

O. PROELSS & W. S. HALL.
 APPARATUS FOR CONCENTRATING SULFURIC ACID.
 APPLICATION FILED JAN. 6, 1910.

960,702.

Patented June 7, 1910.

2 SHEETS—SHEET 1.

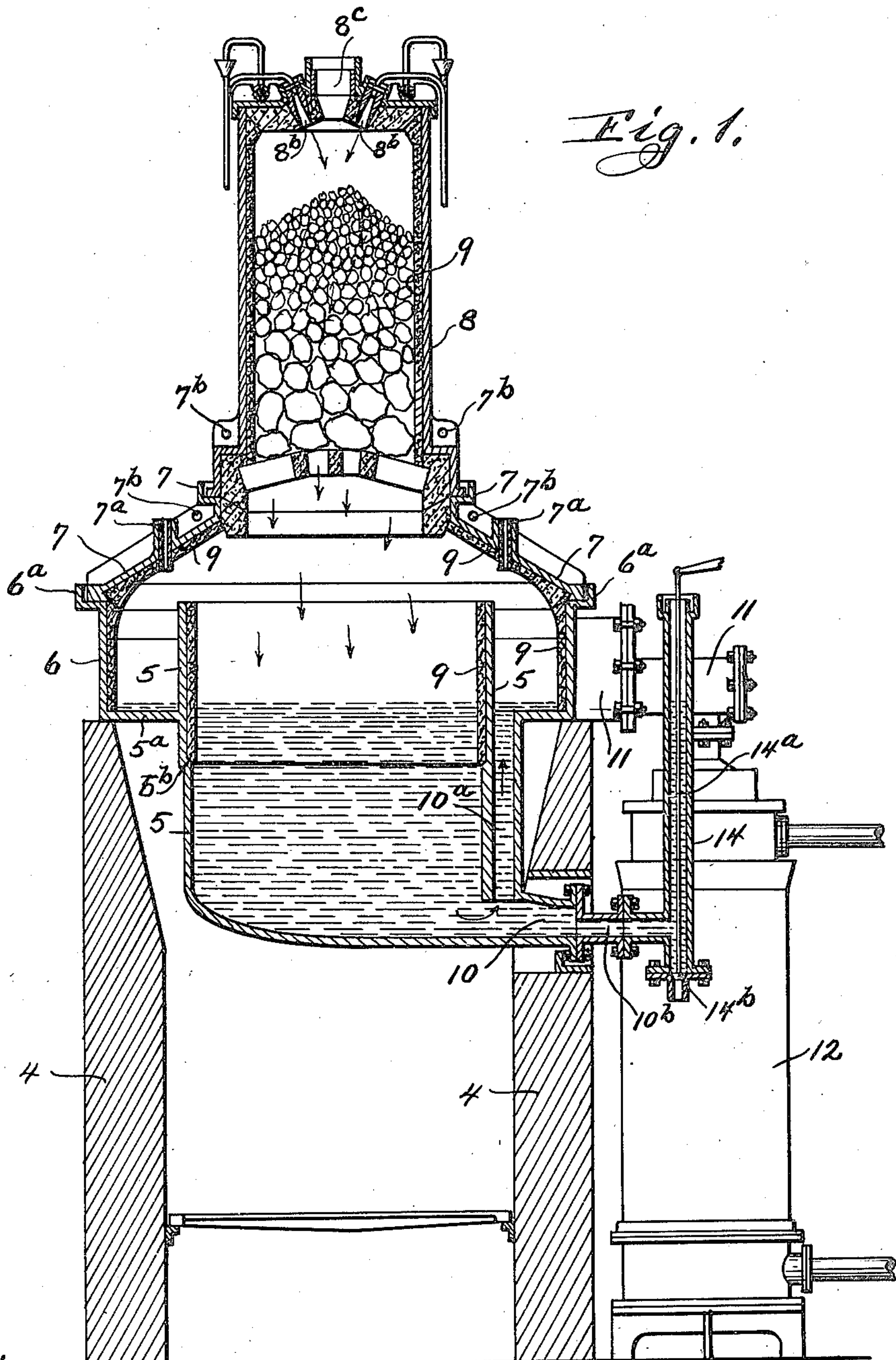


Fig. 1.

Witnesses:
 R. J. Jacker
 Robert Van Sande

Inventors:
 Otto Proelss
 Walter S. Hall
 By J. M. Whipple
 atty

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Fig. 2.

