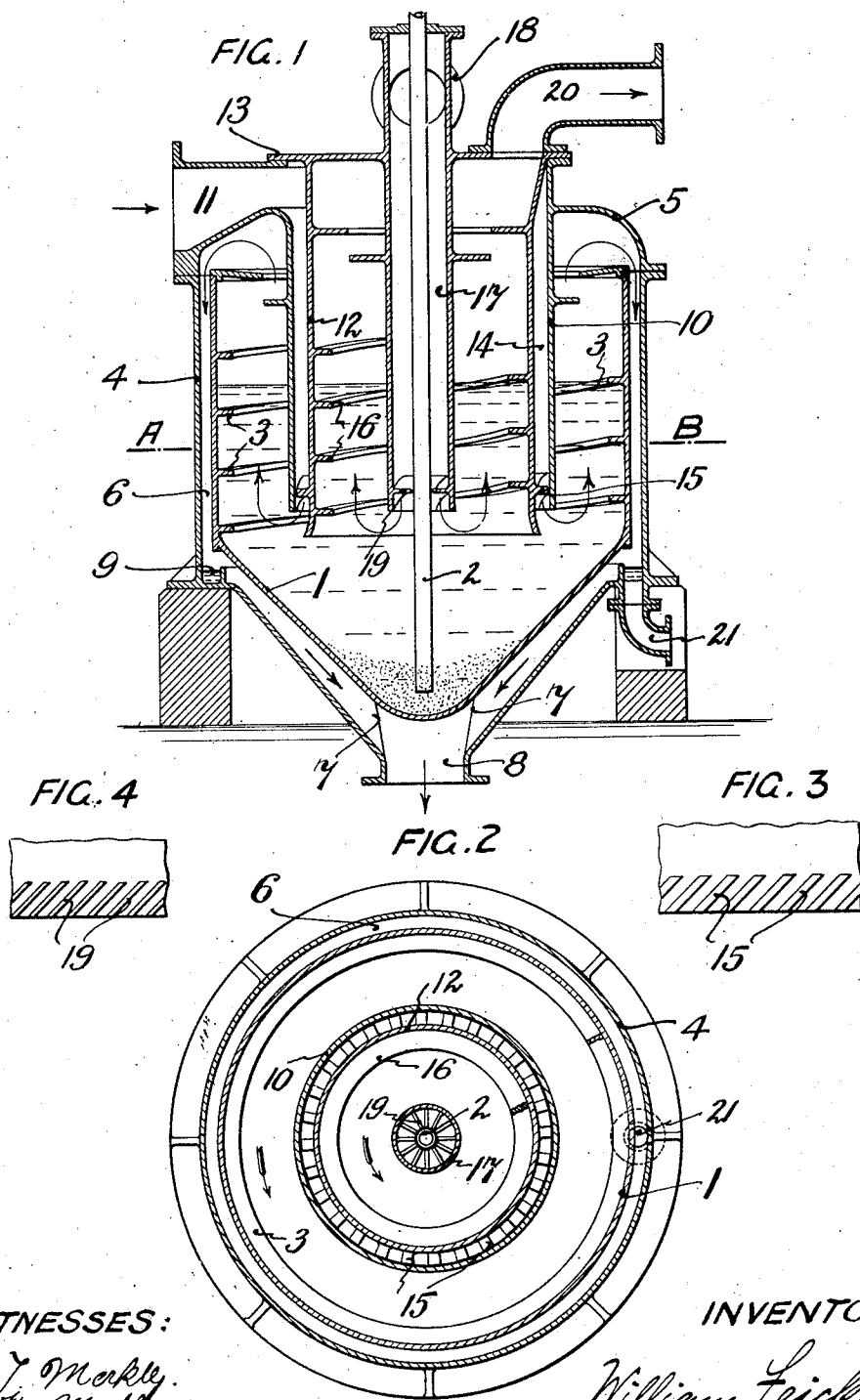


W. FEICKS.
SATURATION APPARATUS.
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1,062,960.

Patented May 27, 1913.



WITNESSES:
F. J. Mackley.
M. H. Merkle.

INVENTOR:

William Feicks

UNITED STATES PATENT OFFICE.

WILLIAM FEICKS, OF BLOOMFIELD, NEW JERSEY.

SATURATION APPARATUS.

1,062,960.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM FEICKS, a subject of the German Emperor, residing at Bloomfield, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Saturation Apparatus, of which the following is a specification.

The object of the present invention is a saturation apparatus mainly designed to carry on the process in which gases of different compositions are separately passed through the same saturation bath and separately withdrawn from the latter.

The apparatus under consideration further employs novel features of construction hereinafter shown and described, to the end of improved results of operation.

