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F. W. HALL

APPARATUS FOR THE MANUFACTURE OF ALUMINUM CHLORIDE

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Fig. 1.

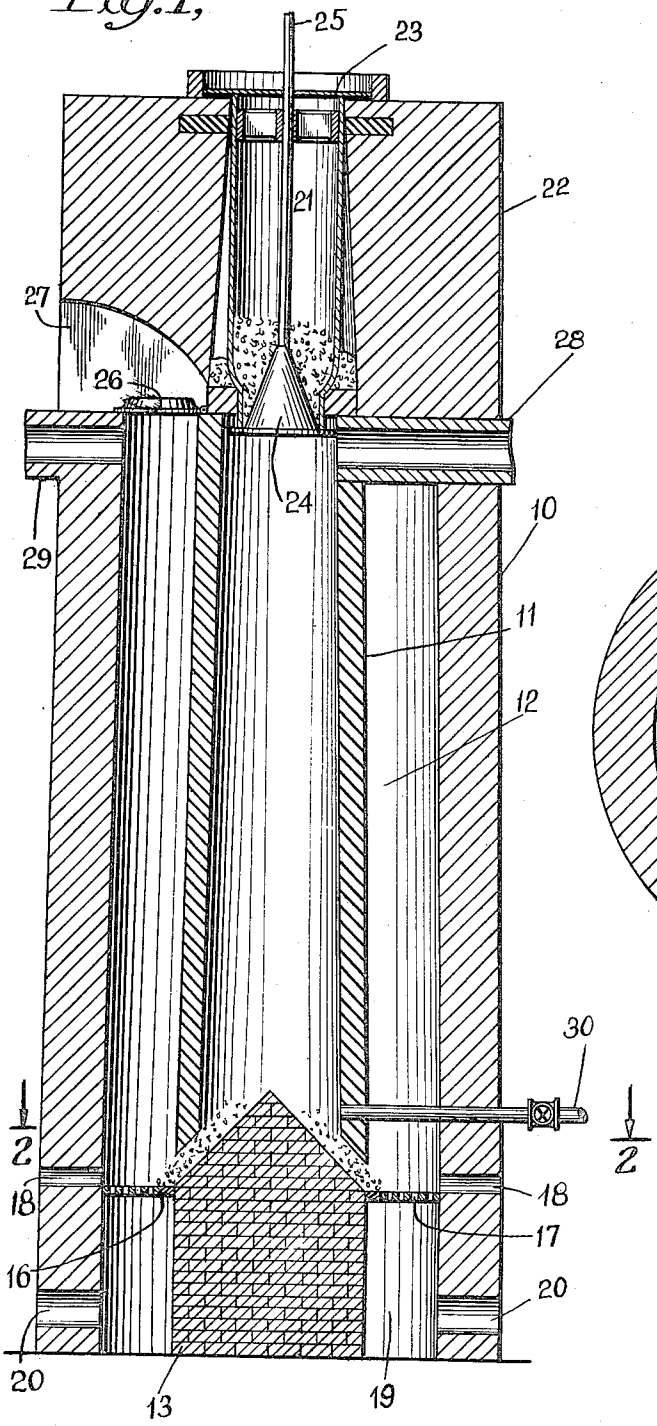
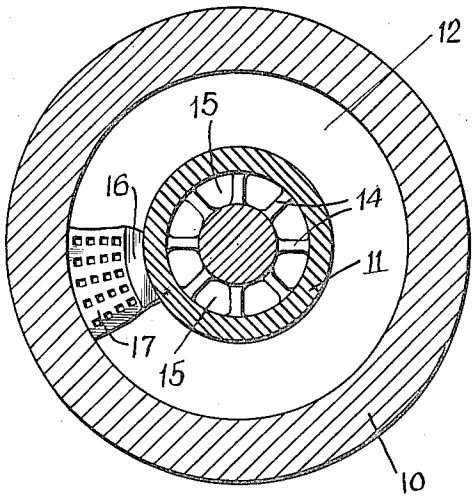


Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANK W. HALL, OF PORT ARTHUR, TEXAS, ASSIGNOR TO THE TEXAS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF TEXAS.