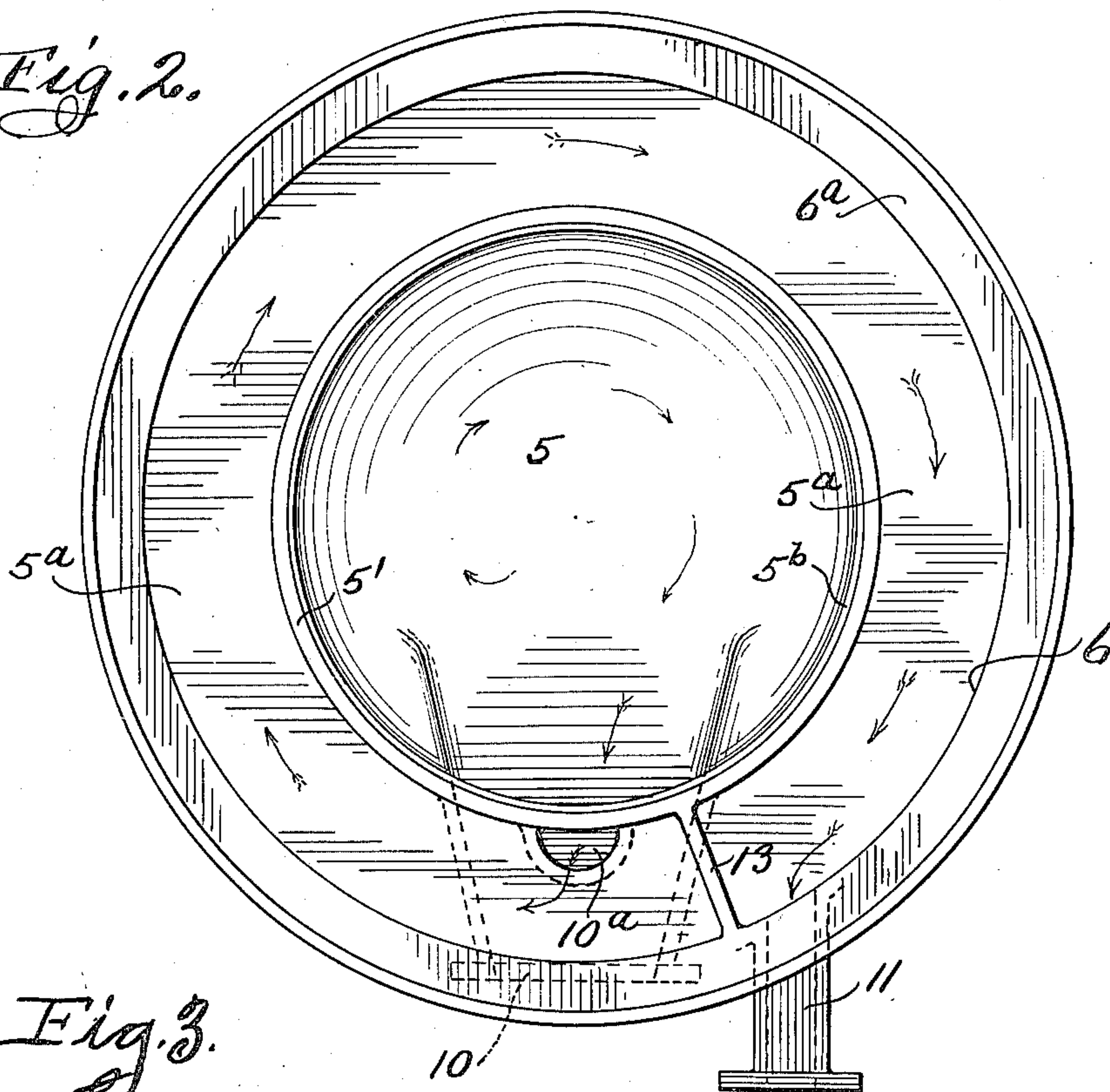
