

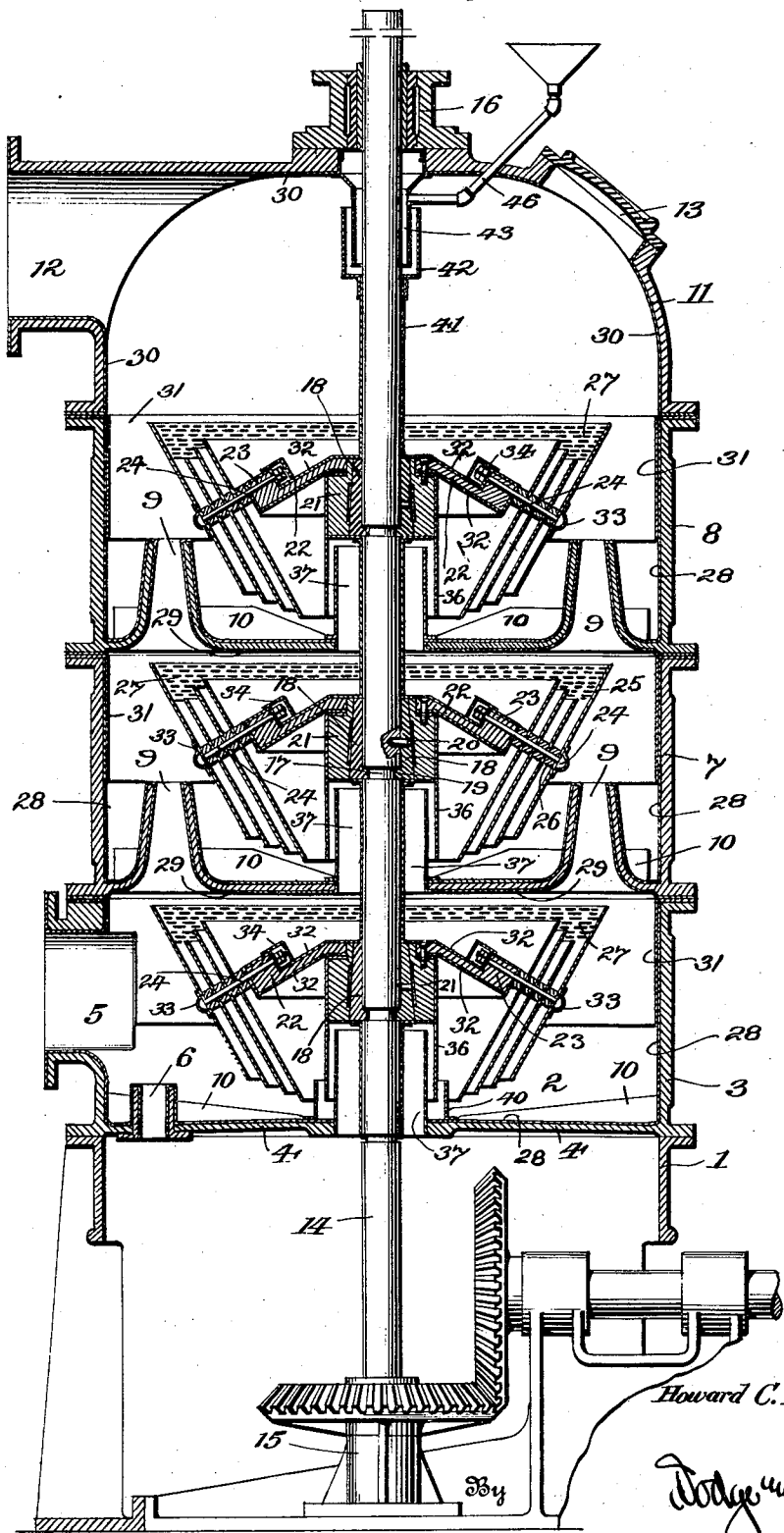
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CENTRIFUGAL CONTACT APPARATUS

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL CONTACT APPARATUS.

