L. C. GREVEMBERG.

APPARATUS FOR USE IN THE SULFURATION OF LIQUIDS.

APPLICATION FILED FEB. 26, 1915.

1,172,133.

Patented Feb. 15, 1916.

2 SHEETS—SHEET 1.

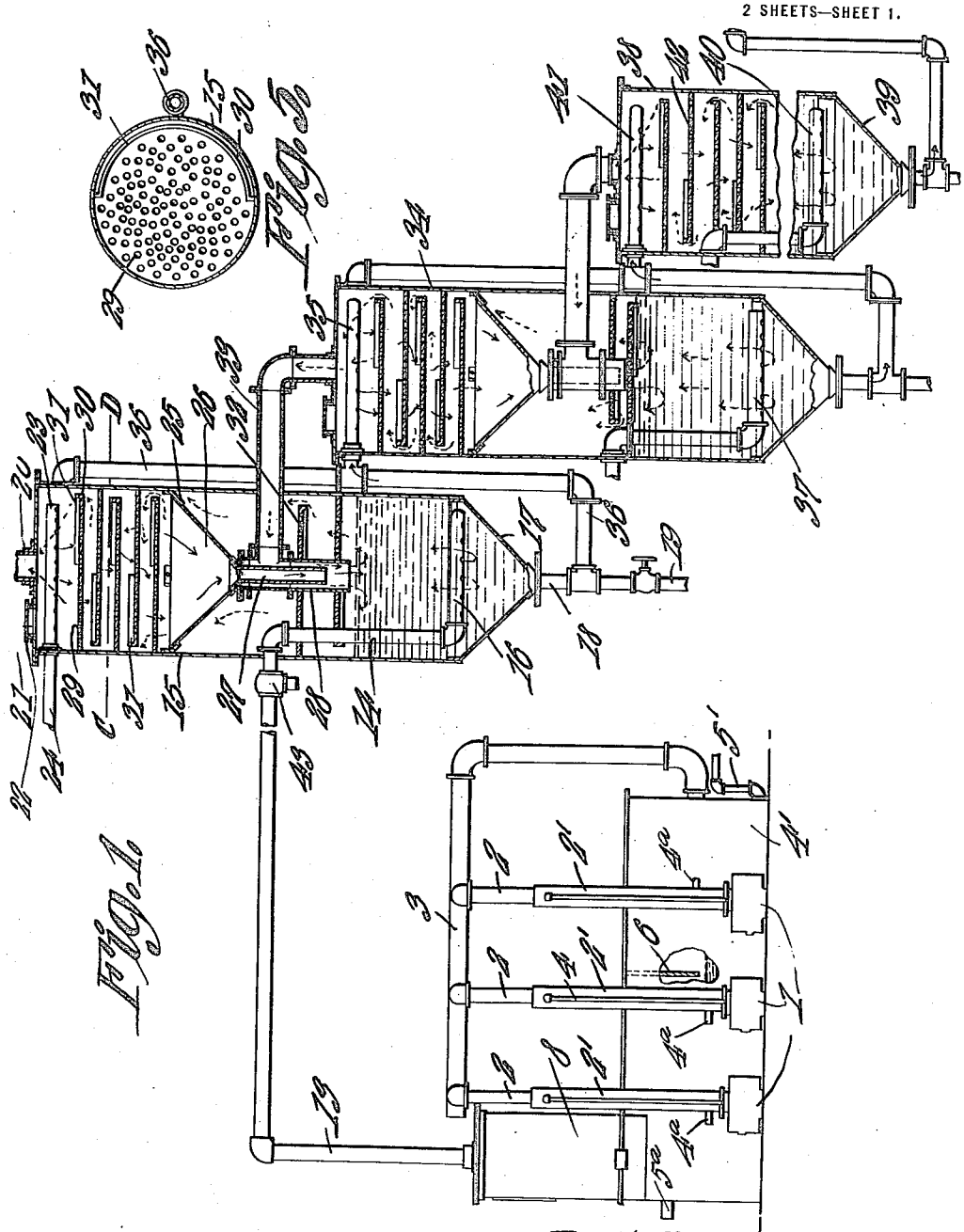


Fig. 1.

