

O. PROELSS.
 PROCESS OF MAKING CONCENTRATED SULFURIC ACID.
 APPLICATION FILED MAY 10, 1907.

963,174.

Patented July 5, 1910.
 2 SHEETS—SHEET 1.

Fig. 2.

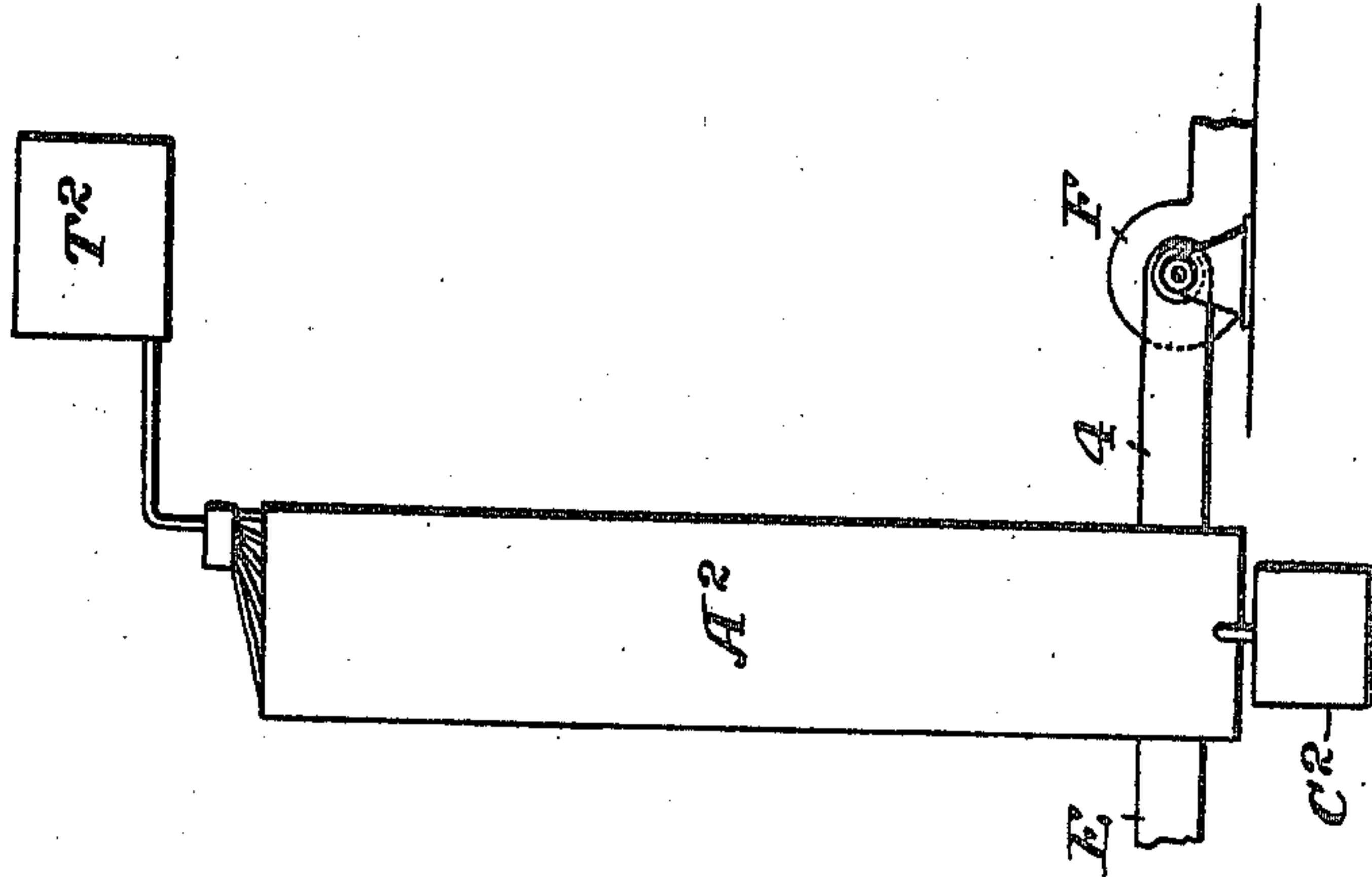
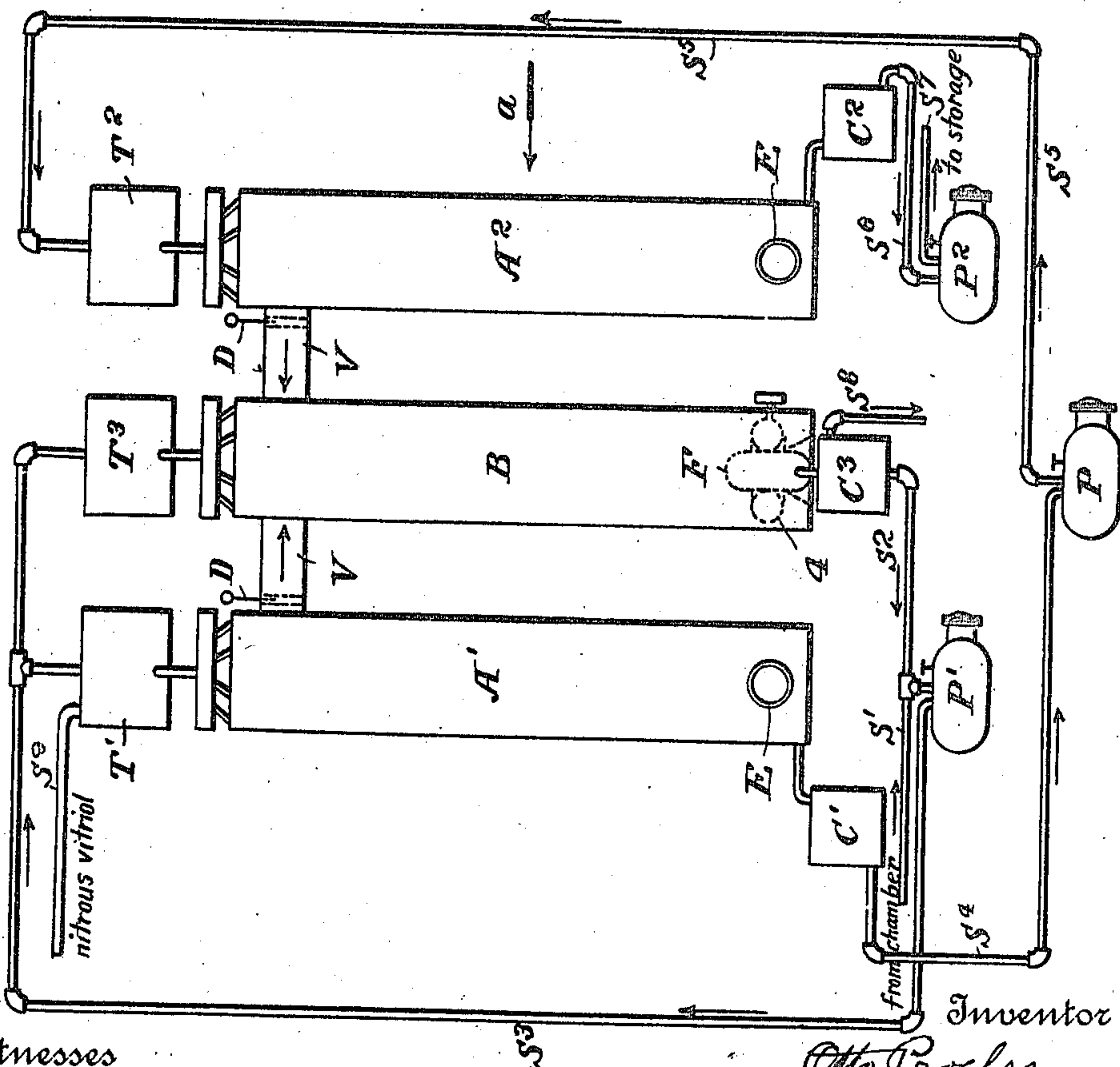


