

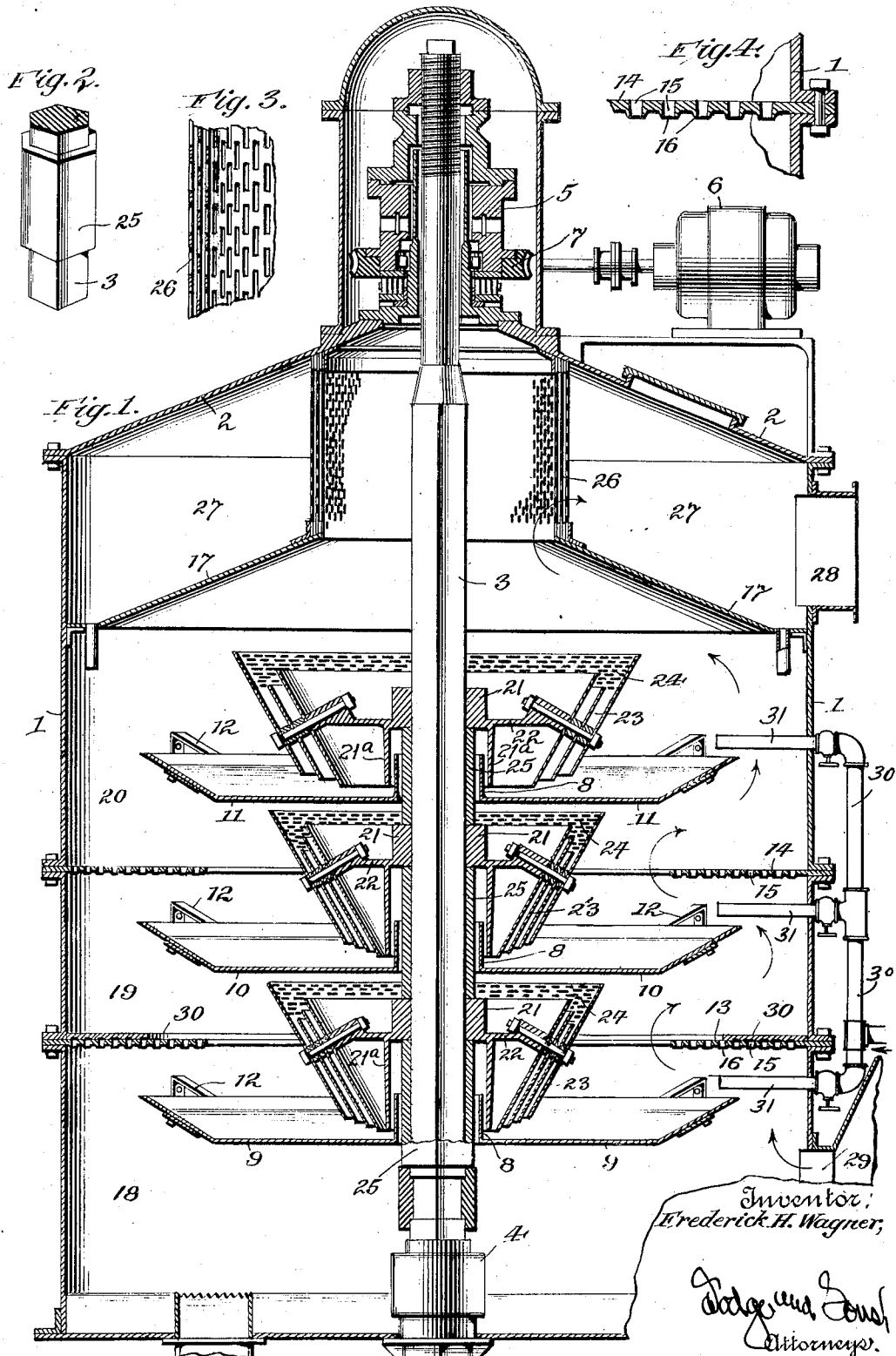
May 15, 1928.

1,669,638

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LIQUID AND GAS CONTACT APPARATUS

Filed Feb. 7, 1925



UNITED STATES PATENT OFFICE.

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LIQUID AND GAS CONTACT APPARATUS.

Application filed February 7, 1925. Serial No. 7,646.

This invention pertains to liquid and gas contact apparatus, and more particularly to that type generally known or denominated in the arts as vertical scrubbers.

