April 12, 1932. L. H. HOSBEIN 1,853,056

STILL CONSTRUCTION

Filed Sept. 7, 1926

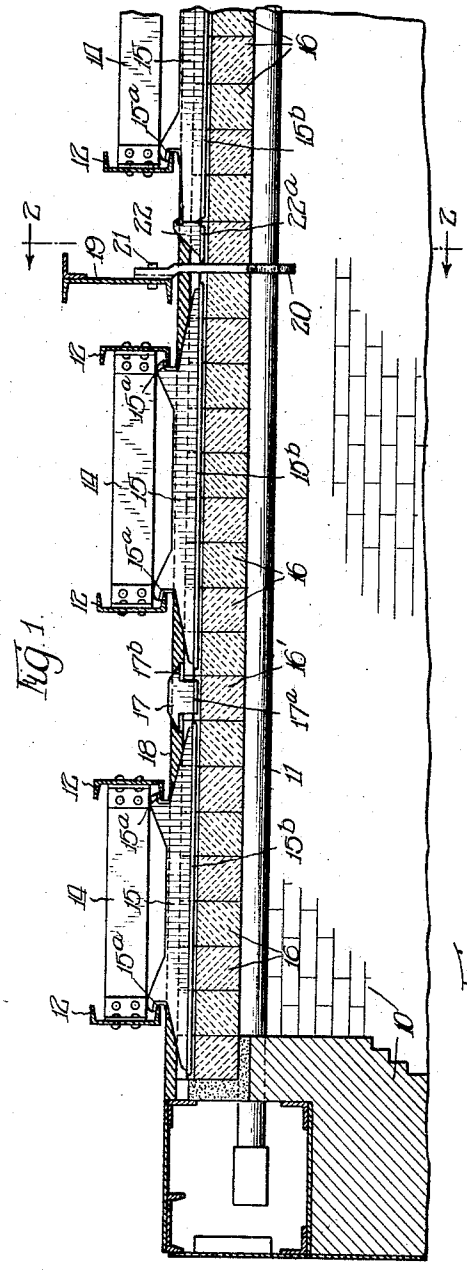

Fig. 1.

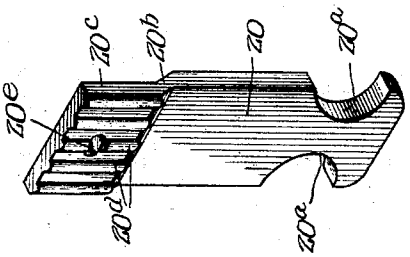

Fig. 4.

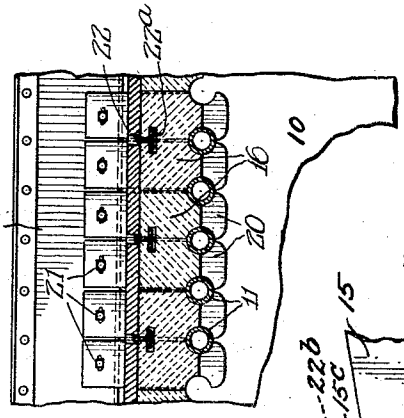

Fig. 3.

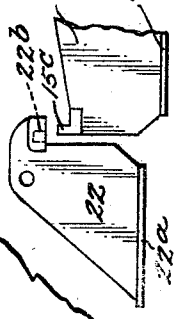

Fig. 5.

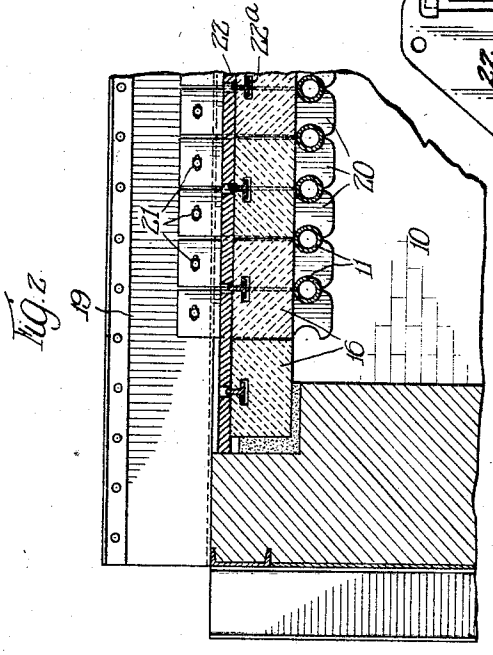

Fig. 2.

