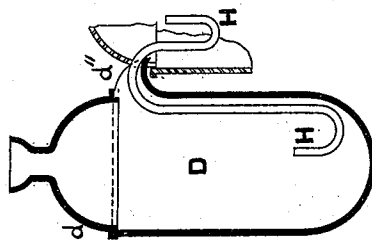


FIG. 9.

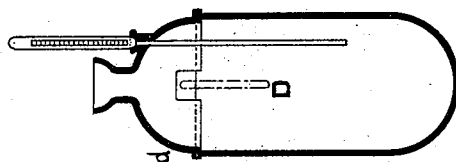


FIG. 8.

WITNESSES.
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UNITED STATES PATENT OFFICE.

ELI DYSON, OF MANCHESTER, ENGLAND.

APPARATUS FOR CONCENTRATING SULFURIC ACID.

SPECIFICATION forming part of Letters Patent No. 548,303, dated October 22, 1895.

Application filed August 30, 1894. Serial No. 521,725. (No model.)

To all whom it may concern:

Be it known that I, ELI DYSON, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Apparatus for Concentrating Sulfuric and other Acids, of which the following is a specification.

This invention relates to that class of apparatus chiefly employed in the concentration of sulfuric acid, in which the evaporating or concentrating vessels are placed on an incline one above another, or with the edge of one above that on one side and below that on the other side; and it is designed to provide a more efficient apparatus than any at present in use.

It consists, essentially, in constructing the evaporating or concentrating vessels of cast-iron with an internal coating of a suitable vitreous or other acid-resisting enamel, (these may be made of two or more separate pieces placed together when in position in the furnace,) in constructing the siphons by which the liquor is carried from one vessel to the next with a double curve or of double-U form to deliver the liquor from the bottom of one vessel to the top of the next in the series and to prevent the siphon becoming empty should the liquor fall below the proper level or the supply cease, so that it will restart running as soon as the liquor rises again to its proper level, in a regulating float-valve, of conical, bell, or other suitable shape, rising and falling in the supply-pipe to control and regulate the flow of acid from the supply-cistern to the concentrating-vessels, and in the arrangement and construction of the apparatus whereby greater efficiency is maintained.

It will be fully described with reference to the accompanying drawings.

Figure 1 is a longitudinal sectional elevation; Fig. 2, a plan; Fig. 3, a sectional plan of concentrating-vessels; Fig. 4, a transverse sectional elevation on line $x x$, Fig. 2; Fig. 5, a transverse sectional elevation on line $y y$; Fig. 6, an end elevation; Fig. 7, a side elevation of the cooler looking from opposite side to Fig. 1; Fig. 8, a sectional elevation of concentrating-vessel removed from plant, enlarged;

Fig. 9, a sectional elevation of same at right angles to Fig. 8.

The furnace A is constructed with an arched flue B, which passes under a second chamber or flue C, in which the concentrating vessels or retorts D are situated, leading to a third flue E in communication with the chimney-stack. The chamber or flue C is connected with the furnace A and flue B by vertical or other openings F at intervals along its length, through which the products of combustion pass, those farther from the furnace being of greater area than those that are nearer to it to allow of an equal temperature throughout the flue C. The flue C is covered by metal or other plates c , with openings through which the vessels D pass and which hold them upright in position. The concentrating-vessels rest on the top or arch of the flue B, and the heated gases and products of combustion come in direct contact with them.

The fire-grate of the furnace A is preferably placed at one end of the flue B, which runs longitudinally of the apparatus.

The flue B, and the arched top, on which the concentrating vessels or retorts D are placed, are inclined from one end to the other, so that each of the vessels D is on a lower level than the one preceding it.

The concentrating-vessels D are preferably made, as shown, with covers d and connecting tubes or nozzles d' , by which they are connected with a pipe or tube G, running longitudinally of the apparatus, through which the fumes or vapor rising from the acid is conducted to a condensing-tower.

The evaporating or concentrating vessels or retorts D are constructed of cast-iron enameled on the internal surfaces with a vitreous or other acid-resisting material and are provided with a projecting lip d'' , upon which rests the siphon H, which conveys the liquor to the next vessel.

The siphons H are made of glass or other suitable material and are constructed of a special double-curved or double-U shape to maintain a constant level and continuous flow of acid through the concentrating vessels or retorts from one to the next, so as to convey the acid from the bottom of one vessel to the top of the next, and so that the siphon cannot

become emptied of liquor should the level fall or the flow cease. By this means all portions of the acid as it becomes concentrated are equally exposed to the heat as it descends from vessel to vessel, the heavier acid being lifted from the bottom of one vessel to the top of the next.

