

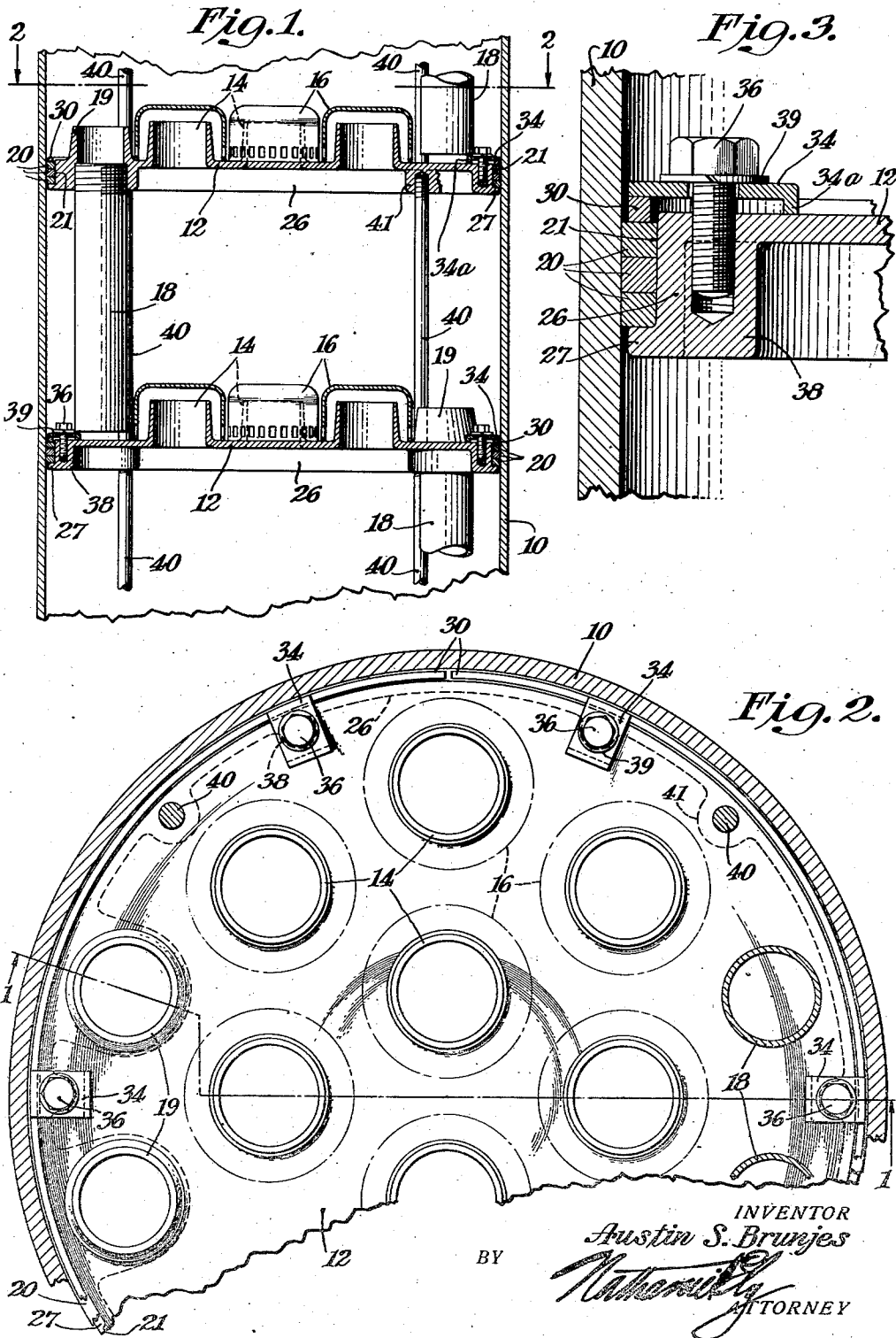
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BUBBLE DECK CONSTRUCTION

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BUBBLE DECK CONSTRUCTION

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1 Claim. (Cl. 261—114)

This invention relates to improvements in the manner of sealing a transverse partition member with respect to the vessel in which it is positioned. More particularly, this invention relates to a bubble deck construction embodying an improved sealing means for use in a fractionating column or the like.