Application filed July 21, 1922. Serial No. 576,624.

To all whom it may concern:

Be it known that I, HOWARD C. FREEDENBURG, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Centrifugal Contact Apparatus, of which the following is a specification.

This invention pertains to an improved centrifugal contact apparatus wherein gas and liquid media are brought into intimate relation to effect an admixture thereof and an interaction between the same where chemical affinity exists.

The apparatus is especially applicable to the manufacture of sulphuric acid and is designed to take the place of the usual contact chambers now commonly employed in the chamber process.

It has been demonstrated that with an apparatus as herein shown and described the large contact chambers necessarily employed in effecting oxidation of the sulphur dioxide can be entirely eliminated, thus saving material expense in installation cost as well as a very material saving in floor space, in addition to which must be considered the high efficiency of the apparatus.

The apparatus is shown in vertical sectional elevation and may be said to comprise a series of intercommunicating chambers in each of which there is arranged means acting centrifugally upon the liquid therein to produce a fine mist or spray thereof and to throw the same through the ascending current or currents of gas which pass through the apparatus.

In the drawing 1 denotes the base of the apparatus upon which is imposed the lower or gas intake chamber 2 having an annular wall 3 and a bottom 4. Said chamber is provided with a gas intake 5 and a discharge pipe 6 for the liquid. Surrounding the lower chamber is a series of chambers, two, as 7 and 8, being shown in the present instance.

A plurality of nozzles 9 extend upwardly from the bottom of each of the chambers 7 and 8, providing upflow passages for the gas and conduits through which the liquid may take a downward flow.

A series of baffles or surge relievers 10 is provided in each chamber to arrest the swirling action of the liquid brought about

through the operation of the centrifugal devices about to be described.

A hood or cover section 11 having a gas exit 12 and a man hole 13 is secured upon the uppermost section 8.

The bottom of each section is formed with a centrally disposed opening and a shaft 14 of a diameter considerably smaller than said opening passes therethrough, the lower end being supported in a suitable stepped bearing 15 while the upper end is sustained in a bearing 16 secured upon the upper wall of the hood or cover 11.

The shaft carries a series of devices which act to lift the liquid in the various chambers and to throw the same outwardly against the walls thereof by centrifugal action.

Such devices are alike in each chamber and consequently a description of one will suffice for all and the parts will be similarly lettered.

An annular groove 17 is formed in the shaft and a two part bushing 18, divided vertically and externally tapered is placed about the shaft, the lower portion of said sections being formed with an inwardly extending flange 19 which seats itself within said groove.

A dowel pin 20 extends through one side of the bushing and into an opening formed in the shaft so as to effect rotation of the bushing with the shaft. 21 denotes a hub which is slipped down on the bushing, being keyed thereto and provided with an annular shoulder at its upper end.

A downwardly flaring spider 22, having spaced lugs 23 formed upon its upper face adjacent its periphery is fitted and secured upon the shoulder portion of the hub so as to rotate therewith.

Bolts 24 are passed through the lugs and serve to sustain a series of inverted frusto-conical members 25 formed of acid resisting material, said members being held in spaced relation by lead washers or blocks 26 placed therebetween and through which the belts extend.

The upper portion of the outermost pumping or liquid elevating member is perforated as at 27. The pumping or elevating members at their lower ends extend down into the liquid and under rotative action brought about through ro-

tation of shaft 14, which may be driven by any suitable means, the liquid moves up along the surface of said elevating members and is thrown from the upper edges thereof by centrifugal action impinging against the screen-like portion of the outermost member, passing therethrough and being thrown against the wall of the chamber in the form of mist or fine spray. The gas passing upward through the nozzles 9 is brought into intimate and close contact with the liquid mist or spray and of necessity a quick reaction or absorption is effected.

When as above indicated the apparatus is employed in acid manufacture it becomes essential to protect the exposed surfaces against the corrosive action of the acid and fumes and to such end I provide each chamber or section with a lead lining as 28, the upper portion or marginal edge whereof is carried outwardly and clamped against the similar lining or cover 29 for the bottom of the adjacent section and between the flanges of such adjacent sections.