5 The present structure pertains to certain modifications of the so-called Feld scrubber, see Patents Nos. 940,103 and 983,037, dated respectively Nov. 16th, 1909, and January 31st, 1911, and the invention has for its objects, among other things, an improved means for mounting the liquid elevating and spraying elements upon the driving shaft; means for breaking up or diffusing the sprayed liquid as it passes from one section 10 of the scrubber to another to effect a more intimate contact between the liquid and gases, said means also causing the gases to travel through a path of increased length; means for producing in the last section of the scrubber a finer spraying of the liquid 15 than in the others for the final treatment of the gas being passed through the apparatus; and the interpositioning of an eliminator between said last section and the discharge 20 outlet for the treated gas.

The structure is illustrated in the annexed drawings, wherein:

Fig. 1 is a vertical sectional view of the scrubber;

30 Fig. 2 is a detail perspective view of a portion of the driving shaft and one of the spacing sleeves or collars;

Fig. 3 an enlarged sectional perspective of a portion of the eliminator; and

35 Fig. 4 a detail sectional view of one of the combined deflector and spray producing plates.

The scrubber may be composed of any number of spraying sections, three being 40 shown in the present instance for the purpose of illustration.

In the drawing, 1 denotes the shell or casing preferably formed from a series of sections bolted together and provided with a top 2. The driving and supporting shaft 45 for the liquid elevating and spraying elements, shortly to be described, is designated by 3. Its lower end is retained in a suitable bearing 4, while its upper end is secured to and supported by any suitable bearing, designated generally by 5, and preferably of that type which is self aligning. Rotary motion is imparted to the shaft by a motor 6 the shaft whereof is connected to the bearing 55 elements which are secured to the shaft

through a worm (not shown) and a worm gear 7.

The shaft 3 which is polygonal in cross section extends throughout the height of the casing and in spaced relation through collars 8 formed centrally of a series of pans 9, 10 and 11, which are sustained in spaced relation to each other and to the wall of the casing by suitable straps or brackets 12, or in any approved manner.

Extending inwardly from the wall of the shell, above each of the lowermost pans 9 and 10 is an annular baffle or deflector plate, said elements being denoted respectively by 13 and 14. The plates are provided with a series of perforations 15, and, as will be best seen upon reference to Fig. 4, the lower end of each opening is defined by a downwardly extending lip or flange 16 the purpose of which is to cause the liquid which passes through the openings to drop therefrom in a stream or as a series of drops from each opening. In other words such lips prevent the liquid from spreading laterally on the under face of the plate and coalescing which 80 would result in the liquid leaving the plate in one or more large streams and thus defeat the object in view,—to wit, subdividing the liquid into a series of minute streams and thereby ensuring an intimate and a large 85 surface contact between the liquid and the gas passing through the apparatus.

These plates 13 and 14, together with a diaphragm 17, frusto-conical in form, and located above the upper pan 11, form what 90 may be termed reacting chambers which are designated respectively 18, 19 and 20.

Mounted upon the shaft 3 for rotation therewith is a series of liquid elevating and spraying elements, one series for each chamber. These members may be said to comprise a hub 21, having the opening there-through of such shape as to closely fit the polygonal shaft, an outwardly extending flange 22, and a series of inverted frusto-conical elements 23 secured to the flange and held in spaced relation to each other, said elements dipping down into the liquid in the pan immediately below the same. The outermost element is provided at its upper portion with a series of fine slots or openings 24, said element also extending upwardly to a slight extent above the upper edge of the highest of the other elements.

Each hub has extending downwardly 110

therefrom a skirt 21^a which with the collar 8 forms a liquid seal to prevent the passage of gas at this point.

The hubs, and consequently the liquid elevating and spraying cones 23, are held in spaced relation by sleeves 25 slipped onto the shaft as the parts are assembled thereon.

As will be seen, the cone shaped elements of the upper liquid spraying member are of a diameter somewhat in excess of those below, and by reason of this arrangement and due to the higher peripheral speed or higher lineal velocity which obtains, the liquid thrown outwardly thereby will be more minutely broken up or subdivided than in the chambers below. Thus in the chamber 20 wherein the final scrubbing action takes place a most intimate contact between the gas and liquid is effected.