Fig. 1.



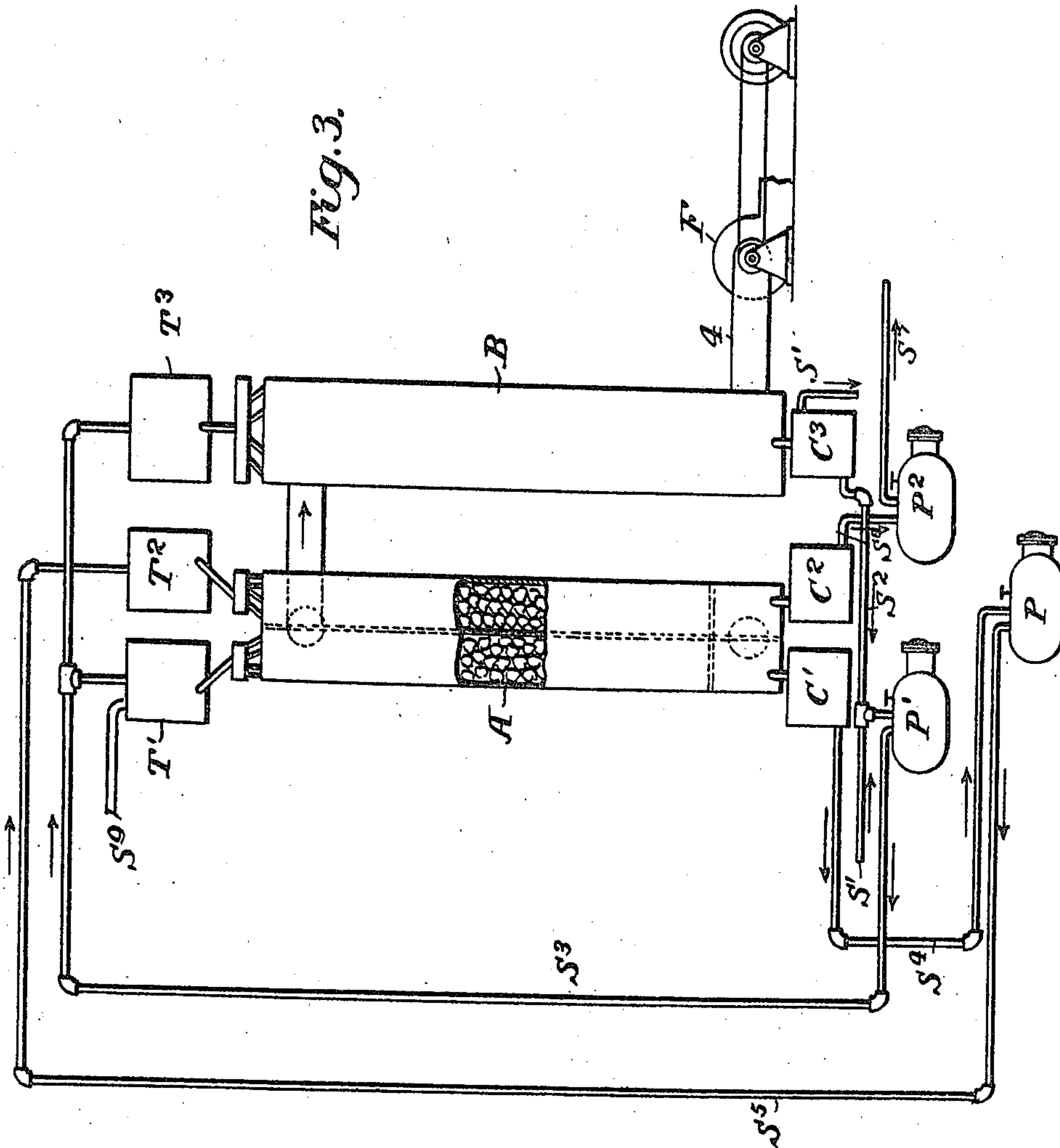
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UNITED STATES PATENT OFFICE.

OTTO PROELSS, OF KANSAS CITY, MISSOURI.

PROCESS OF MAKING CONCENTRATED SULFURIC ACID.

963,174.

Specification of Letters Patent.

Patented July 5, 1910.

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To all whom it may concern:

Be it known that I, OTTO PROELSS, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Processes of Making Concentrated Sulfuric Acid, of which the following is a specification.

Many attempts have been made to produce sulfuric acid of a strength of 66° without the employment of an undue amount of labor and material, by the use of an ordinary sulfuric acid chamber and tower plant, but such attempts, so far as I am aware, have not resulted in such a saving of either labor or material as to render the processes and means employed desirable.

