I. HECHENBLEIKNER.

PROCESS OF CONCENTRATING SULFURIC ACID.

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1,264,182. Patented Apr. 30, 1918.

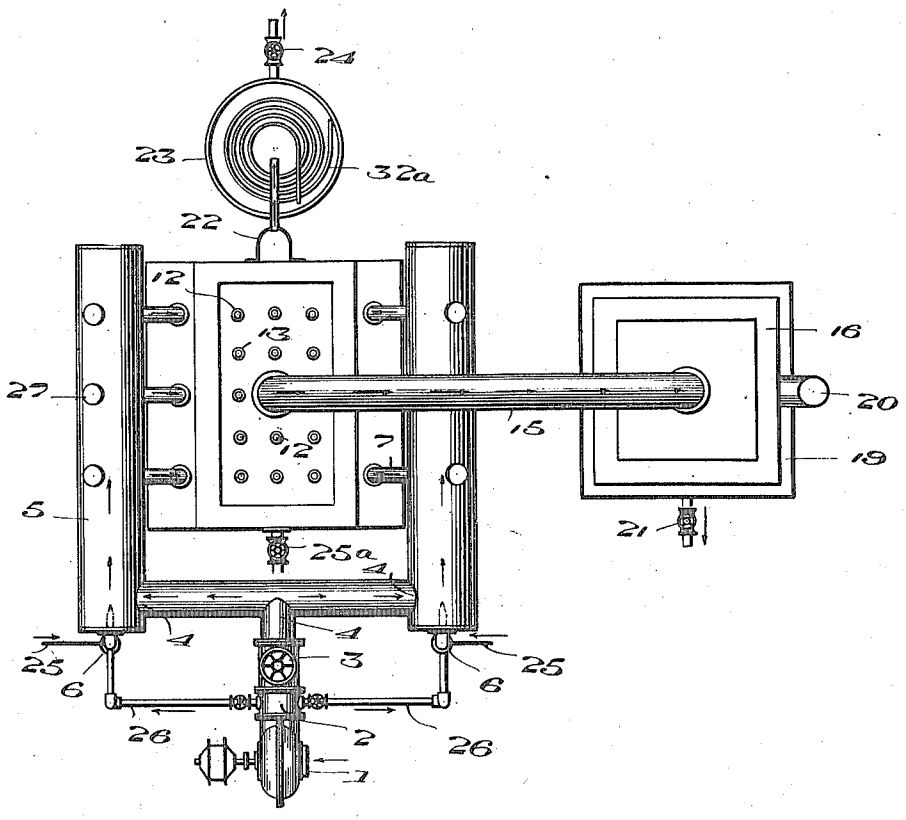


Fig. 2.

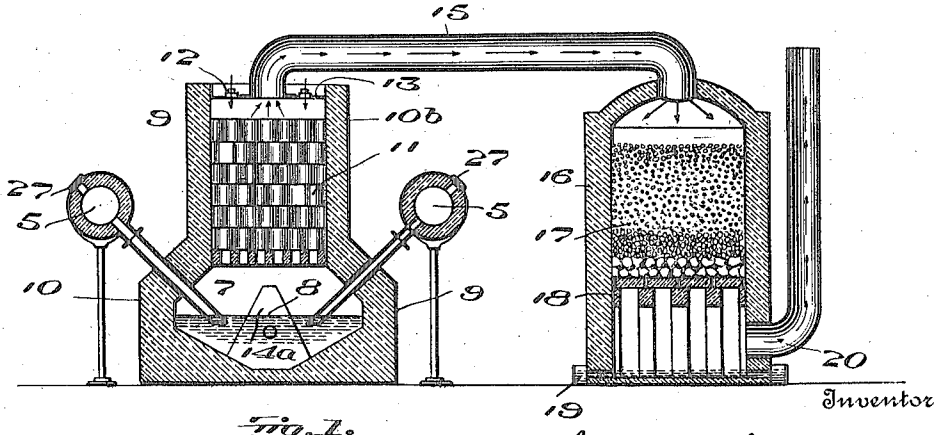


Fig. 1.

Inventor

Eugenius Hechenbleikner

By Meyers, Lenthaus & Rea

Attorney

UNITED STATES PATENT OFFICE.

INGENUIN HECHENBLEIKNER, OF CHARLOTTE, NORTH CAROLINA.

PROCESS OF CONCENTRATING SULFURIC ACID.