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UNITED STATES PATENT OFFICE

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STILL CONSTRUCTION

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This invention has to do with the construction of tube stills of a type employed, among other uses, in the distillation of petroleum. It pertains particularly to the support of the tubes, through which the liquid to be distilled is circulated, in association with the roof or cover portion of the still which forms the top closure for the heat confining chamber.

The general object of the invention is the provision of a construction which will afford the tubes the desired support and sustain them in the proper relationship to the refractory roof which functions to effect a proper distribution and equalization of heat to the tubes.

Another object is the provision of a construction which will afford a desirable freedom of relative movement of the roof refractories and the tubes such as may be occasioned by differences in expansion and contraction incident to heating and cooling.

A further object is the provision of a construction which will avoid the imposition of weight or stresses from the tubes upon the roof or vice versa.

Another object is the provision of a construction which will provide the proper insulation for the roof against dissipation of heat into the surrounding air yet permit the necessary dispersion of heat from the tube supporting portions to prevent their weakening or rapid destruction.

A further object is the provision of a construction which will permit dismantling or repair of the roof without involving removal or replacement of the tubes.

A further object is the provision of a construction which will permit dismounting or replacement of the tubes or tube supporting members without involving dismantling of the roof.

A further object is the provision of a construction in which identical parts may be employed to a maximum extent.

Yet another object is the provision of a construction in which replacement or repair of parts may be accomplished with facility.

Another object is the provision of a form of tube supporting members especially qualified to withstand the high temperatures of the still without rapid destruction.

Other and further objects will be pointed out or indicated hereinafter or will be apparent to one skilled in the art upon an understanding of the invention or its employment in practice.

In the drawings forming a part of this specification I illustrate certain forms in which the invention may be embodied, but these are presented for purpose of illustration only and are not to be given an interpretation having the effect of limiting the claims short of the true and most comprehensive scope of the invention in the art.

In said drawings,

Fig. 1 is a part sectional elevation of the upper portion of a still embodying one form of the invention, the section being taken longitudinally;

Fig. 2 is a part sectional elevation on line 2—2 of Fig. 1;

Fig. 3 is a similar part sectional elevation showing an alternative form of construction, and

Fig. 4 is a perspective view of a tube supporting member. Fig. 5 is a detail showing in side elevation a feature of the roof construction.

The nature of the invention will be most quickly ascertained by reference to these illustrative forms. In the forms illustrated in the drawings, let it be understood that the reference numeral 10 designates wall portions of the still or heating chamber, same being appropriately formed to confine and guide the heat and products of combustion within the chamber formed by such walls and the roof or arch. In the upper portion of the chamber are arranged the tubes 11 extending at their ends through the wall portions for connection to suitable sources of supply from which the fluid to be subjected to the heating is circulated through them. These tubes find support at their end portions on the opposite walls of the furnace chamber, but as the tubes ordinarily are of considerable length, it is necessary to give them additional support at one or more points within the heating chamber between the

walls, and this is accomplished in an advantageous manner by the present invention in the fashion presently to be described. A roof or arch structure forms a top closure for the heating chamber. Support for this roof is afforded by beams 12 which extend across and above the heating chamber, being suitably supported at their ends. These are channel members arranged in pairs with the flanges facing each other, the beams of a pair being connected by spacing members 14. These beams are disposed at a suitable elevation above the roof to allow adequate air circulation about them for the purpose of preventing their overheating. Arch bars 15 of suitable heat resisting metal, such as cast iron, are formed with the hooks 15^a which engage over the lower facing flanges of a pair of beams 12, and have web portions depending from said hook portions and terminating in narrow lateral flanges 15^b. Refractories 16 are provided with appropriate slots for reception of the flanges 15^b whereon the refractories are suspended in alignment on the arch bars. The arch bars 15 on adjacent pairs of beams terminate short of each other by a distance slightly exceeding the thickness of one of the refractories, so that a space is left between the terminal adjacent refractories on such arch bars. This space is filled by refractories 16′ which are supported on bridge members 17 which are cast iron members having flanges 17^a at the bottom and overhanging end portions 17^b which rest upon the terminal refractories 16 of the adjacent arch bars. The refractories are arranged in close lateral abutment so as to form a tight and continuous refractory roof closure for the heating chamber. One or more of the bridge members 17, together with their attached refractories 16′, may be withdrawn upwardly out of the roof, leaving a space through which the aligned refractories 16 may be withdrawn upwardly, one after another. In this fashion replacement of refractories may be made with convenience at various localities in the arch without involving extensive dismantling. The roof refractories are covered with a layer of heat insulating material 18, through which the arch bars project into the atmosphere, the purpose of such insulating cover being to prevent excessive dissipation of heat through the refractory roof.

