March 15, 1927. 1,620,751

K. W. BARTLETT

TRAY

Filed May 6, 1926 2 Sheets-Sheet 1

Fig. 1.

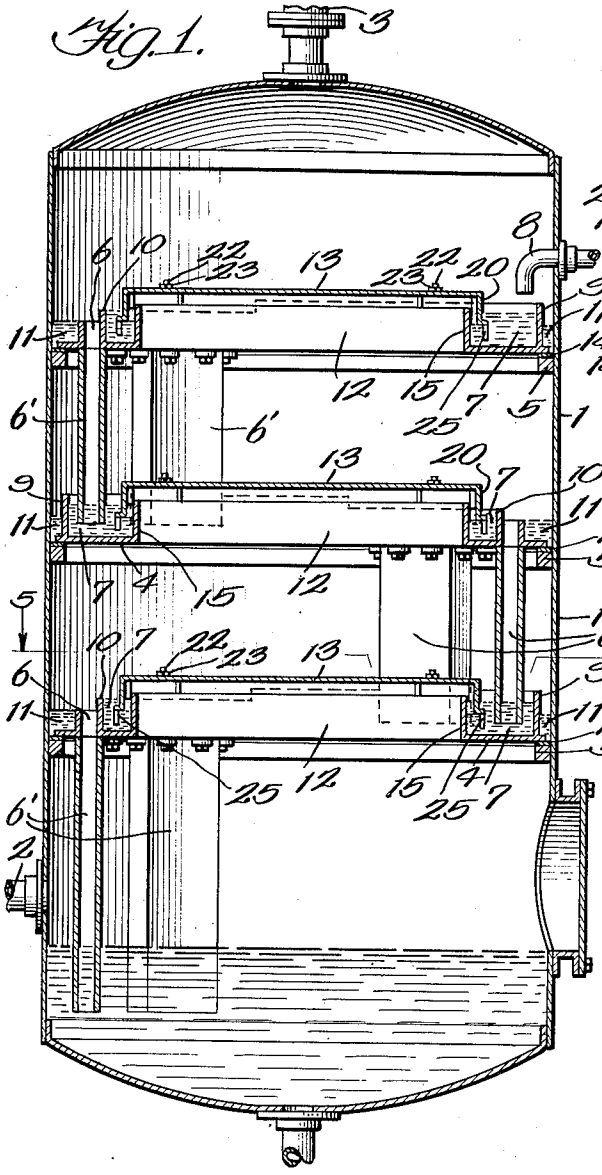


Fig. 3.

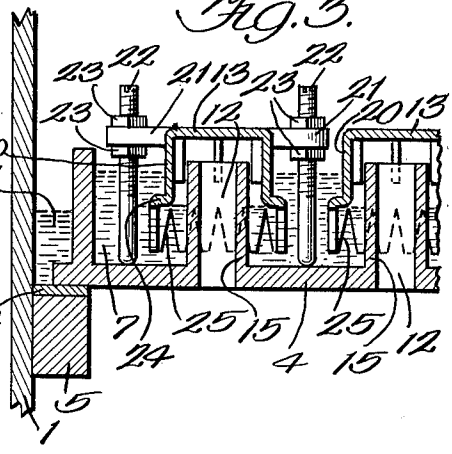


Fig. 4.

