March 3, 1959 F. W. HART 2,875,867

SECURING APPARATUS

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Fig. 1

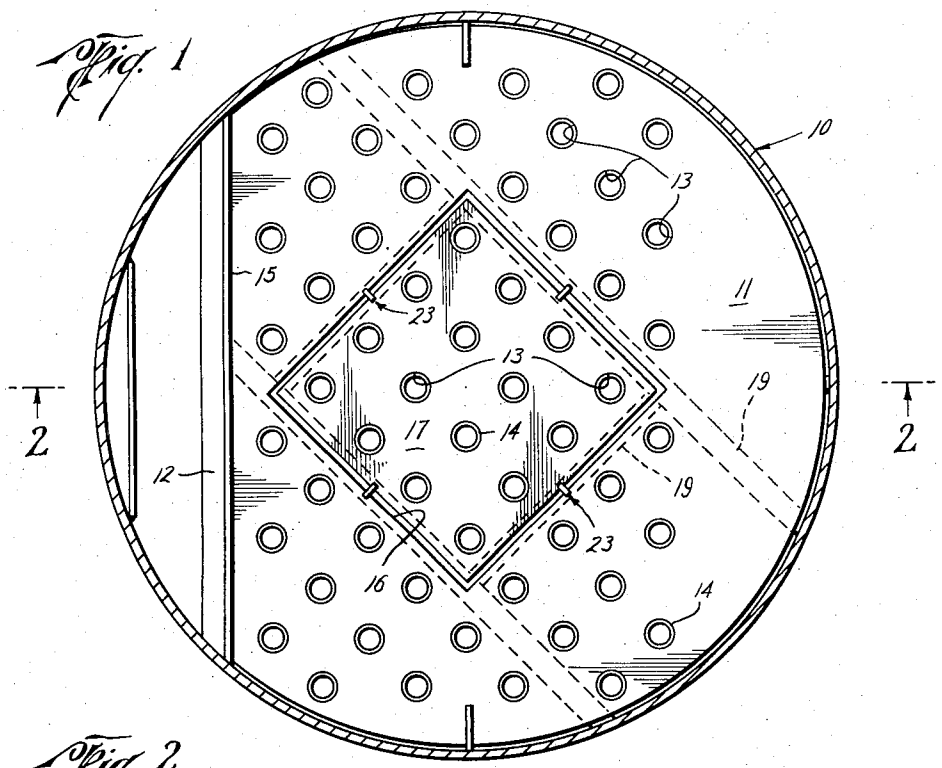
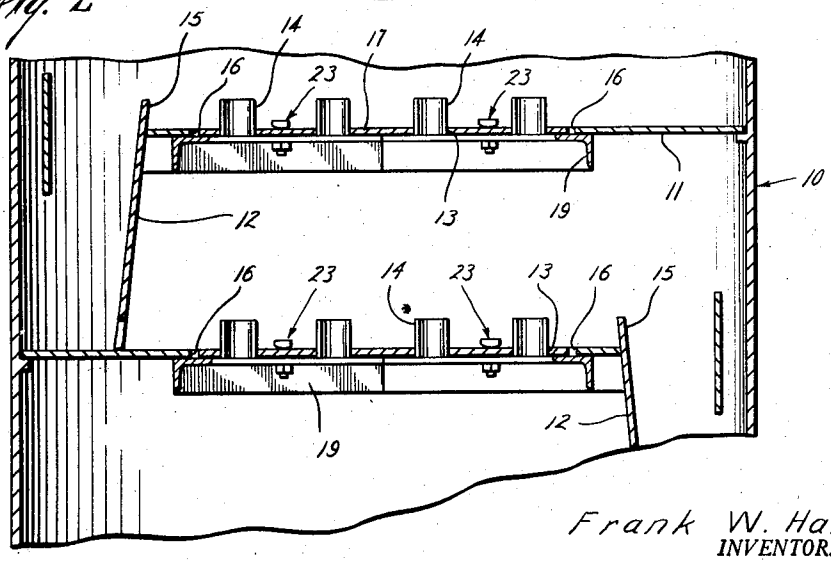