The invention will be best understood by reference to the accompanying drawing in which;

Figure 1 is a vertical section through a saturation apparatus according to my invention. Fig. 2 is a horizontal section on the lines A—B of Fig. 1, while Figs. 3 and 4 represent developments of the lower ends of parts 12 and 17 respectively.

On the drawing 1 represents a vessel of circular cross section and partly filled with a saturation liquid. If the production of ammonium sulfate is intended the saturation liquid consists of sulfuric acid or an acid salt solution. The bottom of vessel 1 is tapered downward to collect the precipitated salt, which is either continuously or at intervals removed by the ejector 2. The cylindrical portion of the vessel is provided on the inside with a helical annular rib or projection 3. Vessel 1, which itself is open at the top, is enveloped by a housing or casing 4, the top part of which is formed by a removable cap 5. Between vessel 1 and housing 4 an annular space or chamber 6 is formed, communicating above with the vessel and through which hot gases issuing from the latter are passed. The bottom of housing 4 is provided with a number of ribs 7 supporting vessel 1, and a gas outlet 8. In the lower part of housing 4 an annular pocket 9 is formed in which any condensates formed by the gases are collected. Cap 5 is provided on the inside with a cylinder 10 formed from depending walls of said cap the lower ends of which project into the saturation liquid preferably concentric with vessel 1. At the upper end cylinder 10 is equipped with a gas inlet 11. Inserted into

cylinder 10 is a second cylinder or bell 12 supported at its upper end by flange 13, which also serves to close the insertion opening provided in cap 5. Bell 12 which, together with cylinder 10 forms the annular chamber 14 projects somewhat deeper into the liquid than cylinder 10 to form a guard for maintaining different gases separately in the acid bath and serving to guide them in their proper channels. Chamber 14 is preferably concentric with chamber 6. The lower end of bell 12 is provided on its outside with a number of short ribs or the like 15 so arranged as to ascend on the outer surface of the bell. The ribs or projections 15 close annularly with a suitable clearance against the inside of cylinder 10. The inside of bell 12 is provided in a similar manner to vessel 1 with a spiral like annular rib or projection 16. Extending within bell 12 is a pipe 17 provided at its upper end with a gas inlet 18. This pipe dips into the liquid to about the same depth as cylinder 10. The lower end of pipe 17 is provided similarly to bell 12 but on its inside with a series of short ribs or projections 19 so arranged as to ascend on the inner surface of the pipe. Ribs 19 close annularly with suitable clearance against the ejector pipe 2. The upper part of bell 12 is provided with a gas outlet 20.

The operation is as follows:—Gases are conducted to annular chamber 14 by the inlet 11. These gases leave chamber 14 through the ducts formed by the inclined ribs 15 and the various streams of gas being thus tangentially deflected in breaking through the liquid cause the latter to assume a continuous rotary motion. The gases after passing through the liquid collect in the top part of vessel 1 and from here are conducted through annular chamber 6 and led away by outlet 8. By this method of withdrawing the hot gases from the saturation vessel the radiation of heat from the latter is greatly reduced and at the same time considerable cooling of the hot gases effected. Any condensates formed by the gases in passing through chamber 6 are collected in the annular pocket 9 and let off by pipe 21.

Simultaneously gases are conducted to pipe 17 by inlet 13 and passed through the liquid by the ducts formed by ribs 19. These gases in breaking through the liquid are deflected in the same direction as the gas passing through chamber 14, so that an ad-

ditional torque is produced. All parts of the liquid are therefore kept well in circulatory motion and by the additional aid of the helical ribs 3 and 16 which, in rotating the liquid produce a continuous up and down movement of the same, a thorough mixing of the bath and a constant acidity and temperature in all parts of same is assured. The gases after passing through the bath are collected in the top part of bell 12 and led away by pipe 20. The salt collecting at the bottom of vessel 1 is removed by the ejector 2. New acid is added to the bath in any desired manner.

What I claim is:—

1. A saturation apparatus comprising a vessel adapted to contain a liquid, a plurality of annular chambers located within said apparatus and terminating below the normal level of the liquid, independent means for supplying gas to each of said annular chambers and independent means for withdrawing such gases from such chambers after they have passed in contact with the liquid.

2. A saturation apparatus comprising a vessel adapted to contain a liquid, an annular chamber outside said vessel communicating at a point above the normal liquid level with said vessel to conduct gases therefrom, means for introducing gases into said vessel and through the liquid and an exit for such gases leading from said annular chamber.

3. A saturation apparatus comprising a vessel adapted to contain a liquid; a housing enveloping said vessel forming a chamber for passage of gases, communicating at one end with said vessel and forming at its other end means for withdrawing gases; and means for supplying gases to said vessel through the liquid.