As will be seen, the diaphragm 17 or upper wall of the upper chamber 20 is open at its center, and located between said opening and the top or cover 2 of the scrubber is an eliminator which has the effect of detaining the liquid particles from the gaseous medium. Said eliminator comprises a plurality of sheets of metal 26 having a series of perforations formed therein, the perforations in one sheet being staggered in relation to the next adjacent sheet. The treated gas after passing through the eliminator plates enters a chamber 27 formed between the diaphragm 17 and the top 2, and passes outwardly from an exit 28. The inlet for the gas is denoted at 29 and opens into the lower chamber 18 at a point below the pan 9 located therein.

From the foregoing it will be seen that the liquid may be elevated by the cones and sprayed outwardly toward the shell of the casing and that such liquid would pass downwardly through the perforations 15 in the deflector plates, and pass downwardly into the chamber next below in the form of a rain of drops. By reason of the lipped formation of the lower portion of the openings, the liquid is prevented from flowing over the under surface of the plates, and coalescing and running down therefrom in streams; hence the gas which has a circuitous path through the apparatus as indicated by the arrows comes into very intimate contact with the liquid which is initially broken up and sprayed outwardly by the cones and thereafter retained in such fine condition or approximately so by the perforate deflector plates.

As will be above noted, by reason of the enlargement of the spraying cone in the upper chamber 20, the liquid will be thrown outwardly therefrom in a finer condition than in the lower chambers, and thus a final washing of the gas by the liquid is effected under the most advantageous conditions. Some of the liquid which is sprayed out-

wardly by the cones will pass back into the pans inasmuch as the diaphragms overlie the pans to a certain extent. Obviously the construction above described requires that the water rate be increased to compensate for that portion of the water which escapes the pans. This may be readily computed and such water supplied through any suitable source (not shown).

Where the machine is employed for concentrating solutions of the gases in the liquid, then I prefer to employ baffles as shown in connection with the lower deflector plate 13. Said baffle merely comprises a ring-shaped member or plate 30 which covers the openings in the outer portion of the deflector and causes all the water or liquid which is thrown outwardly by the cones to flow inwardly toward the center of the scrubber and to pass through those openings in the plate 13 which overlie the pan. Such an arrangement causes a constant re-circulation of the liquid in the chambers. In order to introduce liquid into the various pans a main 30 having valve controlled laterals 31 will be employed.

It is of course manifest that, in so far as the utilization of the perforate deflector plates and the eliminator is concerned, any form of means for elevating the liquid from the pans, and throwing it outwardly in a spray through the gaseous medium, may be employed.

What is claimed is:

1. In an apparatus of the character specified, the combination of a shell or casing; a series of pans mounted therein one above the other, with the edges of the pans standing in spaced relation to the shell; means located above each pan for withdrawing liquid therefrom and spraying the same laterally toward the wall of the shell; and a substantially horizontal perforate baffle plate extending inwardly from the wall of the shell above at least the lower pans of the series and onto which baffle plate the sprayed water returns.

2. An apparatus as specified in claim 1 wherein the perforations in the baffle are provided with depending lips to prevent reflow and coalescence of the liquid on the under face of the baffles.

3. In an apparatus of the character specified, the combination of a shell or casing; a series of pans mounted therein one above the other, with the edges of the pans standing in spaced relation to the shell; means located above each pan for withdrawing liquid therefrom and spraying the same laterally toward the wall of the shell; and a substantially horizontal perforate baffle plate extending inwardly from the wall of the shell above and in spaced relation to at least the lower pans of the series and below the path of the spray the plates extending in-

wardly and terminating at a point inward of the outer edge of the pan.

4. In an apparatus of the character specified, the combination of a shell or casing; a series of pans located therein one above the other; means above each pan acting to withdraw liquid therefrom and to spray it laterally; a perforate deflector plate extending inwardly from the wall of the casing and terminating at its inner edge over one of the pans; and a removable plate resting on the deflector plate, said removable plate being of a width to blank the perforations in the deflector between the wall of the shell and the outer edge of the underlying pan.

5. In an apparatus of the character specified, the combination of a shell or casing; a series of pans located therein, one above the

other; a rotatable shaft extending upwardly through the shell and pans; a series of inverted frusto-conical members secured to the shaft above each pan, the upper portion of the outermost member, at least, being perforated, the outer member of the uppermost series being of a greater diameter at its upper end than the corresponding members of the other series; means for rotating the shaft; and horizontally disposed perforate baffle plates extending inwardly from the wall of the shell intermediate the pans and below the path of spray thrown outwardly by the frusto-conical members.

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

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