The dome or cover 11 is similarly lined as at 30.

Inasmuch as the liquid is thrown outwardly with more or less force and may contain particles of gritty or solid matter, a wear plate 31 is spot welded to the lining 28 where the liquid will impinge upon the same, and by such construction the plate may be renewed from time to time as may be necessary without the necessity of removing the entire lining. So, too, the spiders and the bolt heads and securing nuts are covered as indicated, respectively, at 32, 33 and 34.

The hubs 21 are provided with a covering 35, which extends downwardly below the hub forming a skirt, which is spaced away and surrounds an upstanding collar or sleeve 37 secured in the central opening formed in the bottom wall of each of the sections, said sleeve 37 being formed of lead or other non-corroding metal. The liquid in the bottom of each of the chambers coacting with the skirt and collar forms a seal against the passage of gas up through the opening from one chamber to another. The under face of the hub 21 is likewise provided with a covering 38, the latter being burned to the skirt and likewise being burned to a shell or sleeve 39 which surrounds the shaft.

In the lowermost chamber 2, in addition to the skirt 36 and the collar 37, there is provided a third element or collar 40, spaced away from the lower end of the skirt 36 and burned at its lower end to the lining 28 which extends across the bottom of the chamber, thus producing an effective liquid seal at this point against the entrance of air or the egress of gas.

The shaft at its upper end is provided with a protecting sleeve 41, the lower end of which is burned to the covering 32 of the

spider and at its upper end is burned to a cup shaped member 42 which extends upwardly and is spaced away from a collar 43 which extends downwardly from the lining of the dome 11.

A pipe 46 opens through the sleeve 43, the pipe extending upwardly through the dome and being provided with a funnel through which liquid may be introduced to effect a liquid seal within the cup 42 so as to prevent the passage of gas upwardly along the shaft and into the upper bearing 16.

From the foregoing it will be seen that the interior of the structure throughout is protected against the corrosive action of the acid and fumes and that, by the provision of the wearing plates 31, which are so positioned that they may be readily renewed, the life of the apparatus is almost indefinite. If for any reason any part becomes worn or defective, it may be readily replaced without materially disturbing the lining and such lining may likewise be replaced with a minimum of labor and with the certainty that the joints between the parts are tight. In actual practice in the production of sulphuric acid with an apparatus working upon the lines above indicated, it has been found highly efficient and has done away with the use of the lead-lined chambers.

What is claimed is:—

1. In an apparatus of the character specified, the combination of a series of superposed and intercommunicating chambers; rotative means located in each chamber serving through centrifugal action to atomize liquid contained in said chambers; a lead covering for the interior surfaces of said chambers, and a wear-plate in each chamber, said plates being spot welded to the covering and located in the line of discharge of said rotative means.

2. In an apparatus of the character specified, the combination of a series of superposed and intercommunicating chambers; a shaft extending freely up through said chambers; a liquid seal located at the bottom of each chamber and serving to prevent the flow of gas upwardly about the shaft, the elements of said seal being produced from acid-resisting material; a series of spaced, inverted frusto-conical members secured to the shaft within each chamber, the outer member of each series being perforated adjacent its upper end; means for protecting the inner exposed surface of the chambers, the shaft and allied parts against corrosive action of the gas and liquid employed in the apparatus; and a wear plate in each chamber, said plates being formed of acid-resisting material, located in the line of discharge of said rotative means and being spot welded to the underlying protecting means aforesaid.

3. In combination with a downwardly

flared spider frame; a series of spaced lugs located adjacent the edge thereof; a series of frusto-conical members encircling said frame, said members being produced from acid-resisting material; a series of spacer washers interposed between said members, said blocks likewise being produced from acid-resisting material; a bolt extending through each lug, the frusto-conical members and the spacing washers; and a lead 10 covering for the spider frame and the exposed portions of the bolt.

In testimony whereof I have signed my name to this specification.

HOWARD C. FREEDENBURG.