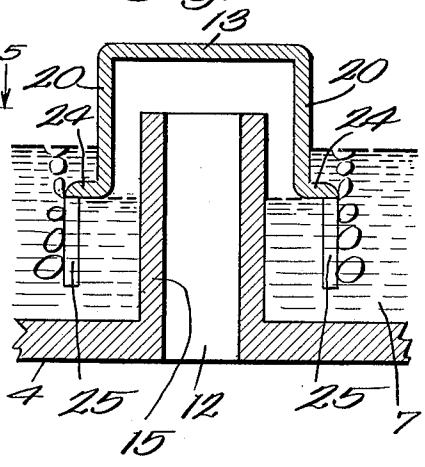
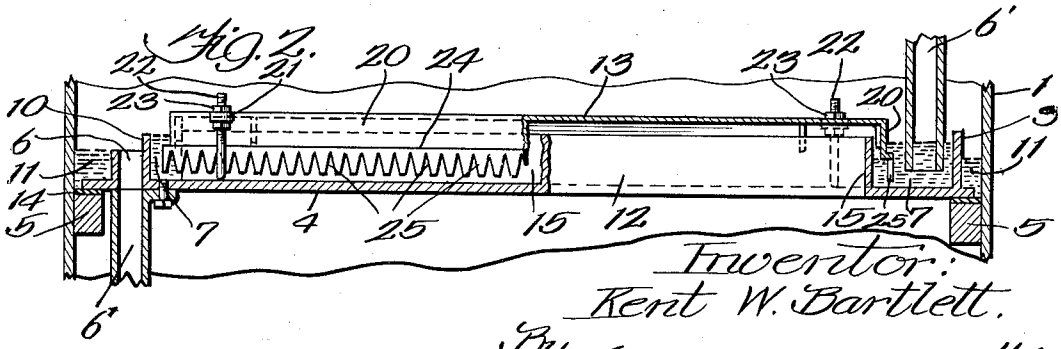


Fig. 2.



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Fig. 5.

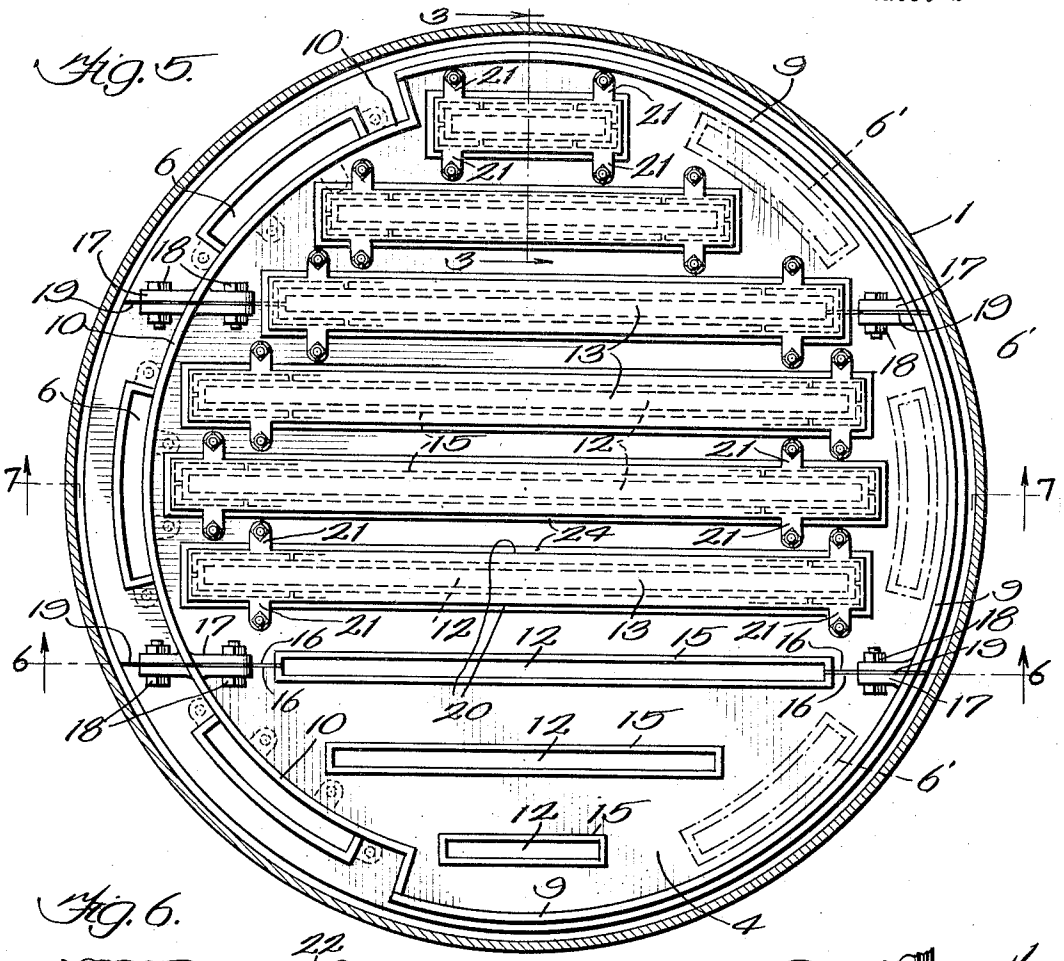


Fig. 6.

