

Sept. 27, 1955

I. E. NUTTER
FULL VENTED FLOATING VALVE BRACKETS
FOR BUBBLE TRAYS AND THE LIKE

2,718,902

Filed July 14, 1953

2 Sheets-Sheet 1

FIG. 1.

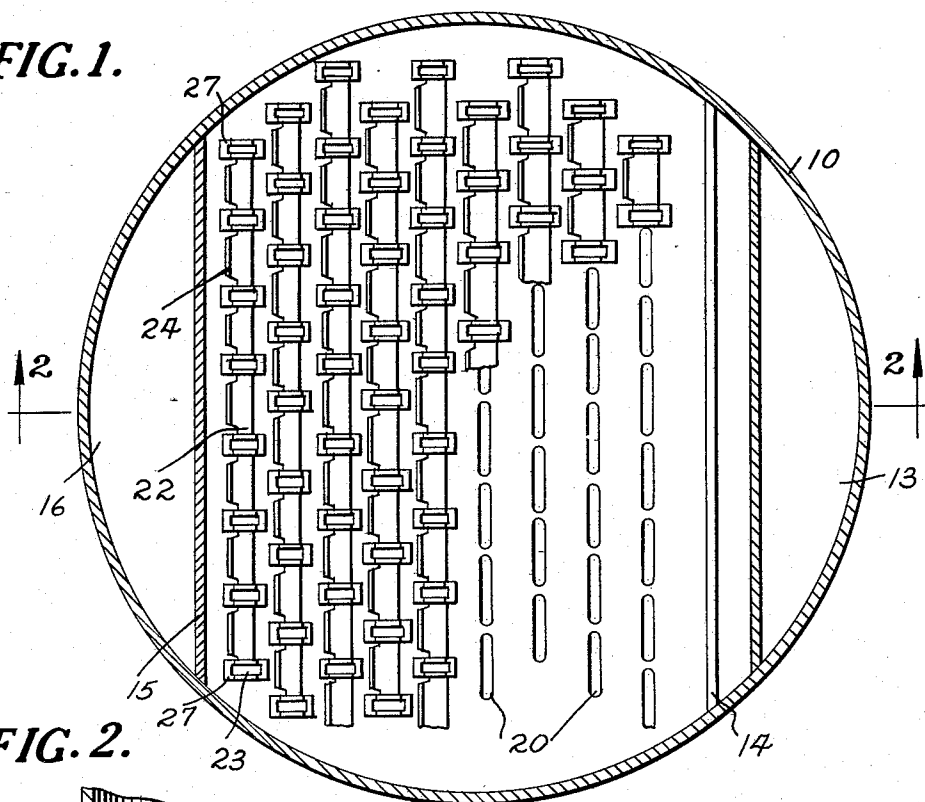


FIG. 2.

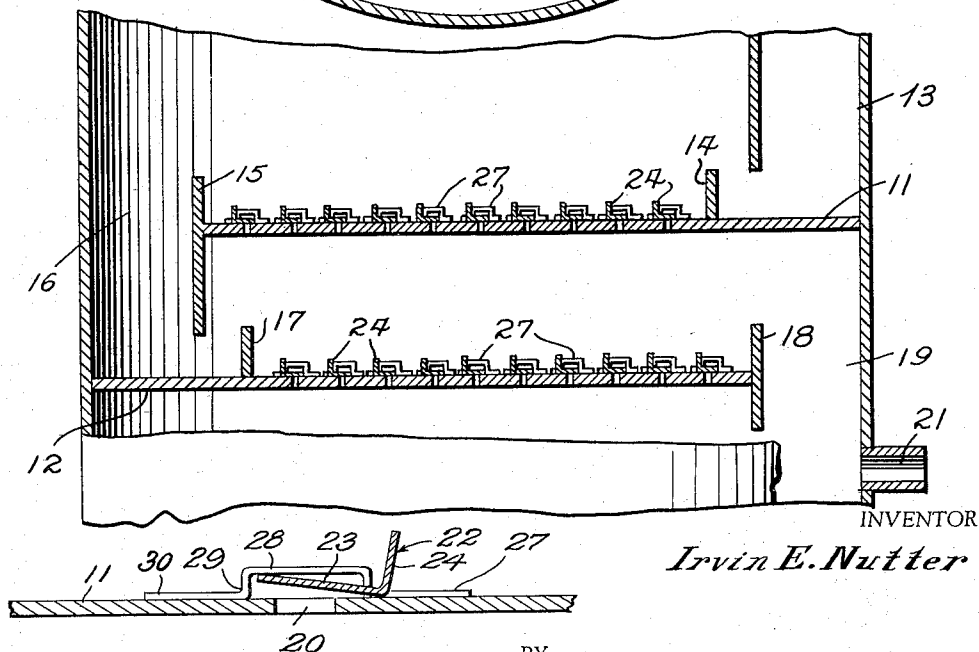


FIG. 8.

