

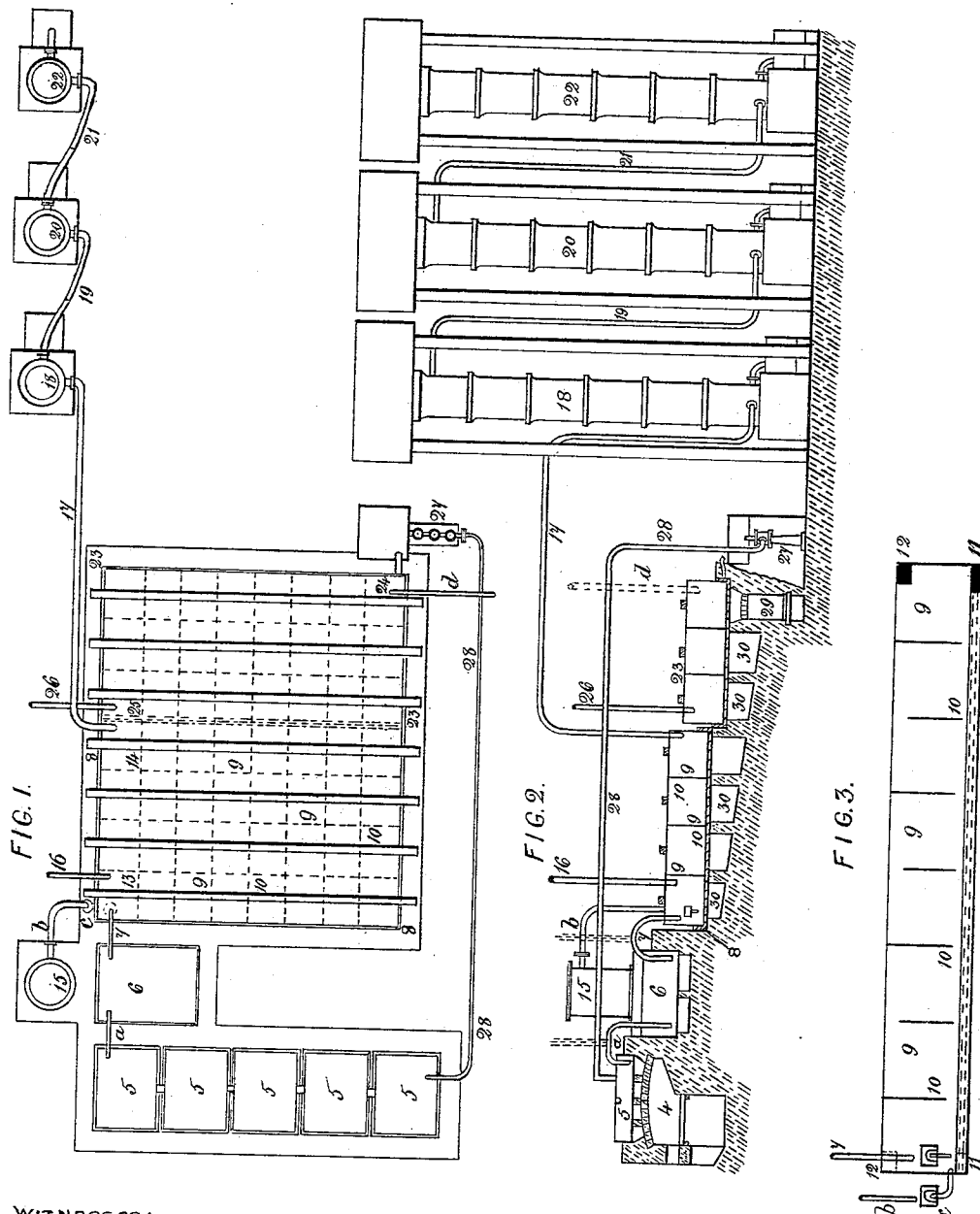
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Patented Apr. 18, 1899.