At one or more points above the heating chamber is disposed a supporting member 19 in the form of a beam properly supported at its ends so that it bridges the heating chamber and roof, with proper spacing from the latter to afford the requisite air circulation for cooling. To this supporting member are connected the tube holders 20. These are identical members formed of a suitable material of adequate tensile strength and heat resisting ability, such as cast iron. They are relatively thin and of a width exceeding the space between juxtaposed tubes 11. Their lower ends are formed with lateral tube seats 20^a arranged to receive adjacent tubes, and their upper ends are offset at 20^b to form an attaching portion 20^c having ribs 20^d spaced apart to afford air channels. The attaching portion is provided with a transversely elongated hole 20^e for reception of a bolt 21 whereby the tube holder is connected to the supporting member 19 with the tops of the ribs 20^d against the web of the supporting member. The elongated slot allows a certain margin of adjustment of the tube holder so that it may be positioned in proper relationship to the tubes such as will permit its hanging vertically, while the connection afforded by the bolt 21 is such as to permit a lateral swinging movement of the tube holder. Arch bars adjacent the supporting member 19 are provided with detachable end extensions 22 which have sockets 22^b that hook on to lugs 15^c on webs of the arch bars and also lower marginal flanges 22^a adapted to support refractories. These end extensions 22 may be withdrawn upwardly to remove from the roof the refractories which they support, thus leaving a space adjacent the tube holders 20 in which the latter may be manipulated for removal from or insertion in the structure. A tube holder is placed in position by inserting it between adjacent tubes, its broader faces parallel with the tubes, and then rotating it so as to bring the tube seats into engagement with the tubes. Then it is bolted to the supporting member 19. When so assembled, the tube holders form supports for the tubes effective to prevent the latter sagging, and holding them in proper relationship to the refractory roof. This is of importance not only for maintaining the structural integrity of the installation, but also for efficient operation, as the proper relationship of the tubes to the refractory roof is of importance in obtaining uniform distribution of heat to the tubes.

It is preferable to have the tube holders of substantial width in the portions above the tubes and the roof, as thereby the dispersion of heat from the entire tube holder is augmented, and the portions exposed within the heating chamber thus safeguarded against rapid destruction by the temperatures. For this reason also it is of advantage to have a substantial portion of the tube holder exposed to air circulation above the roof. The provision of the broad attaching portions of the tube holders, together with their formation in a fashion such as to give only partial or limited contact with the supporting member 19, contributes to this effect and also minimizes the direct conduction of heat from the tube holders to the supporting member, thus safeguarding it against heating to a

point whereat its stiffness would be adversely affected.

When the tube holders are bolted to their supporting beam, they are thereby retained in supporting engagement with the tubes, without requiring any supplementary clamping or connecting members within the heating chamber. The roof refractories contiguous to the tube holders also hold the latter against rotation out of supporting cooperation with the tubes. By having the shanks of the tube holders of such width that they are approximately contiguous with one another, opportunity for leakage through the roof along the line of the holders is minimized.

By virtue of this construction both the refractory roof structure and the tubes are allowed a proper degree of independent movement to accommodate expansion and contraction occasioned by changes in temperature or other operating factors, each of said parts being capable of accommodating itself to conditions in this respect without imposing stresses on the other. Likewise, close joints in the refractory roof are maintained, thus preserving the integrity of the roof closure. Replacements may be made in either the roof or the tubes or the tube supports without requiring extensive dismantling.

The form illustrated in Fig. 3 differs from that shown in Fig. 2 in the fact that the refractories 16 are provided with grooves across their lower ends, permitting the tubes to be set up into them to some extent, a feature which may be of advantage in instances where the head room is limited, or when it may be desired to have increased surface area of the tubes in close proximity to the refractories.