BY *Leushman Darby Leushman*
ATTORNEYS

INVENTOR
Irvin E. Nutter

Sept. 27, 1955

I. E. NUTTER
FULL VENTED FLOATING VALVE BRACKETS
FOR BUBBLE TRAYS AND THE LIKE

2,718,902

Filed July 14, 1953

2 Sheets-Sheet 2

FIG. 3.

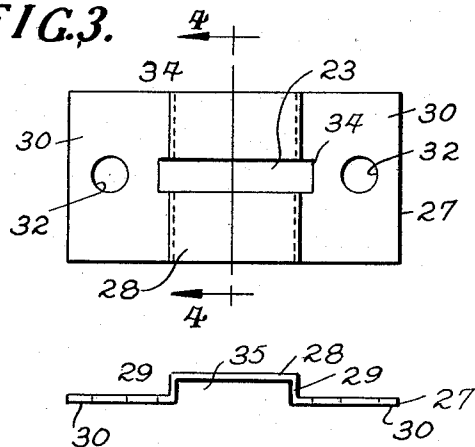


FIG. 4.

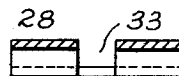


FIG. 5.

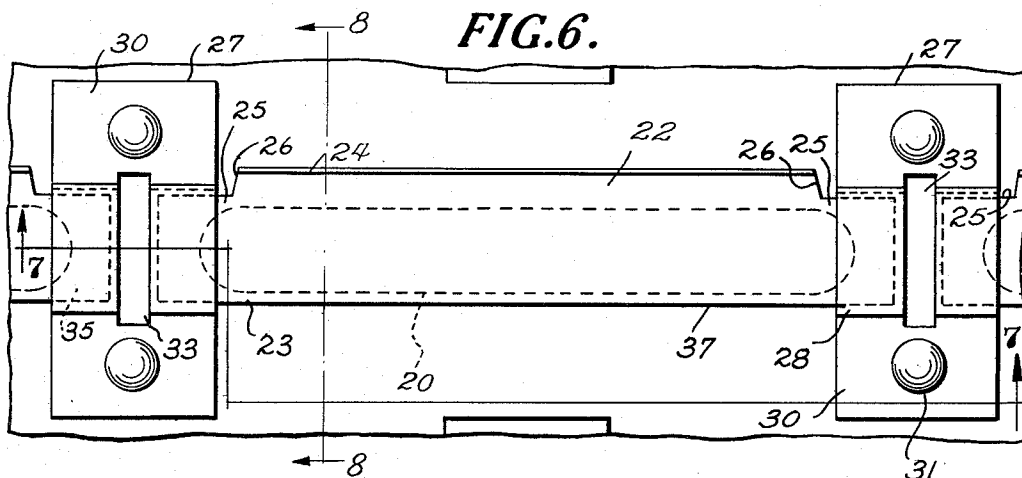
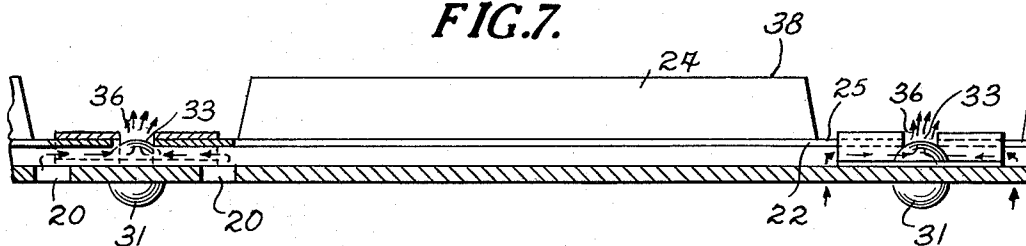


FIG. 6.



INVENTOR

Irvin E. Nutter

BY

Leashman, Darcy, Leashman
ATTORNEYS

1

2,718,902

FULL VENTED FLOATING VALVE BRACKETS FOR BUBBLE TRAYS AND THE LIKE

Irvin Earl Nutter, Amarillo, Tex.

Application July 14, 1953, Serial No. 367,924

3 Claims. (Cl. 137—512.1)

The present invention relates to a gaseous and liquid contact apparatus and more particularly to an improved bubble tray for a bubble tower or the like, for the purpose of providing a uniform distribution of the flow of gas or vapor through a plurality of flow passages so as to insure intimate contact and thorough mixture of the gas and the vapor with the liquid. The invention is an improvement over the floating pivoted valve mechanism embodied in my co-pending application, 274,524, filed March 3, 1952.