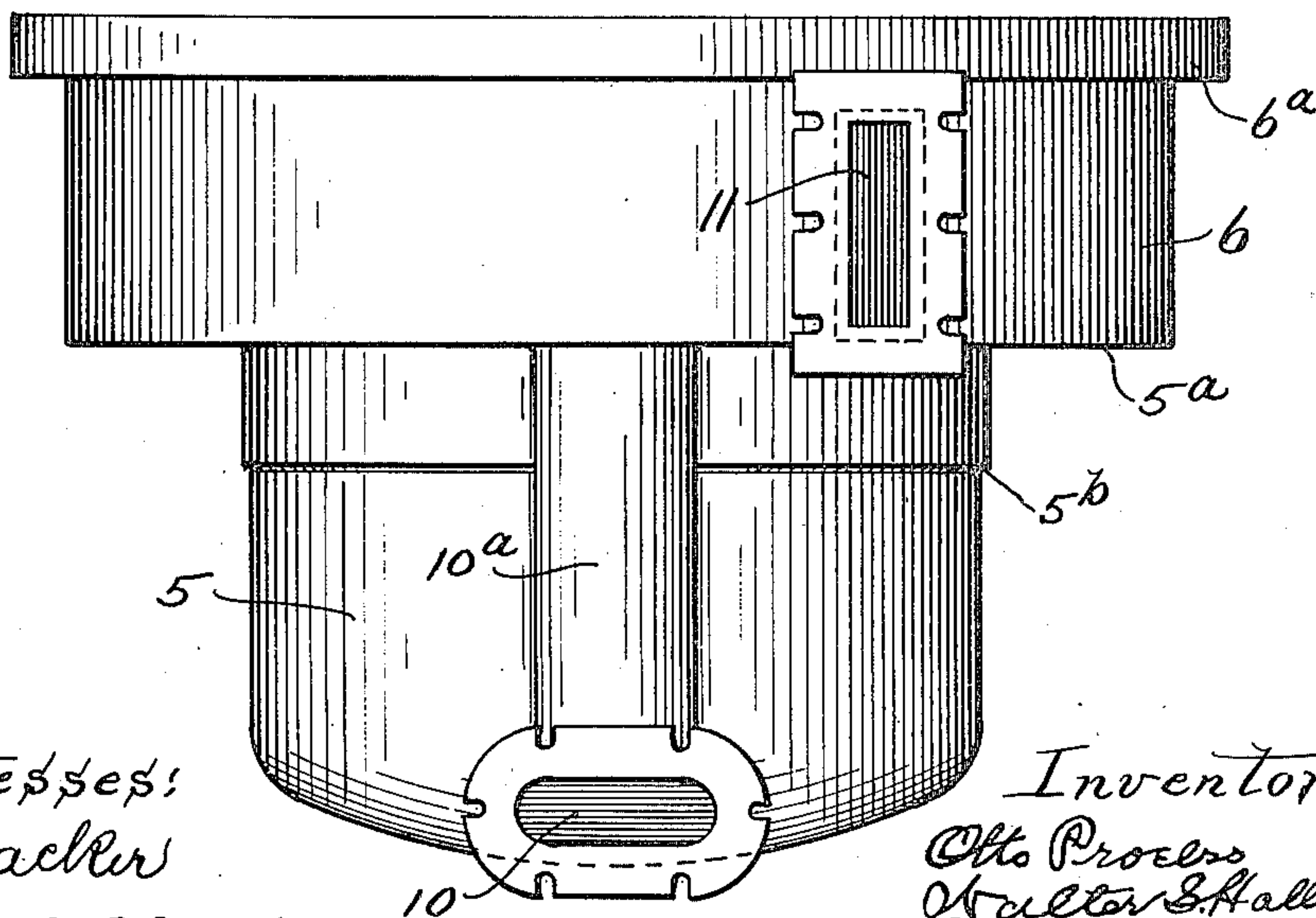