1,264,182. Specification of Letters Patent. Patented Apr. 30, 1918.

Original application filed November 6, 1914, Serial No. 870,624. Divided and this application filed February 10, 1917. Serial No. 147,966.

To all whom it may concern:

Be it known that I, INGENUIN HECHENBLEIKNER, a citizen of the United States, residing at Charlotte, in the county of Mecklenburg and State of North Carolina, have invented certain new and useful Improvements in Processes of Concentrating Sulfuric Acid, of which the following is a specification.

This is a division of my co-pending application for Letters Patent of the United States filed Nov. 6, 1914, Ser. No. 870,624 the invention described herein relating to a process whereas said co-pending application is directed to an apparatus.

This invention relates to the concentration of acids and the invention is described hereinafter by way of illustration as applied to the concentration of dilute sulfuric acid for which purpose I have employed this invention to concentrate the acid to a 98% purity.

A principal object of the invention is to provide a very efficient method for effecting the concentration of a weak acid.

A further object of the invention is to provide for effecting the concentration of the acid with as little loss as possible in the quantity or mass of acid which is being concentrated.

A further object of the invention is to prevent, as far as possible, losses in heat employed in carrying out the method.

The invention resides in the method to be described more fully hereinafter.

The invention consists in those features of the method hereinafter described all of which contribute to produce an efficient method for concentrating acids.

Figure 1 is a vertical section through the apparatus of my invention and which I prefer to use in practising my method.

Fig. 2 is a plan of the apparatus shown in Fig. 1.

Referring more particularly to the drawings wherein is shown one apparatus for carrying out my method, 10 represents any suitable means for maintaining a bath 8 of the acid which is to be concentrated. This means is preferably in the form illustrated and constructed of a suitable material which resists the action of the acid. I prefer to provide this holder or retort with a sheathing 9 of lead or similar material which resists the acid, and construct the wall of a material or lining of suitable brick which also resists the action of the acid.

The lower portion of the basin is preferably laterally extended and directly over this basin I prefer to form the concentrator into a tower 10^b and in this tower I prefer to provide a packing 11 of open checker-work which forms an obstruction in the path of the liquid acid which I prefer to admit through inlet pipes 12 in the cover 13 of the concentrator. This checker-work 11 is preferably supported on suitable arches 14 of brick or other material which will resist the acid. The lower parts of these arches are cut away so as to form gaps 14^a by means of which the entire interior of the basin is made to connect with an outlet valve 25^a by means of which the basin may be cleaned when desired.

In order to concentrate the acid I prefer to remove the volatile impurities in the acid without raising the temperature of the bath to the boiling point. In this way I effect the concentration without substantial loss in the quantity of acid. This is preferably effected through the medium of a heated gas which is preferably heated to a relatively high temperature such as will permit the gas passing through the bath in order to take up the water or other volatile impurities so that the hot gas issues from the path at a temperature below the boiling point of the bath. In this way although I am utilizing the highly efficient high temperature of the gas this does not have the effect of carrying off the acid but substantially eliminates the water or similar impurities.

For this purpose, I prefer to provide a blower or fan 1 which draws in atmospheric air and forces the same through a pipe 2 and regulating valve 3 into a branch pipe 4, which branch pipe preferably connects with two mains or distributing manifolds 5 which are preferably disposed on opposite sides of the concentrator.

I prefer to provide means for heating the air to about 400 deg. in these manifolds, for which purpose I prefer to provide oil burners 6 which are preferably arranged in the ends of the manifolds 5 and which are also preferably of the atomizer type and

therefore provided with air pipes 26 which lead off from the main air pipe connection 2. These burners are supplied with fuel through suitable pipes 25. The manifolds or mains 5 are preferably lined with fire brick and covered with a suitable sheathing. In order to conduct the hot air or other gas from the manifolds 5 through the bath, I prefer to provide a plurality of inclined twyers 7 which lead downwardly from the manifolds so that their mouths are disposed below the level of the bath and as indicated these mouths are preferably disposed in a horizontal plane so that the air will pass out of the mouth at all points around its periphery. In this way, I effect a thorough distribution of the hot air or gas in passing through the bath.

The gases as delivered to the bath are substantially at 400 deg. centigrade and the arrangement is such that they pass from the bath at about 200 deg. centigrade. As the gases pass from the bath, they pass upwardly through the checker-work 11 which forms a baffle for the gases and as the gases pass upwardly they come in contact with weak acid which is admitted through the inlets 12 so as to fall down in a finely divided state, that is, the liquid will trickle down in a descending current coming in contact with the hot gases passing upwardly. In this way, I cause the incoming weak acid to absorb a large portion of the heat of the gases which are passing out of the concentrator and I thereby effect a very substantial economy.