APPARATUS FOR THE MANUFACTURE OF ALUMINUM CHLORIDE.

Application filed December 30, 1921. Serial No. 525,877

To all whom it may concern:

Be it known that I, FRANK W. HALL, a citizen of the United States of America, and a resident of Port Arthur, county of Jefferson, and State of Texas, have invented certain new and useful Improvements in Apparatus for the Manufacture of Aluminum Chloride, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

My invention relates to retorts adapted for the carrying out of chemical reactions and has special reference to apparatus adapted for the large scale continuous production of anhydrous aluminum chloride.

One object of my invention is to provide a retort of the aforesaid character in which the combustion chamber and the retort are combined in a novel and effective manner.

In the preferred embodiment of my invention the heat of the combustion is directly applied to the retort and the ash or spent material from the retort not only serves as a gas seal to prevent the escape of gas from the interior of the retort or the ingress of combustion gases or air from the furnace, but also is mingled and discharged with the ash in the furnace.

In a retort arranged and constructed in the above manner, the production of aluminum chloride may be carried on continuously without air being admitted to the reaction chamber and without the liability of permitting the escape of chlorin or other reaction gas from the chamber.

Other objects and advantages of my invention will be set forth hereinafter, and I will now describe the same with reference to the drawing and point out the novel features thereof in the appended claims.

Figure 1 is a sectional elevation of an apparatus arranged and constructed in accordance with my invention and constituting an embodiment thereof.

Figure 2 is a sectional plan view taken on the line 2—2 of Figure 1.

Referring to the drawings, the apparatus illustrated includes a furnace 10 constructed of suitable refractory material and of any suitable proportions. It is hollow cylindrical in form and a vertical retort 11 is positioned concentrically within the furnace forming an annular combustion or heating chamber 12 between the walls of the furnace and the walls of the retort.

The retort 11 is mounted on a foundation or mass of brick work 13 which is disposed within the furnace 10 at the base and has a conical top which extends into the lower end of the retort.

Spaced supports 14 are interposed between the walls of the retort and the foundation 13, forming openings 15 through which the spent material is discharged from the retort to the furnace. The supports 14 are preferably wedge shaped with the point of the wedge arranged inwardly toward the apex of the cone so that the supports retard as little as possible the flow or passage of material from the retort to the furnace.

The furnace chamber is provided with an annular ledge 16 on which the spent material or ash from the retort accumulates and a grate 17. If desired movable grates or ledges may be employed to facilitate the discharge of the ash. The combustion material such as coke, is burned in the annular chamber 12 of the furnace and is built up on the grate 17. The arrangement is such that the spent material from the retort is commingled with the ash from the combustion chamber and gradually passes out through the grate, a sufficient quantity being always held around the discharge opening 15 of the retort to constitute a gas seal.

Excess ash accumulating on the grate may be removed through openings 18 but these are primarily intended to enable the firemen to introduce a rod or poker to break up the combustion material and also to force the fine ash through the grate into the ash pit 19. The spent material from the retort and the ash accumulating in the ash pit are withdrawn through the doors 20.

The combustion chamber is charged through an opening 27 in the superstructure 22 of the furnace and through a door 26, the combustion gases passing outwardly through the flue 29. In the superstructure 22 is mounted a hopper 21 which discharges into the top of the retort through a gate valve 24 which is controlled from the top of the structure by rod 25, and may be supplied with fresh material such as a coked combination of carbon and aluminum ore, by removing the cover 23 at the top.

By keeping either the cover plate 23 or the gate 24 closed at all times the retort is

sealed so as to prevent the escape of gas or vapors.

The aluminum chloride vapors formed in the retort flow through the outlet 28 into any suitable type of sublimer or condenser (not shown).

The gas, such as chlorin for example, to carry on the reaction, is admitted through the pipe 20.

My retort is particularly adapted for use in the production of anhydrous aluminum chloride and when so used, I prefer to employ the well known reaction obtaining between alumina, carbon and chlorin, but it will be understood that the apparatus may be utilized for carrying out other reactions. To illustrate the operation of the apparatus, I will now describe a specific example employed in the manufacture of aluminum chloride.