The fumes and vapor evaporated from the acid in the concentrating-vessels D are carried away therefrom through the tubes G, of hard earthenware—such as that known as “metalline” or other suitable material—to a condenser or scrubber suitably arranged for receiving same for complete condensation. The fumes or vapor is first carried backward and forward through a number of pipes and then through one or more towers filled with coke or other suitable material. The fumes which collect therein are condensed and any remaining or uncondensed gas is carried to the chimney.

Above the furnace is placed a series of supply-tanks I and J, from which the acid passes to the concentrating-vessels D. The supply-tanks J are placed over the flue, so that the liquor flowing therethrough is gently heated to a moderate temperature before entering the first of the series of concentrating-vessels D. These tanks are of ordinary construction and are fitted with division plates or partitions *j*, each alternate one being provided with an opening or passage *j'* at the bottom to cause the liquor to flow in a sinuous course through them. The first supply-tank I is fitted with inlet and outlet pipes K K', each fitted with suitable taps *k k'*. The inlet-pipe K extends down nearly to the bottom of the tank and is provided with a float-valve L to control the supply of acid. This valve consists of a hollow, conical, bell-shaped, or other suitably-shaped float L with a hollow closed shank or stem *l*. The lower end of the inlet or supply pipe K is of similar shape, and the float is placed therein, the hollow shank extending up the pipe K. The float may be open at the bottom or inclosed, as found most desirable. The float L rises and falls in the mouth of the inlet-pipe K as the liquor in the tank rises and falls. Should the acid in the supply-tank I rise too high, the pressure on the float L causes it to rise and close the mouth of the supply-pipe K, which thus remains closed until the flow of the liquor through the delivery-pipe K' reduces the pressure by lowering the level therein, when the valve L again opens and the supply continues to flow. The flow of acid to the concentrating-vessel is regulated by this valve, and the constant flow is maintained throughout the apparatus by the siphons, which convey it from one vessel to the next.

Outside the furnace I place a number of coolers M, consisting of vessels similar to the concentrating-vessels D, of enameled cast-iron. Two or more of these are placed in an air flue or chamber N, through which a current of air is caused to flow, and the remainder are set

in water-chambers O with a current of cold water flowing through. From these coolers the liquor flows to a vessel P, of enameled iron, in which it is collected. This vessel is fitted with a suitable tap *p* for drawing off the acid into carboys. The water flows into the chambers O through the pipes *o*, and after circulating around the vessels M flows out through the pipes *o'*. Any acid condensing in the tube G is carried off by the pipe *g*.

If desired, the liquor may flow from the coolers before entering the vessel P through one or more large earthenware or other jars for holding a reserve of the concentrated acid before bottling it off.

Between the furnace and the coolers the acid flows over a cast-iron enameled spout or conduit R, provided with a glass cover fitted into a recess or rabbeted sides so that the acid can be seen flowing through, and a similar conduit conveys the acid from the coolers to the vessel P.

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

1. In apparatus for concentrating acids and other liquids the combination with the furnace A, flues B and F and inclined chamber C of a number of concentrating vessels constructed with an outer shell or casing of cast iron and an inner casing or lining of vitreous material substantially as described.

2. In apparatus for concentrating acids and other liquids the combination with the supply tank, of an inlet pipe with a lower conical or bell shaped orifice, and a float valve of conical or bell shape which fits into the orifice of the inlet pipe, and a hollow stem which extends up into the inlet pipe substantially as described.

3. In apparatus for concentrating acids and other liquids the combination with the furnace A, the flues B and F, the chamber C and the vessels D of the cooling vessels M the chambers N through which cold air is circulated, the chambers O through which water is circulated and the circulating pipes *o o'* connected with the chambers substantially as described.

4. In apparatus for concentrating acid and other liquids the combination with the heating furnace A, flues B and F, and heat conducting chamber surrounding the concentrating vessels of a number of concentrating vessels D constructed of cast iron with a vitreous lining, a series of supply tanks J from which the liquor is delivered to the uppermost vessel, siphons H constructed of double curved form to deliver the acid at the top of the vessel and cooling vessels M set in chambers N and O substantially as described.

5. In apparatus for concentrating acids or other liquids the combination of the heating furnace A, the flues B the second chamber or flue C with an inclined floor upon which the vessels D are placed, and covering plates *c* which inclose the lower parts of the vessels, a flue E leading from the chamber C to the

chimney, the concentrating vessels D made
with covers *d* and nozzles *d'* which carry off
fumes or vapor arising from the liquid and
the connecting pipe or tube G running longi-
5 tudinally of the apparatus through which
such fumes are conducted to a condensing
tower substantially as described.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

ELI DYSON.

Witnesses:

J. OWDEN O'BRIEN,
CHAS. OVENDALE.