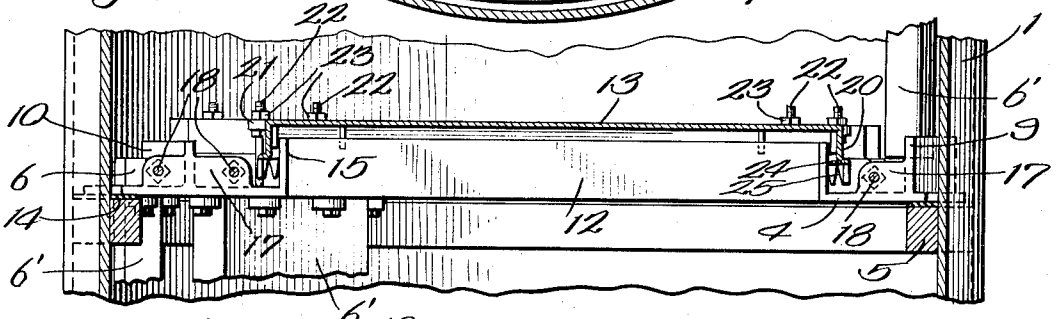
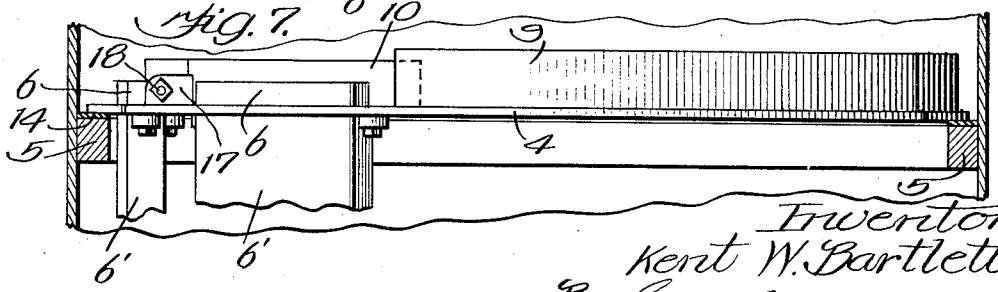


Fig. 7.



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Patented Mar. 15, 1927. 1,620,751

UNITED STATES PATENT OFFICE.

KENT W. BARTLETT, OF HAMMOND, INDIANA.

TRAY.

Application filed May 6, 1926. Serial No. 107,078.

My invention relates to liquid receiving trays and to distilling apparatus or casing equipment employing the same.

In distilling apparatus such, for example, as is employed for distilling oils, liquid receiving trays are employed that are disposed at different levels within casings upwardly through which the distillate vapors or gases are passed under pressure, the parts of distillation of different grades or weights being separated and collected in the trays and at the bottom of the casing from whence they are withdrawn. Hitherto, these trays have been formed each in one piece rendering it difficult to assemble them within the casing and to remove them in repairing the casing equipment. I obviate this difficulty, due to the previous construction of the trays, by forming each tray in sections, the opening in the bottom of the tray through which the distillate vapors or gases rise intervening between the sections of the tray, the tray sections having opposed face portions in fluid-tight assembly and terminating at said openings. By having the opening through which the gas passes intervening between the tray sections, the difficulty in assembling the tray sections in fluid-tight relation is reduced to a minimum.