Fig. 2.

Witnesses

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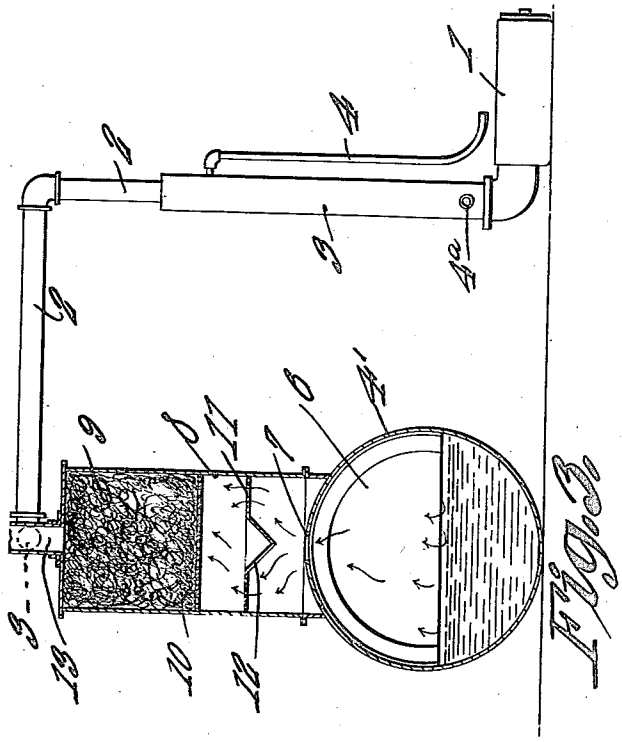


Fig. 3.

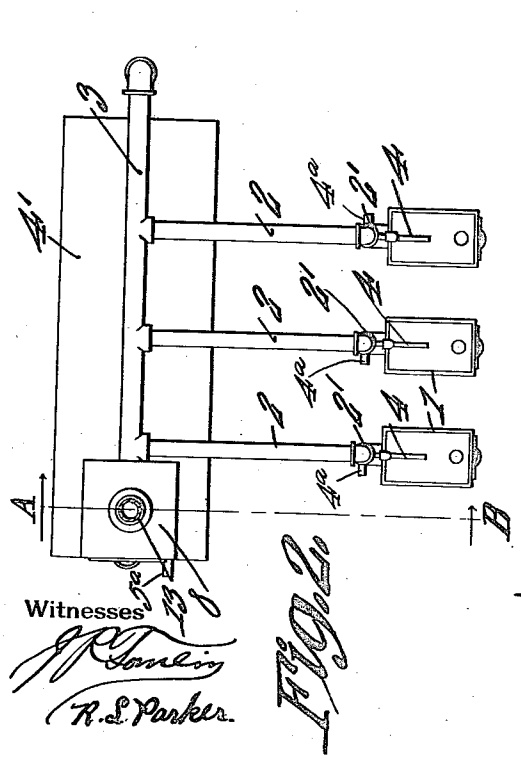


Fig. 2.

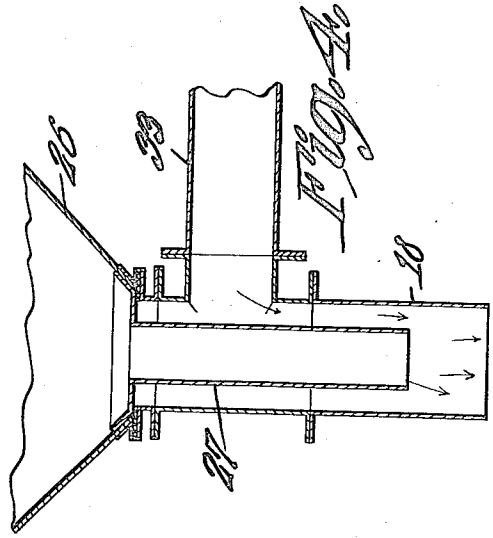


Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

LOUIS CHARLES GREVEMBERG, OF CALUMET, LOUISIANA.