In order to remove any acid which may still remain in the gases which pass from the tower through the pipe 15, I prefer to provide a filter 16 which is built of acid resisting material and filled with a finely divided acid resisting substance 17, said substance being supported preferably on suitable arches 18, also of acid resisting bricks or similar material. The gases pass downwardly through this mass or material 17 and the moisture and acid carried in the gases are deposited and eventually drip down into the basin 19 at the bottom of the filter from which this very weak acid can be drawn off through a suitable valve 21. The outlet at this point is air-sealed in any suitable manner, such as that indicated in Fig. 1. The waste gases pass from this filter near the base through a suitable pipe 20 which directs the same upwardly.

In order to enable the manifolds 5 to be cleaned when desired, their upper sides are provided with removable covers 27. The concentrated acid is delivered through a sealed overflow 22 into a cooler 23 which cooler may be cooled by means of a suitable coil 32^a, through which brine or other cooling medium may be circulated. From the cooler the concentrated acid may be drawn off through a suitable valve 24. All parts which come in contact with the acid should be of acid resisting material.

What I claim is:

1. The method of concentrating a liquid acid which consists in maintaining a bath of the liquid at a temperature below the boiling point of the bath, passing hot air through said liquid to absorb and carry off volatile impurities in the acid and admitting a quantity of the weak acid to said bath and heating the same by the gases escaping from said bath.

2. The method of concentrating a liquid acid which consists in maintaining a bath of the liquid at a temperature below the boiling point of the bath, passing a heated gas into contact with said liquid to carry off volatile impurities in the acid, admitting a quantity of the weak acid to said bath and heating the same by the gases escaping from said bath.

3. The method of concentrating a liquid acid which consists in maintaining a bath of the liquid at a temperature below the boiling point of the bath, passing hot air through said liquid to absorb and carry off volatile impurities in the acid, advancing in a finely divided state a current of the weak acid to replenish the bath and passing the gases escaping from the bath into contact with said current.

4. The method of concentrating a liquid acid which consists in maintaining a bath of the liquid at a temperature below the boiling point of the bath, passing hot air through said liquid to absorb and carry off volatile impurities in the acid, permitting a quantity of the weak acid to pass in a descending current through an obstructed path to replenish the bath and passing the gases from the bath up through said descending current to cause the descending current to absorb the heat thereof.

5. The method of concentrating a liquid acid which consists in maintaining a bath of the liquid at a temperature below the boiling point of the bath, passing hot air through said liquid to absorb and carry off volatile impurities in the acid, admitting a quantity of the weak acid to said bath, heating the same by the gases escaping from said bath and filtering the gases after they escape from said bath.

6. The method of concentrating sulfuric acid which consists in maintaining a bath of the acid at a temperature below the boiling point thereof, passing hot air into said bath at a point below the surface thereof at a temperature of approximately 400 deg. centigrade, and maintaining the bath at a temperature which will cause the escape of the hot air from the bath at a temperature of approximately 200 deg. centigrade.

7. The method of concentrating sulfuric

acid which consists in maintaining a bath of the acid at a temperature below the boiling point thereof, passing hot air into said bath at a point below the surface thereof at a temperature of approximately 400 deg. centigrade, maintaining the bath at a temperature which will cause the escape of the hot air from the bath at a temperature of approximately 200 deg. centigrade, permitting a quantity of the weak acid to pass in a descending current through an obstructed path to replenish the bath and passing the gases from the bath up through said descending current to cause the descending current to absorb the heat thereof.

8. The method of concentrating sulfuric acid which consists in maintaining a bath of the acid at a temperature below the boiling point thereof, passing hot air into said bath at a point below the surface thereof at a temperature of approximately 400 deg. centigrade, maintaining the bath at a temperature which will cause the escape of the hot air from the bath at a temperature of approximately 200 deg. centigrade, permitting a quantity of the weak acid to pass in a descending current through an obstructed path to replenish the bath, passing the gases from the bath up through said descending current to cause the descending current to absorb the heat thereof, and passing the gases thereafter through a filter to remove acid remaining therein.

In testimony whereof I affix my signature.

INGENUIN HECHENBLEIKNER.