In the assembling of a fractionating column, considerable difficulty is frequently encountered in providing a suitable seal between the various bubble decks and the column itself. Such a seal is necessary to prevent leakage of the rising vapors past the joinder of the deck and the column. Since this leakage, especially if permitted to become substantial in amount, may seriously affect the efficiency of fractionation for which the column was originally designed, it becomes essential to provide a tight seal whereby the rising vapors are compelled to pass entirely through the liquid trapped on each deck.

Under the usual conditions of fabrication, the column may vary slightly from true roundness in its finished condition; as a result, the bubble decks, when positioned in the column as by means of bolts, rivets, or the like, do not form a tight seal with the column wall. Although this defect may be overcome by welding the decks directly to the column, such practice is disadvantageous if it becomes necessary or desirable to remove one or more of the decks.

The prior art contains a number of suggestions for effecting a seal between the decks and the column. Substantially all of them are open to the objection that the proposed construction is too complicated mechanically or that the expense of the seal disproportionately increases the initial cost of the column. In some cases, the area on the bubble deck available for the bubble caps is materially reduced whereby the capacity of the column to handle vapors is adversely affected and the proper spacing of the bubble caps to secure the necessary contact between vapors and liquid is greatly restricted.

It is a primary object of my invention to provide an improved bubble deck construction having a sealing arrangement so that the deck may be simply sealed with respect to the fractionating column in which it is to be used, the sealing arrangement having a limited flexibility in that it will fill small irregularities of shape between the deck and the column.

It is another object of my invention to provide an improved sealing construction to effect a seal between a bubble deck and the column in which it is used whereby substantially the entire cross-

section of the bubble deck is utilized in providing the necessary vapor-liquid contact.

Further objects and advantages of my invention will be apparent from the following description thereof taken in connection with the attached drawing, in which—

Fig. 1 is a partial vertical cross-sectional view taken substantially along the line 1—1 of Fig. 2 of a fractionating column provided with my improved bubble deck construction;

Fig. 2 is a partial horizontal cross-sectional view (with bubble caps removed) of my improved bubble deck taken along line 2—2 of Fig. 1;

Fig. 3 is an enlarged vertical section of the details of the sealing construction embodied in my improved bubble deck.

In accordance with my invention, I provide for a vessel a transverse partition embodying my improved sealing construction. This sealing construction includes a flange attached to the periphery of the transverse partition and adapted to support a packing material placed between the vessel wall and the peripheral portion of the transverse partition. A plurality of spaced pressure-applying means secured to the transverse partition by adjustable members serves to compress the packing material to the desired extent. Preferably, a follower-bar is provided to be inserted between the packing material and the pressure-applying means so that the packing material is subjected to substantially uniform compression throughout.

A feature of my invention is the provision of the pressure-applying means within the periphery of the transverse partition. Such construction permits the packing material to be confined in a materially smaller space. Furthermore, with such construction, the pressure reaction is entirely taken up by the transverse partition itself, and the packing material is compressed against the supporting flange and radially against the column and the peripheral portion of the transverse partition. A more positive pressure is thus applied to the packing material.

Although it will be apparent that my invention can be embodied in any type of vessel which is equipped with a transverse partition, I prefer to describe it in connection with fractionating column construction.

As a preferred form of embodiment of my invention, I have shown a portion of a customary fractionating column 10 of substantially circular cross-section, provided with a plurality of spaced bubble decks 12. These decks 12 may be equipped with any suitable type of liquid-vapor

contact device such as a bubble cap consisting of a vapor riser 14 and a cap portion 16. Each deck is also provided with one or more downflow pipes 18, here shown screwed in bosses 19 in the deck, which establish the liquid level on the deck and extend to a point below the liquid level on the next lower deck. It will thus be apparent that the vapors flowing upward as well as the liquid flowing downward must follow a predetermined course.