An important object is to associate with the flow openings of bubble trays and the like, regulating means in the form of floating pivoted valves for covering or closing the openings, and providing retaining members above the regulating means for limiting the upward movement thereof. Each of the retaining members includes an intermediate raised or substantially U-shaped portions having horizontal flanges extending in opposite directions from the raised portion. Each of the raised portions is provided with vent means in the form of a transverse slot for facilitating the escape of foreign matter from the space between the retaining member and the tray, and for also facilitating the escape of gas from underneath the flow regulating means to and in contact with the liquid above the tray.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying drawings and claims.

Referring to the drawings, in which is shown for illustrative purposes one form the invention may assume.

Figure 1 is a sectional plan view of a bubble tower or the like provided with a gaseous and liquid contact apparatus constructed in accordance with the present invention.

Figure 2 is a vertical sectional view taken substantially along the line 2—2 of Figure 1.

Figure 3 is a detail plan view of one of the retaining members.

Figure 4 is a sectional view taken substantially along the line 4—4 of Figure 3.

Figure 5 is a side elevation of Figure 3.

Figure 6 is a detail enlarged plan view of one of the floating pivoted valves and its retaining means shown in Fig. 1.

Figure 7 is a side elevation view taken along line 7—7 of Figure 6, and

Figure 8 is an enlarged sectional view taken substantially along the line 8—8 of Figure 6, looking in the direction of the arrows.

Referring to the drawings, the gaseous and liquid contact apparatus is shown in the form of a bubble tower 10 which will be provided with any suitable number of vertically spaced trays such as 11 and 12 (Fig. 2), each of which is provided with a downspout 13 positioned on one side of the bubble tower for receiving the descending liquid and directing the same over a seal-weir 14 onto and across the tray 11 and over an overflow weir 15

2

into a discharge spout 16 similar to spout 13, but positioned on the opposite side of the tower 10. The spout 16 is located above the tray 12 and directs the liquid over a seal-weir 17 similar to the weir 14 and then across the tray 12 to an overflow weir 18 so as to discharge the liquid into the downspout 19.

Each tray between the seal-weir and the overflow weir has one or more flow openings or passages 20 (Fig. 1), preferably arranged in spaced transverse rows that allow the gas or vapor to flow from below each of the trays to points above the same during the operation of the apparatus, so as to provide intimate contact and mixing of the upwardly flowing gas or vapor with the descending liquid as it laterally traverses the tray. The gas or vapor may be introduced under pressure into the tower 10 through an inlet 21 (Fig. 2) positioned in one side of the apparatus and below a bottom tray of the tower and after vertically traversing upwardly through each tray, it discharges from the tower through an opening not shown, positioned above the uppermost tray.

The rows of flow openings 20 in each of the trays are covered or closed by a flow regulating means preferably in the form of an angulated or substantially L-shaped valve member 22 (Fig. 6). Each of the valve members 22 may have a horizontal leg or portion 23 and a vertical leg 24 and may vary in size, length and shape to meet the particular operating requirements of the bubble tower. Each of the regulating members is preferably formed with reduced end portions 25 and is constructed and arranged so as to constitute a floating or movable pivoted valve of such length that its horizontal leg 23 overlaps one of the slotted openings 20 and normally engages by gravity, the top of the adjacent tray to close one of the flow passages 20. Preferably, the reduced ends 25 are formed by cutting away the ends of leg 24 and an adjacent portion of leg 23 of the valve member 22 so as to provide the inclined shoulders 26 for a purpose subsequently to be described. Each of the spaced floating pivoted valves 22 is held within desirable limits of both lateral and longitudinal positions on its associated tray by transversely disposed retaining members or brackets 27 which may vary in number in accordance with the number of rows of flow openings and floating pivoted valves that are associated with the trays. Each of the retaining members 27 is preferably formed with an intermediate raised or substantially U-shaped transverse portion 28 having parallel depending arms 29 that terminate in horizontally disposed flanges 30 that extend outwardly from opposite sides of the retaining member (Fig. 5). The flanges 30 rest on the top of the tray and are secured thereto in any suitable manner such as by the rivets or bolts 31 that extend through aligned openings 32 in the flanges 30. The raised or substantially U-shaped portion 28 of each of the retaining members 27 is preferably constructed with a vent opening in the form of a transverse slot 33 centrally therein which may extend downwardly to the inner sides of the flanges 30 so as to form the slots 34 therewith (Fig. 3). When the retaining members are connected to the tray, it will be seen that the raised or U-shaped portion 28 of each member is spaced above the tray and provides a chamber 35 into which extends from opposite sides the reduced ends 25 of the flow regulating valves 22. Thus the gas or vapor passing through the flow openings 20 under the ends of the flow regulating valves 22 travels longitudinally in relation to valves 22 and inwardly from each side of the retaining member 27 and issues upwardly through the transverse slot 33 as indicated by the arrows 36 (Fig. 7). The reduced ends 25 of the control members 22 extend into the chamber or opening 35 of the retaining member 27, from opposite sides and terminates short of the transverse slot 33 (Fig. 6).

