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SATURATING RECEPTACLE

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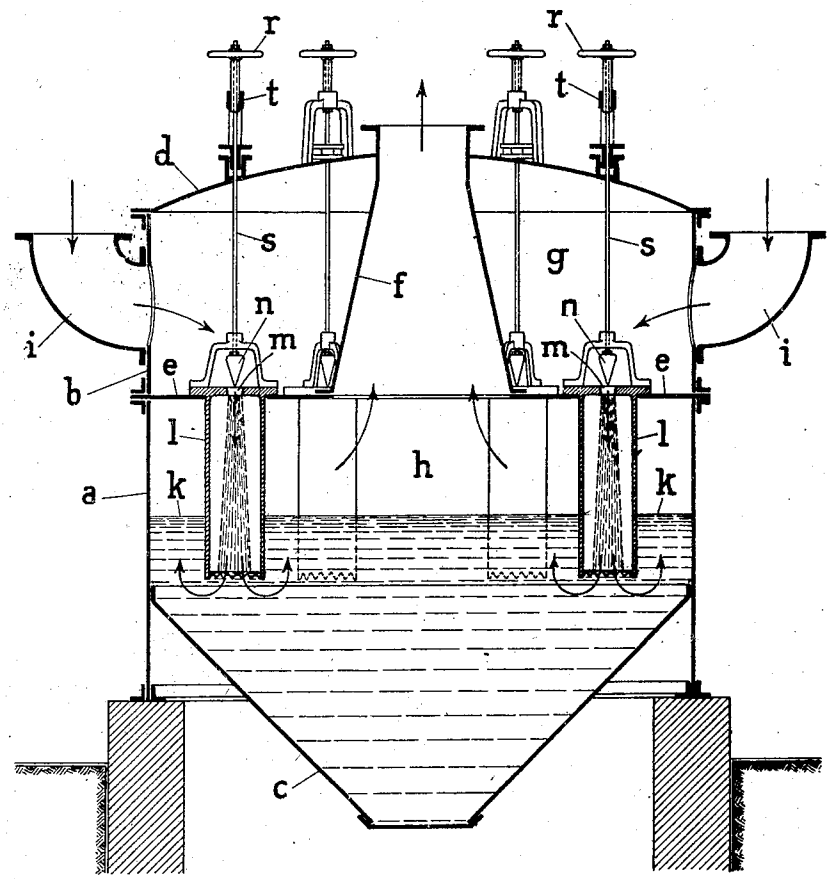

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SATURATING RECEPTACLE.

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This invention relates to that kind of saturators used for producing solid salts by treating gases with acids or other suitable saturating liquids, for instance saturators for the manufacture of sulphate of ammonia from coal distillation gases, in which saturating receptacles the gases are conducted to the saturating liquid from a common supplying and distributing space through several parallelly arranged distributing pipes, which are immersed from above into a uniform saturating bath.

The constructive advantages of such saturating receptacles, which advantages are based mainly on the simplicity and solidity of construction, sutable arrangement and accessibility of the distributing elements, are to a large degree impaired by material drawbacks and difficulties, encountered in the operation of such saturators. Experience has shown that incrustations of solid salt, forming hard thick masses, always are deposited during the operation mainly on the inner walls of the vertical gas distributing pipes, the thickness of said incrustations always increasing more and more, so that finally the cross sectional areas of said distributing pipes are clogged up more or less. The result of said incrustations is of course a very irregular distribution of the gases through the several pipes and the consequence thereof is a defective saturation of the gases due to this nonsymmetrical action of the gases on the liquid. Also a strong swaying and waving of the liquid mass of the bath is produced, whereby many further disadvantages are caused, as the throwing of liquid and salt masses into the gas chambers, the vibrating of the saturator as a whole and the loosening of its individual parts; and all these difficulties will render impossible the regular operation and finally even force the complete shut-down of the plant.

By the present invention all those defects are obviated at once in a very simple manner.

In the accompanying drawing, in which one embodiment of the subject matter of my invention is illustrated, the figure represents a vertical section through a saturating receptacle, constructed according to the principle of my invention.

The saturation receptacle, which in plan view has a circular shape, consists of two cylindrical casing parts *a* and *b*, a funnel-shaped bottom part *c* and a cover *d*. By means of a horizontal partition *e*, arranged between the two casing parts *a* and *b*, and a vertical, large central tube *f*, connecting the partition *e* and the cover *d*, the interior space of the saturator is divided into an upper chamber or head *g* and a lower chamber *h*. The upper chamber or head *g* serves for the admission and distribution of the incoming gases and accordingly is provided with two gas inlet tubes *i*, arranged oppositely to each other through which the gas to be treated is forced in under pressure whereby the gas follows the path indicated by the arrow in pipes *l*. The inflowing gas displaces the liquid at the bottom of pipes *l* as shown in the drawing. The lower chamber *h* serves for holding a bath of saturating liquid, the level of which is indicated by *k*, and for bringing the gas into contact with the liquid. After the gas has been treated by the liquid the former is led away through the central tube *f*. For the distribution of the gas in the saturating liquid a plurality of distributing pipes *l* is provided (in the embodiment shown six pipes, which are arranged in a circle), said pipes being fitted at their upper ends to the partition *e* beneath the chamber *g* whereby they are parallelly connected to a common gas supply, and immersed with their lower, serrated edges to the saturating bath *k*.