Fig. 3.



Witnesses:
 R. J. Jacker
 Robert Van Dams

Inventors:
 Otto Proelss
 Walter S. Hall
 By J. H. Whipple
 Atty

UNITED STATES PATENT OFFICE.

OTTO PROELSS, OF KANSAS CITY, MISSOURI, AND WALTER S. HALL, OF ARGENTINE,
KANSAS.

APPARATUS FOR CONCENTRATING SULFURIC ACID.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, OTTO PROELSS, of Kansas City, in the county of Jackson and State of Missouri, and WALTER S. HALL, of Argentine, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Apparatus for Concentrating Sulfuric Acid, of which the following is a specification.

Our invention relates to apparatus for the concentration of sulfuric acid, by evaporation; and the objects of our improvements are, first to provide means whereby a volume of weak acid may be primarily boiled and continuously passed off automatically into a shallow secondary boiler where a less quantity of the stronger acid is further subjected to heat to produce the highest concentration capable of being produced by evaporation and passed thence to a cooler; and, second, to arrange a cover in conjunction with the boilers in such a manner that the acid vapors rising from the boilers will be condensed and automatically returned to the primary boiler.

We have attained these objects by the apparatus constructed as illustrated in the accompanying drawings in which—

Figure 1 is a central vertical section of the cover and boilers in conjunction with a cooler shown in elevation. Fig. 2 is an enlarged plan view of the boilers without the cover. Fig. 3 is an elevation of the parts shown in Fig. 2.

Like reference numerals marked on the drawings refer to like parts throughout the several views.

The numeral 4 designates a furnace or fireplace, consisting of a square or cylindrical brick chamber provided with a fire grate, an inlet, and an exit flue, for the burning of fuel and the escape of the products of combustion. This may be of any suitable construction known to those skilled in the art.

Mounted on such fireplace is a large primary boiling pot 5 which is open at the top and preferably made of cast iron. Said pot has an annular flange 5^a near its mid-height which is adapted to rest at its outer edge upon the top of the wall 4 so as to support the pot 5 centrally over the fire and have the inner portion of said flange exposed to the heat from below, as well as the bottom and sides of said pot. The periphery

of said flange 5^a is provided with an annular, upwardly-extended rim or wall 6 terminating at the top in an offset recess 6^a for the periphery of the metal cover 7 (Fig. 1) to fit into. The cover of the boilers consists of the outer part 7 having a large opening arranged centrally over the primary boiling pot 5, and an upwardly-extended filled part 8 having a base adapted to fit into an offset recess around the opening of the part 7, similar to that at 6^a so as to have said part 8 cover said large opening and support its interstitial filling directly over said pot 5. The concentric chamber, between the walls of the pot 5 and 6 of the flange 5^a, constitutes a secondary boiling vessel into which the acid passes from the bottom of the pot 5 and is the place where the final boiling of the acid is done.

The upper portion of the pot 5 above a jog 5^b in its wall, the entire inner surface of the wall 6, and of the 2-part cover 7 and 8, are lined with a layer 9 of acid tile, in order to protect the metal (castiron) of which these parts are made, from the corrosive action of the fumes rising from the acid being treated, to which such surfaces would otherwise be subjected in operation.

The pot 5 is provided with a tubular projection 10 at the bottom which is extended horizontally out through an opening in the wall of the fireplace and has a vertical branch 10^a which extends up through the flange 5^a so that when acid is filled into the pot 5 sufficiently to rise above the plane of said flange 5^a it will overflow upon said flange through said branch 10^a. The concentric chamber between the walls 5 and 6 is provided with a tubular projection 11 forming an exit opening through which the concentrated acid can flow out of the concentrator and into a common water cooler 12, which may be of any suitable construction known to those skilled in the art. Said outer concentric chamber or vessel has a partition 13 (Fig. 2) located between the tubular openings 10^a and 11, so as to cause all the acid passing into the same to travel over the entire concentric bottom 5^a, as indicated by the arrows in Fig. 2, before passing out through said exit opening 11 to the cooler.

The tubular extension 10 has a reduced detachable part 10^b to which is attached an angular extension of a vertical tube 14 which is provided with an inner rod 14^a for

working a valve 14^b when it is desired to draw off acid from the pot 5. By removing the reduced part 10^b at its junction with the part 10 the vertical tube 14 may be removed
5 and a scraper or swab may be inserted for cleaning the bottom of said pot 5.

The part 7 of the cover is provided with a tubular opening 7^a for the purpose of ascertaining the acid level at any time in the
10 pot 5 and for draft gage connections. The tile cover over the top of the filled part 8 is provided with openings 8^b through which, by means of tubular connections with a source of supply (not shown), weak acid
15 is introduced into said filled part 8 and trickles down through the mass of the filling and falls into the primary boiling pot 5 over which the said filled part is located. The tile cover at the top of the filled part
20 has a large central opening 8^c through which the uncondensed vapors rising from the acid may escape. The parts 7 and 8 of the cover are provided with perforated ribs or ears 7^b adapted to engage hooks to be applied in
25 the perforations for lifting the said parts off of the boilers.