I have discovered that by independently denitrating and concentrating different bodies of liquor, using sulfurous acid gas in this connection, and thereafter bringing together the hot gases from the concentrating means, and the cooler gases from the denitrating means, and subjecting them to the action of the weak sulfuric acid, I am enabled to secure the desired result.

While different forms of apparatus may be employed for this purpose, I have illustrated one form which has proved practicable in the accompanying drawing, in which—

Figure 1 is an elevation of the said apparatus showing diagrammatically pumps and conducting pipes; Fig. 2 is a side view looking in the direction of the arrow *a*, Fig. 1, and Fig. 3 is a view illustrating a modification.

In carrying out my process I make use of three independent and separate chambers, which may be within one or more structures or buildings, but which, as shown, are in three towers, A', A² and B, each of which may be a Glover tower of ordinary construction.

With the lower end of each of the towers A', A² communicates a pipe or flue E, from which hot sulfurous acid gas is conducted to the tower from the burners, or roasting furnaces, etc., and from the top of each tower A¹, A² a pipe or flue V extends laterally to the tower B. From the tower B a pipe or flue 4 extends to an exhauster F of any suitable character to convey the gases to the chambers; and suitable coolers C¹, C²,

C³ are arranged to receive the liquor from the bottom of each of the towers.

The tanks T¹, T² and T³, are suitably connected with the towers A¹, A², and B respectively, by means of suitable distributing devices. A pump P' supplied by a pipe S¹ with chamber acid from the chambers, and by a pipe S² from the cooler C³, delivers the liquor through the discharge pipe S³ and branch pipes into the tanks T¹ and T³. It will be noted that the liquor in C³ contains nitrogen oxids in solution. The weak acid from tank T³ passes down the tower B and is delivered into the cooler C³, an overflow pipe S⁸ being provided which may lead to a storage tank or the chambers. A pipe S⁹ supplies the tank T¹ with nitrous vitriol from the Gay Lussac tower. The liquor from tank T¹ passes down the tower A¹, collects in the cooler C¹, and is delivered by means of a pipe S⁴ to the pump P, which delivers the liquor by means of a discharge pipe S⁵ to the tank T². The liquor from tank T² passes down the tower A², discharges into the cooler C², which delivers by a pipe S⁶ to a pump P², which is connected to a discharge pipe S⁷ leading to the storage tank.

The hot gases from the tower A² pass to tower B, and the cooler gases from the tower A¹ also pass to the tower B, suitable dampers D, D regulating the flow of these gases, and as these are mixed together in the tower B, they are subjected to the action of weak sulfuric acid, which is discharged into the tower B from the tank T³ supplied from the lead chambers and from tank C³ through S³ as described and properly distributed in the tower.

In operating the apparatus both towers are supplied through the flues E with the sulfurous acid gas, and the tower A¹ is fed with a mixture of chamber acid and nitrous vitriol, as usual, with the result that the liquor at the bottom of the tower and carried to the cooler C¹ is of a strength of from 60° to 62° Be. This liquor is then elevated to the top of the tower A² by the pump P, the apparatus being so regulated that a concentration will be effected in the tower A² and will in all cases produce a liquor exceeding 60° Be., and in order to obtain this liquor free from nitrogen oxids, no niter in any shape must be admitted to the tower A² so that the denitrating is effected wholly in

the other tower. Due to the high concentration of the acid in the tower A² the gases issuing therefrom through the pipe V are very hot and must be cooled down before they enter the lead chambers.

5 The gases issuing from the denitrating tower, of moderate temperature and laden with nitrogen compounds, and those issuing from the concentrating tower, and free from nitrogen compounds and of high temperature, are brought together in the intermediate tower, the function of which is to unite and thoroughly mix these gases and reduce the temperature of the gases from the concentrating tower so that the mixed
10 gases are at a temperature which will not be injurious in the further operations. To this end these mixed gases are subjected in the intermediate tower to the action of the cool weak sulphuric acid, the operation being so regulated that the gases will issue from the intermediate tower at such temperature as is demanded by mechanical and chemical considerations. In other words,
15 my process splits the available burner gas into two parts, one part is used to denitrate the nitrous vitriol and concentrate the weak sulfuric acid formed in the chambers, and the other part of the burner gases is used to effect a further concentration of the 60° to
20 62° sulfuric acid thus produced. The waste gases resulting from the two parallel operations are then brought together mixed and cooled in a subsequent intermediate tower before being admitted to a series of chambers and Gay Lussac towers.

