

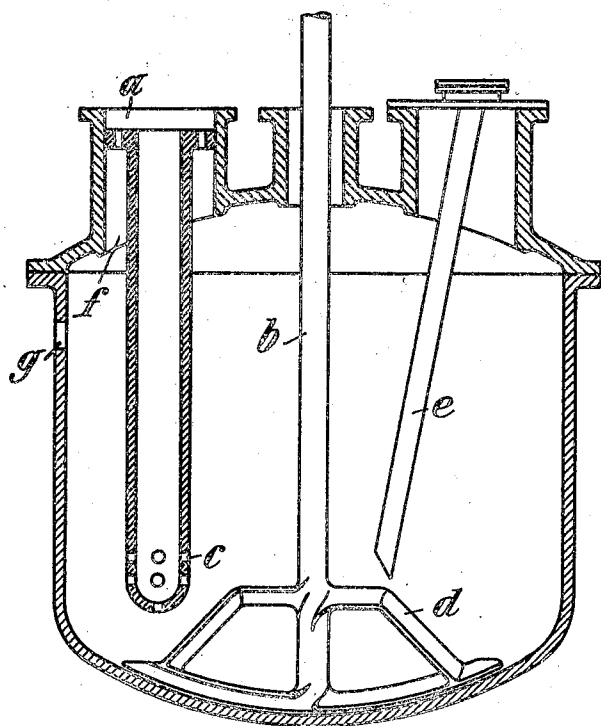
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PROCESS FOR THE HIGH CONCENTRATION OF IMPURE SULPHURIC
ACID TREATED PRELIMINARILY IN A DEPHLEGMATOR

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PROCESS FOR THE HIGH CONCENTRATION OF IMPURE SULPHURIC ACID TREATED
PRELIMINARILY IN A DEPHLEGMATOR

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There is already known vessels intended and designed for concentration and provided with a pipe or pipes through which the liquid concerned is conducted down to the bottom of the respective vessel. A concentration vessel provided with a thus arranged pipe is employed also in connection with the present invention, but in contradistinction to what is known there is used in the present case no open basin but closed vessel, or, more precisely, a cast-iron closed vessel, in which the sulphuric acid to be concentrated is heated to the boiling point, as is known per se also in connection with known plants for the high concentration of sulphuric acid, for instance in the plants of the "Pauling" type. With these plants the sulphuric acid vapor is conducted into a rectification column in order to be used there as separating agent. The sulphuric acid rectified in the column is continually conducted to the surface of the contents of the respective receptacle, and as the acid supplied thereinto becomes weaker and weaker by reason of the rectification procedure in relation to the vapor rising from the sulphuric acid boiler there form layers in this boiler, and the detrimental effect thereof is that those portions of the boiler where the acid is in contact with the vapor space are destroyed by corrosion arising just at those portions. In order to obviate this detrimental effect Pauling has provided at the place in question a cast-iron ring. At any rate, the chief disadvantages are not done away with by that expediency as the weaker concentrated acid floats upon the surface of the boiler contents and flows into the cooler, whereas the strongly concentrated acid forms layers in the lower part of the boiler and gives rise to retardation of ebullition and to superheating of the boiler wall.

The chief drawback of carrying out the concentration in cast-iron boilers is, however, that the impurities present in the rectifying acid, such as metal salts, organic im-

purities, and the like, deposit upon the bottom of the boiler and cause a more or less quickly burning through thereof according to their type and their amount. Besides, the impurities are bad conductors of heat, whereby an increased supply of heat is necessitated in order to concentrate the acid. The boiler walls are not sufficiently cooled and there arises, in consequence thereof, superheating by which the boiler is destroyed in the course of time.

Moreover, when the concentration is carried out in that manner in cast-iron boilers, the bottom thereof is subjected to the greatest heat and the generation of vapor is, therefore, strongest just at the bottom, but as the level of the acid is pretty much remote from the bottom the bubbles can rise only with difficulty, that is to say, can overcome only with difficulty the resistance presented by the vertical height of the acid in the boiler. That gives rise to retardation of ebullition and the acid leaves the boiler in the form of forcibly expelled individual amounts. Finally, the sulphuric acid vapor is partly superheated and is decomposed and transformed into sulphurous acid and oxygen.

The drawbacks and disadvantages disclosed in the preceding paragraphs are obviated, according to the present invention, by the feature that the acid to be concentrated and introduced into the lowermost portion of a closed cast-iron boiler is stirred so that a uniform supply of heat is made possible. Besides this, the certainty is attained that no superheating in the sulphuric acid boiler can occur so that the thickness of the boiler wall can be considerably less than heretofore. Furthermore, the foreign substances, such as metal salts, iron mud, and the like, present in the boiler are separated by the stirring so that the boiler is thereby automatically cleaned. It is also and particularly rendered possible to concentrate, by the procedure stated, impure sulphuric acid in a

manner perfectly free from disturbances. Up to now the concentration of this acid has met with extraordinarily great difficulties owing to the separation and precipitation of the metal salts whereby grave disturbances were caused not only with Pauling's process, but also with the likewise known process of Kessler.

The greatest advantage, however, which the present improved process presents over the known processes consists therein that one succeeds in producing in continuous service sulphuric acid of from 98 to 98.5% without any loss worth mentioning. This has up to now been impossible since in attempting to manufacture sulphuric acid of 98% the equilibrium is very easily disturbed according to the formula



whereby when the concentration is carried out in cast-iron boilers large losses are very likely to occur and the manufacture of that acid is consequently, uneconomical.

In my improved process in which the acid is introduced into the boiler at a lower place, and the circulation of the same is furthered by stirring, the retardation of the ebullition, as well as the dissociation of the acid, are prevented.

A further essential advantage is attained if air or an equivalent fluid is introduced as oxidation agent. When an agent of this kind is introduced into the stirred acid near the bottom of the boiler the contact between the two substances is by far more intimate than otherwise and the oxidation agent is utilized in a very high measure which appears from the fact that considerably less air, etc., than otherwise is required.

The improved process is carried out preferably in a boiler designed as shown diagrammatically and by way of example on the accompanying drawing which shows a vertical axial section through the boiler. The acid to be concentrated is introduced into the boiler through the pipe *a* which is closed at its lower, i. e. inner end but is there provided with a plurality of openings *c*. *d* denotes a stirring member on a shaft *b* which is rotated by any suitable means (not shown). *e* is a tube through which the compressed air or an equivalent agent is introduced into the acid. Instead of providing this separate tube, the shaft of the stirring member *d* may be hollow, and outlet apertures for the air, etc., introduced through the hollow shaft may be provided near the lower end thereof.

The arising vapor escapes through the branch *f*, whereas the highly concentrated acid, together with the stirred-up mud, the metal salts, and the like, is withdrawn through the aperture *g*.

I wish it, however, to be understood that these details allow of a member of modifica-

tions according to the conditions to be paid attention to in the individual cases.

I claim:

A method for the high concentration of impure sulphuric acid treated preliminarily in a dephlegmator or the like, consisting in introducing the impure acid into the lowermost part of a closed vessel, and stirring the acid therein and introducing air into the acid to act at the same time as an oxidizing agent.

In testimony whereof I affix my signature.

WILLI BÜSCHING.