A. VOGT & A. R. SCOTT.
PROCESS OF OBTAINING CHLORIN.

(Application filed Dec. 3, 1897.)

(No Model.)



WITNESSES:

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ADOLPH VOGT AND ANDREW ROSS SCOTT, OF GLASGOW, SCOTLAND.

PROCESS OF OBTAINING CHLORIN.

SPECIFICATION forming part of Letters Patent No. 623,447, dated April 18, 1899.

Application filed December 3, 1897. Serial No. 660,717. (No specimens.)

To all whom it may concern:

Be it known that we, ADOLPH VOGT and ANDREW ROSS SCOTT, subjects of the Queen of Great Britain and Ireland, and residents of Glasgow, in the county of Lanark, Scotland, have invented certain Improvements in Obtaining Chlorine, (for which we have obtained British Patent No. 12,074, dated June 20, 1893; French Patent No. 231,847, dated July 29, 1893; Belgian Patent No. 106,830, dated October 16, 1893, and German Patent No. 73,962, dated July 27, 1893,) of which the following is a specification.

This invention relates to the obtainment of chlorine from hydrochloric acid by means of nitric and sulphuric acids, and has for its object to simplify and improve the process and to render it more economical and satisfactory than as hitherto conducted.

This invention consists in causing streams or currents of the three acids to flow in a continuous manner all in one direction through suitable apparatus while subjected to suitable heat.

In carrying out the invention the apparatus employed is made of or lined with lead or other not easily corrodible material, and consists of a covered channel which is horizontal or slightly inclined. Through the channel a continuous stream of sulphuric acid is maintained, and above the sulphuric acid hydrochloric acid, preferably gaseous, is led into the apparatus. Along with the other acids nitric acid is admitted in a manner to flow along the surface of the sulphuric acid without mixing therewith to any great extent, or the nitric acid may be admitted in a vaporized condition. A temperature of 125° centigrade is maintained throughout the apparatus, or the temperature may gradually decrease along the channel to a terminal temperature of 105°. The channel may consist of a single straight length or of a number of lengths connected at alternate ends to form a tortuous course, and the heat may be applied by means of a furnace with flues extending under the channel or channels, or more or less of the heat may be due to the sulphuric acid being admitted in a heated state—as, for example, when supplied directly from a concentrating apparatus.

As the acids flow through the apparatus re-

actions take place, resulting in the production of free chlorine and gaseous nitrogen compounds, which are led from the channel into apparatus in which the nitrogen compounds and any hydrochloric acid are separated from the chlorine by well-known means. The sulphuric acid becomes diluted with water taken up by it in the reactions, but leaves the apparatus practically free from nitrogen compounds and merely requires concentration to enable it to be used over again. Nitric acid is by well-known means re-formed from the gaseous nitrogen compounds, some hydrochloric acid being also re-formed from chlorine forming a constituent of those compounds.

In order that the said invention and the manner of performing the same may be properly understood, there is hereunto appended a sheet of explanatory drawings to be hereinafter referred to and representing, by way of example, a form of apparatus suitable for carrying out the invention.

Figure 1 of the drawings is a diagrammatic plan, and Fig. 2 is a corresponding sectional elevation, while Fig. 3 is an enlarged vertical section taken along a part of the channel and transversely to Figs. 1 and 2.

In the drawings the same reference letters and numerals are used to mark the same or like parts wherever they are repeated.