In operation the heat from the boiling acid rises through the interstitial filling of the part 8 and the fumes carried up thereby
30 which contain vapors of acid are partially condensed and the acid so condensed falls back into the central or primary boiler with the incoming acid, which is fed in through said filling. The boiling in the primary
35 boiler increases the strength of the acid as it descends in said boiler, so that the acid rising to the concentric outer vessel or secondary boiler through the vertical tube 10^a is of the acid most concentrated in the cen-
40 tral or primary boiling vessel, and is spread in a thin layer and caused to travel over the entire bottom of the outer or secondary boiling vessel wherein the greatest concentration is effected immediately preceding the cool-
45 ing of the acid. The degree of concentration may be varied in accordance with the speed at which the weaker acid is fed to the central primary boiler, and therefore the regulation of the feed may be the means for
50 attaining the desired acid strength.

The strongest acid possible by evaporation viz: 98.20% H₂SO₄ has been made continuously by our above described concentrator.

55 Having fully described our invention, what we claim and desire to secure by Letters Patent is:

1. In an apparatus of the class described, the combination with a fireplace of a central
60 vessel having an opening at its bottom, a concentric outer vessel having an exit opening at its bottom said bottom being arranged at a higher level than said opening of the central vessel, a vertical tubular connection
65 of said outer vessel with said opening of

said central vessel, a partition in said outer concentric vessel located between said tubular connection and said exit opening, and a perforated cover for said vessels, as specified. 70

2. In an apparatus of the class described, the combination with a central vessel having an opening at its bottom communicating with a vertical tube, of a concentric outer vessel communicating at its bottom with the upper
75 end of said vertical tube and having an exit opening near its bottom, means for causing the acid treated to pass over the entire bottom of said outer vessel before reaching said exit opening, and a cover adapted to support
80 an interstitial filling over said central vessel, as specified.

3. In an apparatus of the class described, the combination with a central vessel having a tubular horizontal extension 10 of a detach-
85 able tubular part 10^b and a vertical tube 14 provided with a valve and rod for operating the valve, as specified.

4. In an apparatus of the class described, the combination with a fire-place of a boil-
90 ing pot 5 having an opening at its bottom communicating with a vertical tube 10^a, a concentric flange 5^a at about its mid-height and perforated by said tube; a concentric
95 flange 6 having tubular perforations 11, and a perforated cover having parts 7 and 8, as and for the purpose specified.

5. In an apparatus of the class described, the combination with a fire-place of a cast metal boiling pot 5 having an opening 10
100 and vertical tube 10^a, a flange 5^a and rim 6 adapted to form an outer concentric boiling vessel having its bottom perforated by said tube 10^a and its rim perforated at the bot-
105 tom by a tubular exit opening, a perforated cover having parts 7 and 8, the latter being filled, and the interior acid tile lining 9 of said parts, as specified.

6. In an apparatus of the class described, the combination with a primary boiling pot
110 of a secondary boiling pot having its bottom located at a higher level than the bottom of said primary boiling pot and a tubular connection with said primary boiling pot below the level of the bottom of said sec-
115 ondary boiling pot and extended upwardly to the bottom of said secondary boiling pot and perforating the same to cause liquid acid rising in said primary boiling pot to a higher level than the bottom of said sec-
120 ondary boiling pot to overflow upon said bottom, as and for the purpose specified.

7. In an apparatus of the class described, the combination with a fire-place of a pri-
125 mary boiling pot and a secondary boiling pot, the latter having its bottom arranged above the level of the bottom of said primary boiling pot, a tubular connection having one end terminating in a perforation of the
130 bottom of said secondary boiling pot and

the other end in communication with said primary boiling pot at its bottom, and a perforated cover over said primary and secondary boiling pots adapted to permit the feeding of weak acid into said primary boiling pot, as and for the purpose specified.

8. In an apparatus of the class described, the combination with a fire-place of a primary boiling pot and a secondary boiling pot having their bottom parts arranged at different levels, a tubular connection perforating the bottom of said secondary boiling pot, communicating with said primary boil-

ing pot near its bottom and adapted to cause an overflow of acid rising in said primary boiling pot to a point above the level of the bottom of said secondary boiling pot, and a perforated cover for said primary and secondary boiling pots provided with an interstitial filling arranged over said primary boiling pot, as and for the purpose specified.

OTTO PROELSS.

WALTER S. HALL.

Witnesses:

F. W. EPPS,

J. E. CAROTHERS.