It will be noted that due to the high concentration of the acid in the tower A² the gases issuing therefrom will be very hot while the gases issuing from the tower A¹
40 will not be at such a high temperature. It is for the purpose of cooling down the hot gases issuing from A² that the tower B is provided, where the hot gases from A² thoroughly mix with the gases from A¹ and the mixture is cooled to a low temperature, due to the excess of acid percolating down B. It is much easier to construct the lining of A² so as to resist the high temperature and
50 the strong acid than it is to construct the entire lining of the chambers which are of very large area, and therefore the lining in A² is a special acid and heat resisting lining, and the hot gases being reduced in temperature in the intermediate tower B, no injury
55 to the lead chambers will result.

The liquor from the intermediate tower is suitably cooled in the cooler C³ and constitutes part of the body of liquor which is
60 operated upon in denitrating and concentrating in the tower A¹. The liquor from the tank C² is carried by a pump P² to a suitable storage reservoir. By means of this process sulfuric acid containing as high as
65 96° (H₂S₀₄) has been obtained without any

greater amount of fuel, labor or supervision than is ordinarily required in producing acid of much lower strength, and by means of properly constructed flues and dust chambers the acid may be had of the proper light
70 color, or freedom from color.

It will be evident that while in Figs. 1 and 2 I have shown three structures in order to provide the proper independent chambers, it is wholly immaterial whether such chambers be in a plurality of structures or not.
75 In the construction shown in Fig. 3 the tower B corresponds to the tower B of Figs. 1 and 2, but the tower A is subdivided vertically into two chambers.

Without limiting myself to the details of operation or apparatus hereinbefore set forth, I claim as my invention:

1. The method of manufacturing concentrated sulfuric acid which consists in independently operating upon two bodies of liquor to denitrate one and concentrate the other in the presence of hot sulfurous acid gas, and then bringing the gases from the two operations together into contact with
80 cool weak acid before discharging them into the chambers.

2. The method of manufacturing concentrated sulfuric acid which consists in exposing independent portions of the liquor to the action of the hot burner gases one for denitration and the other for concentration, and thereafter bringing the gases together into contact with weak liquor before discharging them into the chambers.
85 90 95 100

3. The method of manufacturing concentrated sulfuric acid which consists in exposing independent portions of the liquor to the action of the hot burner gases one for denitration and the other for concentration, and thereafter bringing the gases together into contact with an excess of weak cool liquor before discharging them into the chambers.
105

4. The method of manufacturing concentrated sulfuric acid which consists in conducting independent portions of the hot burner gases through a denitrating apparatus and a concentrating apparatus, and thereafter bringing the gases together into
110 a cooling apparatus before discharging them into the chambers.

5. The method of manufacturing concentrated sulfuric acid which consists in conducting independent portions of the hot burner gases through a denitrating apparatus and a concentrating apparatus, and thereafter bringing the gases together and passing them through a cooling apparatus into contact with an excess of dilute liquor
115 before discharging them into the chambers.

6. The method of manufacturing concentrated sulfuric acid which consists in conducting independent portions of the hot burner gases through a denitrating appa-
120 125 130

ratus and a concentrating apparatus, thereafter bringing the gases together into a cooling apparatus in the presence of weak liquor before discharging them into the chambers, and discharging the denitrated liquor from the denitrating apparatus into the concentrating apparatus.

7. The method of manufacturing concentrated sulfuric acid which consists in conducting independent portions of the hot burner gases through a denitrating apparatus and a concentrating apparatus, and

thereafter bringing the gases together and passing them through a cooling apparatus into contact with an excess of dilute liquor before discharging them into the chambers, and using the dilute liquor from the cooling apparatus in the denitrating apparatus. 15

In testimony whereof I affix my signature in presence of two witnesses.

OTTO PROELSS.

Witnesses:

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J. P. MITSAY.