APPARATUS FOR USE IN THE SULFURATION OF LIQUIDS.

1,172,133. Specification of Letters Patent. Patented Feb. 15, 1916.

Application filed February 26, 1915. Serial No. 10,860.

To all whom it may concern:

Be it known that I, LOUIS C. GREVEMBERG, a citizen of the United Staes, residing at Calumet, in the parish of St. Mary and State of Louisiana, have invented a new and useful Apparatus for Use in the Sulfuration of Liquids, of which the following is a specification.

This invention relates to apparatus for use in the sulfuration of liquid, it being more especially designed for bleaching the juice of the sugar cane, although it is to be understood that the same is equally efficient in treating syrups, molasses, and other like fluids.

One of the objects of the invention is to provide simple and efficient means for the generation of sulfur dioxid, cooling and cleansing the gas thus produced, and subsequently directing the gas through the liquid to be treated, means being provided whereby the waste of gas is reduced to the minimum and complete sulfuration of the liquid is effected.

A further object is to provide apparatus of this character made up of a plurality of units, one or more of which can be eliminated or added, as desired, this being dependent upon the degree of acidity to be imparted to the liquid being treated.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, can be made within the scope of what is claimed, without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:—Figure 1 is a view partly in elevation and partly in section of the complete sulfurator. Fig. 2 is a plan view of that portion of the apparatus used for the generation of sulfur dioxid. Fig. 3 is an enlarged section on line A—B Fig. 2. Fig. 4 is an enlarged vertical section through a portion of one of the units of the sulfurator. Fig. 5 is a horizontal section on line C—D Fig. 1.

Referring to the figures by characters of reference 1 designates a series of stoves for the generation of sulfur dioxid (SO_2) each of these stoves having an outlet pipe 2 for conducting the gas to a manifold 3. Each of the pipes is preferably surrounded by a water jacket 2′, the water inlet and outlet pipes being indicated at 4 and 4^a. Thus it will be seen that as the gases pass through the pipes 2 and into the manifold 3 they will be cooled. The manifold 3 discharges downwardly, at one end, into one end of a cleaning cylinder 4′ partly filled with water as shown, the water being supplied to the tank in any suitable manner, as through a pipe 5^a. Arranged within the cylinder 4′ is a transverse baffle or partition 6 which extends close to but out of contact with the level of the water contained in the cleaning cylinder or tank 4′. This baffle is located between the gas inlet of the tank and the outlet, said gas outlet, which is indicated at 7, being arranged under a casing 8 the upper portion of which contains a filtering medium 9 supported in any suitable manner, as by means of a foraminous diaphragm 10. A disk 11 having apertures therein is preferably located between the outlet 7 and the diaphragm 10 and may be formed with a central spreading means 12 in the form of a depending cone. An outlet pipe 13 extends from the top of the filter and serves to direct the sulfur dioxid into a pipe 14 suspended within the lower portion of the casing 15 of the first unit of the sulfurator, this depending pipe being provided at its lower end with a diametrically disposed spraying nozzle 16 from which the gas is adapted to flow in minute jets, the said jets being directed downwardly from the nozzle. The casing 15 is preferably formed with a conical bottom 17 located under and close to the nozzle 16 and having a downwardly extending outlet pipe 18 below which is arranged a valved draw-off 19 for sediment.

The casing 15 is closed at its top but provided with an outlet pipe 20 through which escapes waste gases. The said casing is also provided with an opening 21 normally closed by means of a bolted plate 22 or the like. A spraying nozzle 23 is supported within the upper portion of the casing 15 and is connected to a supply pipe 24 whereby the juice or other liquid to be treated is discharged downwardly. Brackets 25 are secured in the casing 15 and support a conical hopper 26 from which is suspended a drain pipe 27. This drain pipe is sur-

rounded by a jacket 28 open at its lower end and supported some distance above the nozzle 16.