4. A saturation apparatus comprising a vessel adapted to contain a liquid, means for passing gas through and imparting a rotary motion to said liquid, a circulatory annular projection inside said vessel and means for introducing gas into and withdrawing it from said vessel.

5. A saturation apparatus comprising a vessel adapted to contain a liquid, means for the introduction to and removal of gases from said vessel and helical projections in said vessel arranged to cooperate with the gas to cause stirring of the liquid.

6. A saturation apparatus comprising a vessel adapted to contain a liquid, a gas supply pipe terminating in said liquid, means for causing gas introduced through said pipe to pass down into said liquid for a short distance, then upwardly in circulatory paths to stir the same, and means for collecting the gas from said vessel.

7. A saturation apparatus comprising a vessel adapted to contain a liquid, a gas sup-

ply pipe terminating in said liquid and provided at its lower end with outwardly and downwardly inclined ducts to cause gas to be projected thoroughly and downwardly into the liquid, means to cause the gas to travel a circulatory course in ascending to stir the liquid, and means for collecting such gas from said vessel.

8. A saturation apparatus comprising a vessel adapted to contain liquid, means for passing gas through and imparting a rotary motion to the liquid, and a bell or the like located in said vessel terminating below the normal level of the liquid and provided with a helical annular projection, means for introducing gas into said vessel, and means for collecting gas therefrom.

9. A saturation vessel in which two different gases may be separately passed through the same acid bath of liquid, comprising; an outer casing, a cap for the same having an inner depending wall and an opening for a bell and pipe; a liquid vessel the walls of which serve to form annular chambers or passages with the walls of said casing and with the depending wall of said cap for the passage of one gas; an inner bell-like member having walls adapted to cooperate with the depending wall of said cap to form a passage for the same gas but extending below the depth of said depending wall in the liquid to act as a guard against the passage of other gases; a pipe within said inner bell adapted to supply another gas to said vessel and within said liquid and forming with said inner bell an annular passage for such other gas; an exit leading from such passage; an exit leading from said casing and from the chamber or passage formed between the vessel and said casing; means for introducing gases into the passage formed by the depending wall of said cap and the bell; means for introducing other gases into said pipe; and means for removing salt formed from the liquid in said vessel.

10. In a saturating apparatus, a vessel for containing liquid having annular projections forming a circulatory path within such vessel, a casing for such vessel adapted to form a passage with said vessel, a cap for said casing having a depending wall within said vessel and forming a passage, an inner bell located in said vessel and forming a passage with said depending wall, and a pipe within said bell forming a passage with the walls of said bell, the said bell projecting into the liquid to a greater depth than said depending wall, means for introducing gases into the passage formed by the bell and the depending wall through the liquid, thence in the passage formed by the vessel and said depending wall and in a circulatory path in said passage, and thence to the passage formed by the walls of the cas-

ing and said vessel, and thence from the apparatus, and means for introducing gas into said pipe, thence through said liquid, thence to the passage formed by said pipe and the walls of said bell, and thence to an exit from the apparatus.

11. In a saturation apparatus, a vessel for containing liquid and means for passing gases into contact with said liquid and from the apparatus, a casing forming one of the passages for the gas and having an annular condensation pocket with an outlet therefor, and means for removing the salt formed.

12. A saturation apparatus comprising a vessel adapted to contain a liquid, an annular chamber in said vessel provided with a gas supply, lower end of said chamber normally communicating with the liquid in said vessel for passing gases therethrough and having ducts inclined to the vertical and so arranged that the gases are caused to travel through the liquid in circular paths, and means for introducing gas into said annular chamber.

13. A saturation apparatus comprising a reservoir for liquid, and at least two sets of concentric passages, one such set arranged to conduct the gas from one source through the liquid and from the apparatus and another set arranged to conduct gas from another source through different parts

of the same liquid and from the apparatus without the mingling of said gases.

14. A saturation apparatus comprising a reservoir for liquid, and at least two sets of passages for gases, said passages provided with means for causing said gases to enter the liquid in approximately circular paths, one such set arranged to conduct gas from one source through the liquid and from the apparatus and the other set arranged to conduct gas from another source through the liquid and from the apparatus without the mingling of said gases.

15. A saturation apparatus comprising a reservoir adapted to contain liquid, and at least two sets of passages formed by spaced walls arranged so that gas from one source may travel a certain set of passages and through the liquid and gas from another source may travel another certain set of passages and through another part of the same liquid, certain of said walls being seated to a greater depth below the normal level of the liquid than other said walls to prevent mingling of said different gases and to guide the gases to the proper passages.

WILLIAM FEICKS.

Witnesses:

F. T. MERKLE,
M. K. MERKLE.