At the left-hand parts of Figs. 1 and 2 a furnace 4 is shown, arranged for heating a set of pans 5 for reconcentrating the sulphuric acid which becomes diluted in the process. From the pans 5 the concentrated sulphuric acid is transferred by means of a siphon to a reservoir or tank 6, from which it is supplied by means of a siphon 7 to the channel apparatus in which the process constituting the invention is in operation. This channel apparatus consists of a rectangular lead or lead-lined structure 8, divided into four transverse lengths by vertical partitions 9, of which one is shown separately in Fig. 3, and the spaces thereby formed are subdivided by partitions 10, none of which reach the bottom, but which are formed and placed in a manner to allow gases to flow alternately under and over each in succession. The partitions 9 are made each with lower and upper openings 11 12 at one end, the lower opening being for

the passage of the liquids and the upper one for the gases, and these openings 11 12 are at opposite ends of the alternate partitions 9, the dotted lines in Fig. 3 indicating the positions of the openings in the next partition. With these arrangements the liquids and gases flow from the inlet part 13 along the spaces formed by the partitions 9 alternately in opposite directions to the outlet part 14, the partitions 10 at right angles to the partitions 9 being for the purpose of keeping the gases well mixed and of preventing portions passing along the tops of the spaces without approaching the liquids.

The sulphuric acid is caused to flow through the apparatus in a stream having a small depth of, for example, 2 to 4 centimeters. The nitric acid is supplied from a reservoir or tank 15 by a pipe *b* and inlet-traps *c*, which prevents escape of gas, and is introduced at the inlet part 13 at the surface of the sulphuric acid, so that it may flow along that surface with as little mixing as possible. The hydrochloric acid is supplied at the inlet part 13 by a pipe 16. The gaseous chlorine and nitrogen compounds formed in the process by the reactions between the three acids leave the channel apparatus 8 at the outlet part 14 by a pipe 17, communicating with the bottom of a tower 18, up which the gases pass, while sulphuric acid passes downward to absorb the nitrogen compounds. From the top of the tower 18 the chlorine, having mixed with it some hydrochloric acid, passes by a pipe 19 to the bottom of a second tower 20, down which water is passed to absorb the hydrochloric acid. Finally the chlorine is led by a pipe 21 to the bottom of a third tower 22, in which it is acted on by sulphuric acid to absorb moisture, and it may then be passed to lime-chambers or used in any desired manner.

When the sulphuric acid leaves the channel apparatus 8 at the outlet part 14, it is still strong enough for dehydrating hydrochloric acid as that acid comes from the ordinary salts-decomposing furnace, and it is used for that purpose in supplementary channel apparatus 23, which is internally divided like the main channel apparatus 8, the fresh hydrochloric-acid gas entering by a pipe *d* at the part 24, at which the sulphuric acid finally

leaves the apparatus, and leaving it at 25, at which the sulphuric acid enters from the other apparatus 8. The dried hydrochloric acid leaves the channel apparatus 23 by a pipe 26 and is by preference passed through any suitable measuring apparatus before being supplied by the pipe 16 to the main channel apparatus 8 in order that the quantities of nitric acid and sulphuric acid introduced may be suitably proportioned to the hydrochloric acid.

The hydrochloric acid may be introduced in an aqueous condition, in which case the quantity of sulphuric acid must be proportionately increased to absorb the larger quantity of water.

The diluted sulphuric acid is by means of a pump 27 and pipes 28 transferred to the concentrating-pans 5.

The channel apparatus 8 and 23 is heated by means of a furnace 29, from which flues 30 extend under the apparatus.

What we claim as our invention is—

1. The herein-described continuous process of obtaining chlorine, consisting in causing hydrochloric acid, sulphuric acid and nitric acid to flow in substantially horizontal streams in a continuous manner in the same direction in contact with each other, while subjected to suitable heat, substantially as set forth.

2. The improved continuous process for obtaining chlorine, consisting in causing hydrochloric acid to flow in a substantially horizontal stream over, and in the same direction with, a substantially horizontal stream of sulphuric acid, over which there is caused to flow at the same time and in the same direction, nitric acid, the whole being subjected to heat, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of the subscribing witnesses.

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ANDREW ROSS SCOTT.

Witnesses as to Adolph Vogt:

GUSTAVUS W. RAWSON,

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Witnesses as to Andrew Ross Scott:

EDMUND HUNT,

DAVID FERGUSON.