In equipment of this character, a cap is employed in connection with each tray, this cap overlying the wall which margins the opening in the tray through which the gas passes and which wall extends above the tray bottom to separate the opening and the liquid receiving space of the tray. Such cap is formed with a skirt surrounding the wall and projecting into the liquid receiving space of the tray, the portion of the cap above the liquid receiving space being imperforate, there being spacing between the wall that margins the aforesaid opening and the top and skirt of the cap and below the imperforate portion of the cap that permits gas to flow from beneath the cap into the liquid upon the exterior of the cap. It frequently happens that the casing which carries the tray within it is not in plumb which causes the level of the liquid to be below some portions of the cap skirts thereby permitting the gas to escape without passing through the liquid in the trays. I obviate this difficulty by providing means for tilting the caps with reference to the trays so that no space for the escape of gas may intervene between the upper levels of the liquid and the caps. As the casings may be out of plumb in more than one direction, the tilting means is preferably such that the caps may be tilted with reference to the trays in either or both of two angular directions.

I have observed that the globules of gas have so hugged the skirts of the caps of prior construction as to prevent these gas globules from having as intimate contact with the liquid in the trays through which they pass as is desired for the most perfect action. To eliminate or reduce this defect, hitherto existing, I outwardly and laterally deflect the cap skirts where they are received in the liquid receiving spaces of the trays, the cap skirts being imperforate from the tops of the caps to the terminations of the deflected portions of the cap skirts so that the globules of gas, in rising through the liquid, are sufficiently spaced from the bodies of the caps. I also desirably continue the cap skirts downwardly from the termination of their deflected skirt portions, these downward continuations of the cap skirts being formed with gas discharging openings that are desirably closely adjacent the lateral deflections of the cap skirts, these openings being preferably formed by serrating the cap skirt continuations. These serrations are desirably of such shape as to cause the gas discharging openings in the cap skirts to taper upwardly, whereby the larger globules of gas seek the bottom portions of the skirts and the smaller globules of gas seek portions above the bottoms of the skirts. By this means, the larger globules of gas are given more extended travel through the liquid than the smaller globules of gas with resulting improvement in the process.

I will explain my invention more fully by reference to the accompanying drawings in which Fig. 1 is a sectional elevation of a casing equipped with the preferred structure of my invention; Fig. 2 is a view in elevation and in sectional elevation of a portion of the casing and a tray there disposed; Fig. 3 is a sectional view on line 3—3 of Fig. 5; Fig. 4 is a sectional view illustrating the flow of the globules of gas from beneath the cap and through the surrounding fluid; Fig. 5 is a sectional view on line 5—5 of Fig. 1, the caps being removed from some of the gas conveying openings in the tray shown in this figure; Fig. 6 is a sectional view on

line 6—6 of Fig. 5; and Fig. 7 is a sectional view on line 7—7 of Fig. 5.

The distillate vapors or gases are admitted to the casing 1 through the inlet 2 at the bottom of the casing, the remnants of these gases or vapors after the condensing process within the casing escaping from the casing at the outlet 3 at the top of the casing. Liquid receiving trays 4 are disposed within the casing and upon ledges 5 spaced apart along the casing at suitable intervals. Each tray is formed with one or more downwardly extending passages 6 which enter the liquid at 7 in the tray below or the liquid in the bottom of the casing in the case of the lowermost tray. Each passage is formed at its upper part in the body of the tray upon the exterior of the liquid receiving space of the tray and is downwardly continued through a flattened pipe portion 6' which may be separately formed from the tray and assembled therewith. Any deficiency in the liquid in the trays is made up by liquid admitted to the top tray through the pipe 8. This liquid may be the condensate of the vapors escaping at 3. The liquid passes from the trays at points diametrically opposite the places where the liquid is received by the trays. Each tray has its encompassing wall higher where the liquid is received, as indicated at 9, and lower where the liquid overflows from the tray into the passages 6, as indicated at 10. Each liquid passage 6 terminates at its upper end above the adjacent ledge and below the top of the liquid receiving space of the tray, the arrangement being such that a liqiud receiving pocket surrounds each tray, as indicated at 11, the limiting level of the liquid in this pocket being determined by the location of the upper end of the overflow passages. Each tray has one or more gas passages 12 extending upwardly therethrough and separated from the liquid receiving space thereof. Each of these gas passages has a cap 13 above it which is shaped and positioned to compel the flow of gas, under pressure, from this passage through the surrounding liquid in the tray and to thereafter permit the escape of gas from this liquid.