Mounted within the casing 15 between the hopper 26 and the upper nozzle 23 are baffle plates 29, each of which is provided with a plurality of small apertures. The marginal portion of each baffle plate is cut away for about one-half the circumference of the plate, as shown particularly at 30, and along the edge of this cut-away portion is formed an upstanding flange 31 which prevents liquid from draining over said edge. The superposed baffles are oppositely disposed, as shown in Fig. 1, each baffle plate overhanging the cut away portion of the next adjoining baffle plate thereunder so that any gases circulating between the baffle plates must necessarily pursue a tortuous course. Additional baffle plates 32 are located around the jacket 28 and are similar to the baffle plates 29 with the exception that the flanges along the cut away portions of the peripheries of the plates extend downwardly instead of upwardly, so that liquid is thus free to drain over the edges of these baffle plates. A gas return pipe 33 extends into the casing 15 and discharges into the jacket 28, this return pipe serving to receive gases from the top of the casing 34 of the next adjoining unit of the sulfurator. The construction of this second unit is similar to that of the first unit hereinbefore described, the same being provided with a juice discharging nozzle 35 in the upper portion thereof and which communicates with the outlet pipe 18 through a pipe 36. As shown in Fig. 1, this pipe 36 may be extended upwardly beyond the nozzle 35 and discharge into the upper portion of the casing 15 of the first unit when only a single unit is used. A fresh supply of sulfur dioxid may be discharged into the lower portion of the second unit through a nozzle 37 similar to the nozzle 16 and which is likewise in communication with the pipe 12 of the generating apparatus. Any desired number of units corresponding with those heretofore described can be employed. The last unit of the apparatus is the same as other units but in the drawing the hopper 26 and the associated parts are eliminated to conserve space in illustration. As shown in Fig. 1, the casing 38 of the last unit is formed with a conical bottom 39 and a nozzle 40 similar to the nozzles 16 and 37 may be arranged in the lower portion of the casing for directing sulfur dioxid into the casing 38. Furthermore a nozzle 41 is located in the upper portion of casing 38 for directing juice into the casing, this nozzle being in communication with the outlet of the next adjoining unit. Baffles 42 similar to those hereinbefore described are interposed between the two nozzles 40 and 41.

It is to be understood that some means must be utilized for forcing the sulfur dioxid through the apparatus and for this purpose any desired form of injector, indicated generally at 43, may be employed. One of these injectors is preferably used in connection with each of the nozzles 16, 37 and 40, although in Fig. 1 only one injector has been indicated.

In using the apparatus herein described, the sulfur dioxid generated by the burning of sulfur in the stoves 1 flows through the pipes 2 into the manifold 3, the gas being cooled by the water jackets 2′. The gas is conducted from the manifold into one end of the tank 4′, where it passes over the surface of the water contained in the tank, the gas being deflected downwardly by the baffle 6 so as to pass through a restricted space where the gas is brought into direct contact with the surface of the water and practically all of the impurities removed therefrom while, at the same time, the temperature of the gas is further reduced. Upon leaving the tank 4′ the gas flows upwardly against the deflector 12 and then through the disk 11 and diaphragm 10 to the filtering medium 9. The gas then flows through pipe 13 and is forcibly ejected from nozzle 16 into the juice or other liquid contained in the lower portion of the casing 15. This juice is supplied to the casing 15 through the nozzle 23, it trickling through the baffles 29 into the hopper 26 from which it flows by way of the depending tube 27. Any portion of the juice which may flow downwardly from the baffles 30 through the space between the upper edge of the funnel 26 and the wall of the casing 15, will fall onto the baffles 32. The gas rising within the liquid accumulated in the casing 15 is absorbed to a great extent by the liquid and that portion of the gas passing upwardly from the liquid comes against the baffle 32 and is broken up and spread within the casing after which it flows upwardly and around the hopper 26 and through and back and forth between the baffles 29, thus coming into intimate contact with the finely divided liquid flowing downwardly through the baffles 29. Any gas left unabsorbed upon reaching the top of casing 15 will flow from the casing by way of the outlet pipe 20. An additional supply of sulfur dioxid is directed into the second unit of the apparatus and in rising acts on the liquid discharged into said unit from the nozzle 35, that portion of the gas left unabsorbed escaping through the outlet pipe 33 into the jacket 28 in the first or next preceding unit. This jacket directs such exhaust gas downwardly about the stream of liquid escaping through the tube 27 so that as the liquid is discharging downwardly through this tube it comes into in-