Alumina and carbon after having been mixed together and coked are admitted into the hopper 21 where they are preheated by waste heat from the furnace and retort, and then discharged into the retort 11. The chlorin gas is introduced through the pipe 30. Coal, coke or other fuel, is charged through the door 26 and the combustion chamber is fired in such manner as to obtain the required temperature in the retort 11.

The aluminum chloride vapors generated in the retort pass through the outlet 29, by which they are conducted to suitable condensers or collectors, as may be desired. The spent materials which have been acted upon by the chlorin tend to settle down into the lower part of the retort and fresh charges of alumina-carbon coke are introduced through the hopper 21 as may be desired. When the coked mixture has been properly chlorinated, a fine ash accumulates in the bottom of the retort and is discharged through the opening 15. This ash while in transit through the openings forms a seal therein which prevents the ingress and egress of vapors or gases to or from the retort. The excess ash, is removed either through the openings 18 or else is discharged through the grate 17 into the ash chamber.

A fuel such as coke, is admitted into the combustion chamber from time to time as necessary and the ash from the combustion chamber as well as the ash from the retort may thus be discharged through the grate 17 into the ash chamber.

Apparatus of preferred form and construction has been illustrated and described for the purpose of showing a way in which this invention may be practiced, but the inventive thought upon which this application is based is broader than this illustrative embodiment. It is therefore understood that the scope of the invention is not to be limited by the present disclosure, reference being had to the appended claims for that purpose.

What I claim is:

1. Apparatus for the manufacture of aluminum chloride comprising an inner vertical retort, a furnace surrounding the retort and spaced from it to form a furnace chamber, a grate dividing the furnace into a combustion chamber and an ash pit and outlets at the bottom of the retort discharging onto said grate.

2. Apparatus for the manufacture of aluminum chloride comprising an inner vertical retort, a substantially cylindrical furnace surrounding the retort and spaced from it to form a furnace chamber, an annular grate dividing the furnace into a combustion chamber and an ash pit, and outlets at the bottom of the retort discharging onto said grate.

3. Apparatus for the production of aluminum chloride comprising a retort, means for admitting thereto materials adapted to be treated to form aluminum chloride means for removing the aluminum chloride vapors produced, a combustion chamber adapted for heating said retort, means for admitting fuel to said chamber, an outlet at the bottom of the retort communicating with the combustion chamber, means for permitting the ash discharged from the retort to accumulate about said outlet to form a gas tight seal.

4. Apparatus for the production of aluminum chloride comprising a furnace having a combustion chamber, a grate at the bottom of the combustion chamber, a ledge adjacent said grate, a retort positioned within said combustion chamber and an outlet at the bottom of the retort adapted to discharge ash onto said ledge.

5. Apparatus for the manufacture of aluminum chloride comprising a retort, a combustion chamber about the retort adapted to supply heat thereto, a discharge outlet from the retort to the combustion chamber and means for maintaining ash from the retort about said outlet so as to form a gas-tight seal.

6. Apparatus for the production of aluminum chloride, comprising a furnace having a vertically disposed combustion chamber, a vertical retort disposed therein, means for admitting material to the retort, means for admitting fuel to the combustion chamber at the top thereof, a discharge outlet at the base of the retort, and means for retaining material about said outlet to form a gas tight seal preventing ingress or egress of gases to or from the retort.

7. Apparatus for the production of aluminum chloride, comprising a furnace having a combustion chamber, a grate near the bottom of the combustion chamber, a ledge adjacent said grate, a vertical retort

positioned within the said combustion chamber of the furnace, an outlet at the bottom of the retort adapted to discharge ash onto said ledge, and a chamber beneath said grate adapted to receive material therefrom.

8. Apparatus for the manufacture of aluminum chloride comprising a retort, a combustion chamber about the retort adapted to supply heat thereto, a discharge outlet from the retort to the combustion chamber, means for receiving material from said outlet and supporting same about the outlet so as to form a seal therein and a grate adapted to permit discharge of material from the combustion chammer.

In witness whereof I have hereunto set my hand and seal this 12th day of December, 1921.

FRANK W. HALL.