I claim:

1. In a still construction, the combination with the heating chamber and tubes extending across the upper portion thereof, of beams spanning the heating chamber, tube holders for supporting the tubes, refractories suspended from the beams independently of the tube holders to form a top closure for the heating chamber above the tubes, said tube holders insertable through the roof into supporting engagement with the tubes, and means for securing the tube holders to a beam above the roof.

2. In apparatus of the class described, the combination with the heating chamber having tubes arranged in a horizontal banc in the upper portion thereof, of refractories arranged over said tubes to form a roof for the chamber, independently removable tube holders extending through the roof and having supporting cooperation with the tubes to hold them against sagging, and supporting means above the roof for individual holders and roof refractories contiguous thereto permitting their removal individually outwardly from the roof without displacement of other refractories and holders.

3. In apparatus of the class described, the combination with the heating chamber having tubes arranged in a horizontal banc in the upper portion thereof, of refractories suspended over said tubes to form a roof for the chamber, tube holders insertable through the roof and between the tubes and rotatable on vertical axes into and out of supporting engagement with the tubes, and means for securing the holders above the roof to support and hold them against such rotation.

4. In apparatus of the sort described, the combination with the heating chamber having a banc of tubes in its upper portion, of refractories suspended over the tubes to form a roof for the chamber, tube holders insertable through the roof and rotatable on vertical axes into and out of supporting engagement with the tubes, means above the roof for supporting and holding the tube holders against such rotation, supporting means for roof refractories contiguous to the holders permitting their removal from the roof without displacement of other refractories, the removal of said contiguous refractories affording space for the rotation of tube holders into and out of tube-engaging position.

5. In furnace construction, the combination with the furnace chamber and a banc of tubes in the upper portion thereof, of tube supports movable between the tubes into and out of supporting engagement therewith while the tubes remain in place, refractories supported above the tubes independently of the tubes and tube supports to form a roof for the furnace chamber in association with the tubes, support connections above the roof for the tube holders, and supports for refractories immediately adjacent the tube holders permitting their withdrawal upwardly from the roof to permit insertion and withdrawal of the tube holders through the roof.

6. In furnace construction, the combination with the furnace chamber and a banc of tubes in the upper portion thereof, of tube holders rotatable between the tubes into and out of engagement therewith, refractories suspended above the tubes independently of the tube holders to form a roof for the furnace chamber, means disposed externally of the roof for supporting the tube holders in engagement with the tubes, and supports for refractories immediately adjacent the tube holders permitting removal of said refractories individually from the roof to afford space for rotation of the tube holders.

7. In furnace construction, the combination with the furnace chamber and a banc of tubes fixed therein, of tube holders movable transversely of the tubes into and out of supporting engagement therewith, refrac-

tories supported independently of the tubes to form a roof for the furnace chamber, means outside the furnace chamber for supporting the tube holders independently of the refractories, supports for refractories adjacent the tube holders permitting withdrawal of said refractories outwardly from the roof independently of the other roof refractories to permit insertion and withdrawal of the tube holders through the roof and between the tubes.

8. In a still construction, the combination with the heating chamber and tubes stationarily supported in the upper portion thereof, of supporting members arranged above the heating chamber, tube holders removably connected to certain of said supporting members and engaging the tubes to support them, refractories suspended from some of the supporting members independently of the tube holders to form a roof in association with the tubes, roof refractories adjacent the tube holders being independently withdrawable outwardly from the roof to afford space to accommodate the moving of the tube holders into and out of supporting engagement with the tubes.

9. In a still having a heating chamber, the combination with tubes traversing the upper portion of the heating chamber, of refractories supported independently of the tubes to form a roof above the tubes, a beam disposed above the roof, tube holders supported on the beam and extending through the roof into supporting engagement with the tubes, said tube holders being detachable from the tubes and beam and withdrawable from the roof while the tubes are in place.

10. In a still having a heating chamber and tubes traversing the upper portion of the heating chamber, refractories supported independently of the tubes to form a roof for the heating chamber, a supporting member above the roof, tube holders individually movable through the roof into and out of supporting engagement with the tubes, and means connecting the holders to the supporting member and holding them in supporting engagement with the tubes.

11. In a furnace having tubes arranged side-by-side below the roof of the heating chamber, a supporting member above the roof, and removable tube holders connected individually to the supporting member and extending through the roof and between the tubes, tube holders on opposite sides of a tube having portions engaging said tube to support it in association with the roof.

In testimony whereof I have hereunto subscribed my name.

LOUIS H. HOSBEIN.