As the principal feature of my invention, I provide an improved means for sealing the decks 12 with respect to the column 10. This includes a gasket or packing material 20 which is placed between the nominal periphery 21 of the deck 12 and the inner wall of the column 10. Each deck, at its outer periphery, has a downwardly extending flange 26, the outer surface 21 of which becomes a sealing surface opposed to the column wall. At its lower edge, the flange has an outwardly projecting lip-like extension 27, which serves to support the packing material 20. The outer diameter of lip 27 is sufficiently less than the diameter of the column to afford clearance so that the decks 12 may be readily inserted in the column 10.

The packing material 20 may be asbestos rope or the like; it may be used in one piece if desired, or it may be built up in several layers as shown. In contact with the packing material 20 is the ring follower-member 30, which may be split or continuous but is at least long enough to confine the packing material 20 and is rigid enough to maintain it under uniform compression.

A plurality of clamps 34, spaced at intervals about the periphery of each deck, serve to hold the ring 30 in fixed position on the packing material. A stud 36 passes through each clamp and engages a boss 38, which is preferably formed in the deck 12 contiguous with flange 26. The spacing of the clamps and the rigidity of the ring 30, are such that sufficient pressure can be applied to the packing material 20 to compress it to the desired degree of tightness. Lock washers 39 or the like may be used to maintain the studs in the desired position. Preferably clamp 34 is provided with a flange 34a along its inner edge and with an opening somewhat larger than the stud cross-section so that adequate pressure can be placed on the packing material 20.

The decks are supported by any desired means. In Fig. 1, for example, spacing rods 40 may be conveniently screwed into bosses 41 in the respective decks; with such a construction, the decks can be uniformly and adjustably spaced. The interior of the column 10 is smooth with this construction. Any other convenient means of support may also be used without departing from the spirit of the invention.

The sealing arrangement described is simple to construct and can be readily assembled. It forms a tight seal which effectively prevents the flow of vapors past the periphery of the bubble deck. Moreover, since the sealing means is entirely concentrated at the greatest radius of the bubble

deck and since the studs necessary to compress the packing material and to hold it in place are also at the greatest radius possible, the surface area of the bubble deck can be more fully utilized to obtain the liquid-vapor contact desired. It will be realized that, by placing the sealing means entirely below the level of the deck and by providing clamps at spaced intervals to hold the packing material in place, the bubble caps can be placed on the deck so that those about the periphery may actually extend over the sealing means. Thus, the entire cross-section of the column can be effectively utilized. Such a construction is particularly valuable in a column of small diameter wherein it is essential to use the entire surface area of the deck and the available space for positioning the sealing means is extremely limited. For example, in one 18" column that was recently built, my improved sealing means was the only one found applicable to effectively seal a 1/4" peripheral space between the deck and the column.

Several modifications of my invention will be readily apparent. Although I have described the invention in connection with a vessel of circular cross-section, it will be obvious that it may also be used in a vessel of other cross-section. Under certain circumstances it may be desirable to install the transverse partition in a position inverted to that shown, in which case my improved sealing arrangement may be used without substantial alteration. It will be understood that means may also be provided to fix the transverse partitions in position without departing from the scope of the invention.

Although I have described a preferred form of embodiment of my invention, it will be apparent that modifications may be made thereto without departing from the scope and spirit of the invention; therefore, only such limitations as appear in the claim appended hereinafter should be imposed.

In combination with a fractionating column of relatively small diameter, a bubble deck extending to the inner periphery of the column, means to support the deck in said column, and means to seal the periphery of the deck with respect to the column comprising a continuous peripheral flange projecting downwardly from the plane of the said deck and forming a sealing surface, an outwardly extending, continuous integral lip around the lower edge of the said peripheral flange, packing material supported by the said lip, a ring member in contact with the upper surface of the said packing material, a plurality of threaded bosses contiguous with the said flange and a plurality of adjustable members spaced about the periphery of the deck in contact with the ring member, threaded studs in said bosses engaging said adjustable members to compress the packing material against the said lip and radially against the interior of the column and the sealing surface of the flange.

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