According to the invention each distributing pipe *l* is provided in its upper part at some distance from the bath level *k*, preferably, according to the embodiment shown in the drawing, at its upper inlet end with a device for forming a narrowed or constricted passage *m* at the center of its cross-sectional area. Preferably this construction is made adjustable, for instance by means of a closure cone valve *n*, which is vertically adjustable. Said cone *n* is secured to a threaded spindle *s* which projects upwardly through the saturator cover *d* and is provided at its upper end with a hand-wheel *r*,

said spindle *s* being guided by means of a fixed nut *t*. Of course also other suitable means can be employed for adjusting the constricted passage openings of the distributing pipes; for instance, such means may be exchangeable plugs provided with passage openings of different sizes, said plugs being limited to the gradual changing of the free cross-sectional area of the passage openings. Of course, all of the passage openings *m* of the individual distributing pipes *l* must have the same free cross-sectional area or must be adjusted to the same in order that the same quantity of gas be fed to each of the distributing pipes. The gas to be treated, for instance distillation gas containing ammonia, enters, always moving in the direction of the arrows, from the distributing chamber *g* through the passage openings *m* into all of the distributing pipes *l*, flows through each of said pipes in axial direction in the shape of a central jet, as indicated in the drawing, and enters the liquid which, for example, may be sulphate of ammonia solution containing sulphuric acid, through the serrated lower edges of the pipes. In this manner the gas is finely distributed in the bath of saturating liquid, the unabsorbed portion of the gas escaping into the collecting chamber *h* and passing away through the central tube *f*. The solid salt, formed by the reaction of the gas with the saturating liquid, for instance sulphate of ammonia, collects as a deposit in the funnel or cone-shaped bottom part *c* of the saturating receptacle and is removed from said bottom part from time to time by means of any known suitable device, not shown in the drawing, while at the same time of course care must be taken to replace in a corresponding degree the absorbing agent, for instance sulphuric acid, consumed from the saturating liquid.

The described guiding of the gas through the distributing pipes *l* by means of the constrictions *m* has the peculiar effect, that any deposits of salt incrustations in the saturator, mainly at the inner surfaces of the distributing pipes *l*, and accordingly all drawbacks of operation caused by such incrustations, are fully avoided. This effect may be explained by the fact, that on account of the axial position of the central gas jets, which are formed by the constrictions *m* and do not completely fill out the cross-sectional areas of the distributing pipes *l*, the action of fresh gas particles upon that part of the liquid, which in consequence of unavoidable spurting is continuously wetting the walls of the pipes *l*, is reduced so far, that any noticeable separation of salt on these wetted surfaces is prevented. Furthermore on account of the quiet, steady and uniform operation, attained in this manner, the throwing of liquid and salt masses into the gas spaces of the saturator is reduced to the smallest degree. As however the before explained formation of the gas jets within the interior of the distributing pipes *l* requires a certain minimum velocity of the passing gas, also the adjustability of the free cross-sectional areas of the constrictions *m* is of essential importance in the case of changing quantities of gas and varying conditions of operation to be dealt with.

Having thus particularly described the nature of my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A saturating receptacle for producing solid salts by treating gas with acids, comprising in combination a cylindrical middle member, a cover, and a cone-shaped bottom member, a partition dividing said cylindrical middle member into an upper gas distributing chamber and a lower chamber for a saturating liquid, a central tube for leading away treated gas and connected with the lower chamber and passing through the cover, and a plurality of vertically and parallel arranged gas distributing pipes communicating with said distributing chamber, arranged to have their lower ends immersed in the saturating liquid, each of said distributing pipes being provided at some distance above the level of the liquid with a restricted opening axially disposed.

2. A saturating receptacle for producing solid salts by treating a gas with a liquid, comprising, a liquid container, a gas distributing head, and a plurality of vertically arranged gas distributing pipes, effecting communication between the distributing head and the liquid container, each of said pipes having a gas inlet opening of smaller cross-section than that of the pipe, whereby gas from the distributing head flows through said opening and into the liquid container, and a gas outlet leading from the liquid container.

3. A saturating receptacle for producing solid salts by treating gas with liquids, comprising, in combination, a vessel, the lower part of the vessel being formed to receive a bath of saturating liquid, the upper part of the vessel bearing several parallel gas distributing pipes, a common gas supply connected to the pipes, the pipes being positioned to be immersed from above into the saturating bath, each of the distributing pipes being provided at a distance above the level of the bath with a restricted opening axially disposed, and an outlet leading from the lower part of the vessel for escape of unabsorbed gases therefrom.

4. A saturating receptacle for producing solid salts by treating gas with acids, comprising in combination, a vessel having a lower part for holding a bath of saturating liquid and an upper part, a common gas sup-

ply furnished by the upper part, a plurality of gas distributing pipes connected in parallel to the common gas supply and positioned to be immersed from above into the saturating bath, each of the distributing pipes being provided at some distance above the level of the saturating bath with a restricted opening axially arranged and means positioned at its central axis for adjustably controlling said openings so as to adjust at will the free passage through the pipe and an outlet leading from the lower part of the vessel, for escape of unabsorbed gases therefrom.

In testimony whereof I affix my signature.

CARL STILL.