timate contact with this waste or exhaust gas so that a large percentage of the gas is absorbed by the liquid as it is discharged from the tube 27 in the first unit. Any of the exhaust gas thus discharged into the first unit and which is not absorbed by the liquid will flow upwardly with the gas discharged into the first unit by way of nozzle 16.

The foregoing operation can be repeated through one or more units constituting the apparatus and the liquid is finally treated within the last unit where it is intimately commingled with the gas discharging from the nozzle 40, the liquid escaping from the apparatus through the outlet at the bottom of the casing 38. Any sediment accumulating in the casing of any one of the units can be drawn off by way of the drain pipe 19.

It is to be understood that if desired the supply of gas to the first unit can be cut off so that the juice or other liquid to be treated will, while passing through the unit be acted on solely by sulfur dioxid directed into one or more of the succeeding units of the apparatus. In this manner the degree of acidity of the treated fluid can be controlled.

It has been found in actual practice that apparatus such as herein described is especially efficient in the treatment of cane juice, molasses, syrup and the like, and is of the maximum efficiency in effecting the absorption of the sulfur dioxid and in attaining such acidity as is desired.

What is claimed is:—

1. In apparatus for sulfuration of liquid, the combination with separate units each including a casing, means for generating a gaseous bleaching agent, a nozzle within the lower portion of each casing, and means for directing the bleaching agent from the generating means to the respective nozzles, of means for directing the liquid to be treated into the upper portion of the casing of one of the units, means for conveying liquid from the outlet of said unit into the upper portion of the second unit, means within the casing of each unit for breaking up into finely divided portions the liquid discharging downwardly within the casing, means within each casing for accumulating the downwardly discharging liquid and directing it in a stream into the lower portion of the casing, each of said casings having a gas outlet at its upper end, and means for directing the exhaust gas from the outlet of the second unit into intimate contact with the descending stream of fluid in the first unit.

2. In apparatus for sulfuration of liquid, separate units each including a casing having a liquid outlet at its bottom and a gas outlet at its top, a nozzle in the lower portion of each casing for directing gas into the casing, a nozzle in the upper end portion of each casing for directing liquid into the casing, means for conducting a bleaching agent to the first named nozzle, a plurality of superposed baffles below the liquid discharging nozzles for reducing the discharged liquid into a finely divided state, means supported below the baffles in each casing for accumulating the descending liquid, a tubular member depending from each of said accumulating means for directing the fluid in a stream into the lower portion of the casing, a jacket surrounding each of said depending tubes, means for conducting exhaust gas from the outlet of one of the casings to the jacket of the other casing, and means for conducting liquid from the outlet of one of the casings to the liquid discharging means in the other casing.

3. In apparatus for sulfuration of liquid, a unit including a casing having a liquid outlet at the bottom thereof, and a gas outlet at the top, means for directing a gaseous bleaching agent into the lower portion of the casing, means for directing a liquid into the upper portion of the casing, superposed baffles within the casing for breaking up the discharged liquid into finely divided portions during the descent of the liquid, means within the casing for accumulating the finely divided liquid, a tube depending from said means for directing the liquid downwardly in a stream into the lower portion of the casing, said liquid during its descent through the baffles being brought into intimate contact with the ascending bleaching agent, and means for directing a gaseous bleaching agent around the depending tube and into intimate contact with the descending stream of liquid.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

LOUIS CHARLES GREVEMBERG.

Witnesses:
A. W. GRELLET,
C. V. BOUDREAU.