In operation, it will be seen that if sufficient gas or

vapor pressure differential accumulates across each of the trays to overcome the liquid head above the tray, the light edge 37 of the floating pivoted valve 22 will be raised so as to allow the gas or vapor from below the tray to pass upwardly through the openings 20 at a rate permitted by the distance the reduced portion 25 of each leg 23 of the valve is raised so that the gas and vapor passes from below the tray through the chamber 35 on each side of the slots 33 of the retaining member and upwardly through this vent opening so as to intimately contact with the liquid passing over the top of the tray. As the pressure differential continues to increase and as the heavy edge 38 of the floating pivoted valve 22 starts to move and is finally raised to a position where the valve is in its complete open position, additional volumes of gas or vapors pass through the vent openings or slots 33 with the volume passing at all times being in proportion to the opening provided underneath the ends 25 of the valves 22, in relation to the areas of opening provided along the sides of the valve. It will be seen that the venting of the gaseous medium through the vent openings 33 in the brackets 27 provides an area of contact of the gas with the liquid above the surface of the tray and thus provides additional means for mixing or contacting the gas with the liquid. Moreover, if the gas stream is carrying fouling materials such as carbon, tars or other foreign substances as is the case in a number of refinery operations, such fouling materials will be swept or carried through from underneath the U-shaped brackets or retaining members 27 and will not deposit by eddying into this area, thus the accumulation of such foreign matter which would interfere with the free and efficient operation of the ends 25 of the floating pivoted valves is avoided.

It will be observed that due to the novel location of the vent openings or slots 33 in each of the retaining members 27 that simple, efficient and positive means are provided for allowing the gas or vapor flowing through the openings 20 in the tray at the sides of the retaining members 27, to travel laterally inward from each side of the retaining member 27 (Fig. 7) so as to issue upwardly through the vent openings 33 after passing beyond the reduced ends 25 of each of the flow regulating means 22. Further means are also provided for preventing gases or vapors, carrying fouling or foreign matter, from eddying into the area underneath the retaining or bracket members 27 and which if allowed to accumulate, would interfere with the efficient operation of the valves. The slots 33 are spaced relative to the flow openings 20 so that the area at which the gas or vapors escape from the vent slots is isolated from the streams of gas issuing from underneath the sides

of the flow regulating means, with the result that additional gas or vapor intimately and efficiently contacts the liquid in areas of the tray which heretofore were inactive.

It will be understood that the form of the invention shown is merely illustrative of a preferred embodiment and that such changes may be made as come within the purview of the following claims.

I claim:

1. In a gas and liquid contact apparatus of the class described, a tray having spaced transverse rows of flow openings, longitudinally spaced aligned valve means for closing said openings, said valve means being fluid pressure responsive, spaced retaining members above the ends of the valve means and extending transversely thereof, each of said retaining members including an intermediate raised portion and horizontal flanges extending in opposite directions from said raised portion, means connecting said flanges to the tray, said raised portion coacting with the tray to provide a space for receiving the ends of the valve means, and said raised portion having a transverse slot for facilitating the escape of gas at the ends of the valve means and through the slots into the space above the tray.

2. In a gas and liquid contact apparatus of the class described, a tray having spaced transverse rows of flow openings, longitudinally spaced aligned valve means for closing said openings, said valve means being fluid pressure responsive and having reduced end portions, spaced retaining members above said reduced end portion and extending transversely thereof, each of said retaining members including a substantially U-shaped portion having parallel depending sides and horizontally disposed flanges extending in opposite directions from said sides, means for connecting said flanges to a tray, the U-shaped portion of each retaining member coacting with the top of the tray to provide a space into which extend from opposite sides, the reduced ends of said valve means, each of said U-shaped portions having an elongated vent for facilitating the escape of gas and foreign matter at the ends of the valve means and upwardly through said slots into the space above the tray.

3. A gaseous and liquid contact apparatus as called for in claim 2 in which the vent extends into the adjacent sides of the flanges.

References Cited in the file of this patent

UNITED STATES PATENTS

1,607,324 Voss ----- Nov. 16, 1926