It is desirable to have fluid-tight engagement between each tray and its supporting ledge to which end I provide each ledge with a sealing gasket 14. However, if there should be leakage space between a tray and its supporting ledge, a portion of the gas flowing upwardly through the casing will pass through this leakage space into the liquid within the pocket so as to be subjected to the condensing action of such liquid, the upward flow of the gas through the pockets preventing the material descent of the liquid from these pockets. The provision of the pockets at 11, functioning as described, forms the subject matter of my copending application Serial No. 107,077, filed May 6, 1926.

Each tray is provided with walls 15 which margin the openings 12 passing through the bottom of the tray and which walls extend above the tray bottom to separate said openings and the liquid receiving space of the tray. Each tray is desirably circular in contour and formed in three sections. An opening 12 intervenes between each two adjacent sections and these adjacent sections have opposed face portions 16 in fluid-tight assembly, these opposed face portions of the tray sections terminating at the adjacent openings 12. The tray sections may be equipped with flanges 17 at the opposed face portions 16, these flanges being clamped together by means of bolts 18, packing material 19 being desirably interposed between the opposed face portions of the tray sections to make the assembly between the tray sections perfectly fluid-tight where these tray sections meet beyond the opening 12 therebetween. Each of the openings 12 is desirably elongated, this being especially true of such openings that intervene between the adjacent tray sections whereby the extent of the opposed face portions of the adjacent tray sections that are to be clamped in fluid-tight assembly is reduced to a minimum.

The cap 13, provided in conjunction with each opening 12, is formed with a skirt 20 which surrounds the wall 15 margining such opening. This skirt projects into the liquid receiving space, at 7, the portion of the cap above the liquid receiving space being imperforate, there being spacing between said wall 15 and the top and skirt of the cap and below the imperforate portion of the cap skirt that permits flow of gas from beneath the cap into the liquid upon the exterior of the cap. Each cap is formed with two ears 21 at each end of the cap and on opposite sides of the cap. Threaded posts 22 pass freely through these ears, being held in adjusted positions by means of the nuts 23 on opposite sides of said ears whereby the distances between the caps and the bottoms of the trays may be regulated. The posts 22 and the nuts 23 constitute means whereby the caps may be tilted in either or both of two angular planes so that the imperforate portions of the cap skirts may extend below the upper levels of the bodies of liquid in the trays in case the trays do not occupy true horizontal positions, in the event that the casings are out of plumb.

The skirt of each cap, where received in the liquid receiving space of the corresponding tray, is formed with a surrounding rim 24 which constitutes an outwardly and laterally deflected portion of the cap skirt, such cap skirt being imperforate from the top of the cap to the termination of said rim or deflected portion 24. Each cap skirt

is also desirably downwardly continued from the termination of the deflected portion 24 of the cap skirt, this downward continuation of the cap being serrated. The serrations are such that upwardly tapering gas discharging openings 25 are formed in the downward continuations of the cap skirts. These openings 25 terminate at the lateral deflection 24 of each cap skirt whereby the smaller globules of gas are released at the deflected portions 24, globules of increasing size being released in the lower portions of said openings. The contact between the globules of gas and the cap skirt is thus reduced to a minimum while at the same time permitting the larger globules to have more extended travel through the liquid than do the smaller globules whereby more thorough inter-action is permitted between the escaping gas and the liquid through which the gas passes.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:—

A tray having a liquid holding space, an opening through its bottom and a wall margining said opening and extending above the tray bottom to separate said opening and the liquid receiving space of the tray, the tray being formed in sections between which said opening intervenes and having opposed face portions in fluid-tight assembly and terminating at said opening.

In witness whereof, I hereunto subscribe my name.

KENT W. BARTLETT.