Fig. 2



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Fig. 3

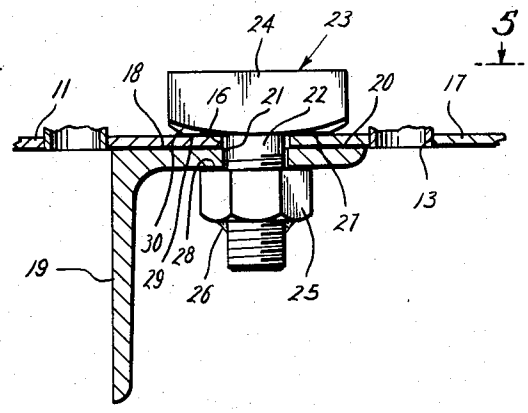


Fig. 4

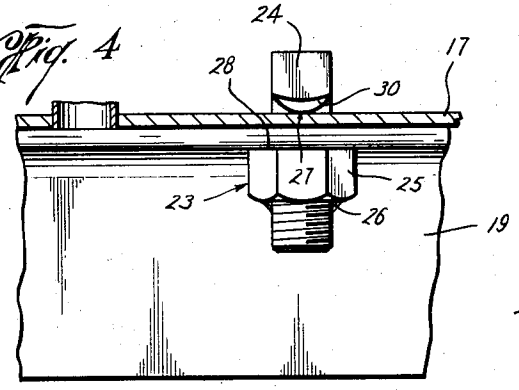


Fig. 5

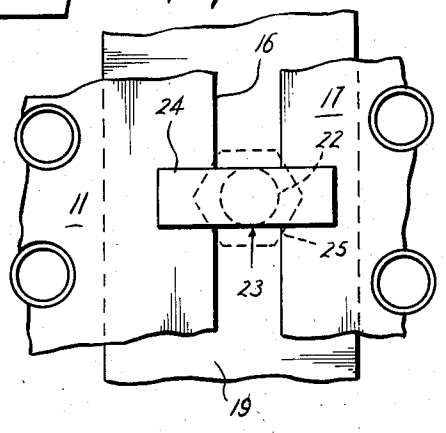


Fig. 6

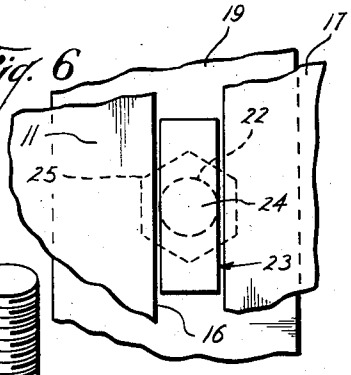
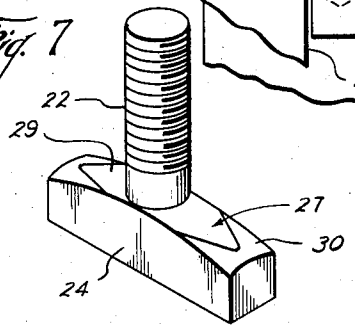


Fig. 7



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SECURING APPARATUS

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2 Claims. (Cl. 189—35)

This invention relates to an improved apparatus for releasably securing a plate-like member in edge facing relation to another such member. More particularly, this invention relates to such apparatus that is operable from either side of the plate-like member being secured and as such is especially well suited for securing covers over manways in partitions extending across vertical towers.

Towers of the type mentioned are employed, for example, in the petroleum refining industry as gas-liquid contact apparatus in which heavy hydrocarbons are extracted from hydrocarbon gases containing these heavy constituents as well as lighter constituents. As well known in the industry, the interior of such a tower is provided with a plurality of vertically spaced and laterally disposed perforated partitions known as bubble trays. Liquid is caused to flow downwardly through the tower from one tray to another by means of openings through successive trays and staggered with respect to one another. The upwardly flowing gas, in passing through the perforations and bubble caps disposed thereover, contacts the liquid contained on each tray.

In order to permit cleaning and repair of the towers, and at the same time eliminate the necessity of a large number of manholes in the sides thereof, it has been the practice to provide access along the entire length of the tower interiors by means of manways through the bubble trays. Such manways are closed by removable covers which may be provided with perforations to form a part of the tray and which are releasably securable in fixed position over the manway. It will be understood that a prime requisite of the covers is that they be releasably securable from either above or below the trays in order that a workman may open and close each manway as he traverses the length of the tower.

Although the apparatus of the present invention finds special utility in the afore-mentioned field, and is illustrated and described below in connection therewith, it is obvious that it is not limited thereto and many other practical applications are contemplated.

It is an object of this invention to provide a latching or fastening device for use with apparatus of the character described, which device is of extremely simplified construction having a minimum of parts requiring a minimum amount of assembly and machining.

Another object is to provide apparatus carried by a plate-like member for releasably securing another such member in edge facing relation thereto, which apparatus is actuable from either side of the first-mentioned plate-like member to permit removal of the second-mentioned of such members.

Still another object is to provide apparatus of the type described in the foregoing object in which said plate-like members may be secured with their surfaces in substantially coplanar relation.

Yet another object is to provide, in combination with a vertical tower having partitions extending laterally thereacross and covers for closing manways through the partitions, means for releasably securing such covers over the manways, which means is carried by the partition and operable from either above or below the partition.

Other objects, advantages and features of this invention will be apparent to one skilled in the art upon a consideration of the written specification, the attached claims and the annexed drawings.

In the drawings, wherein like reference characters are used throughout to designate like parts:

Fig. 1 is a horizontal sectional view of a tower, showing a bubble tray with a cover closing a manway therethrough and securely held in closed position by the apparatus of the present invention;

Fig. 2 is a vertical sectional view of a part of the tower taken substantially along broken line 2—2 of Fig. 1;

Fig. 3 is an enlarged side view of the apparatus in cover securing position;

Fig. 4 is a view similar to Fig. 3, taken substantially along broken line 4—4 of Fig. 3;

Fig. 5 is a top view of the apparatus shown in Figs. 3 and 4, taken substantially along broken line 5—5 of Fig. 3;

Fig. 6 is a view similar to Fig. 5, but with the latching device of the apparatus moved to non-securing position; and

Fig. 7 is a perspective view of a part of the latching device of the securing apparatus.

The apparatus of the present invention includes a latching or fastening device having a shaft with actuators rigidly connected thereto at spaced locations above the length of the shaft for rotating the same. This shaft is received through an opening in a support having a surface for supporting a plate-like member in edge facing, and preferably coplanar, relation to another such member. Upon rotation of the device from either side of the support, cam surfaces on the spaced actuators are engageable with the support and the plate-like members for releasably securing them in their supported position. When released upon rotation of the device to non-securing position, one or both of the plate-like members are removable from said supported position.

The latching or fastening device itself consists of only two parts, one part being a T headed bolt having the cam surface for engagement with the plate-like members and the other a conventional nut threaded onto the bolt and welded thereto in the location desired, and upon which the other cam surface for engagement with the support is disposed.

Turning now to the illustrated embodiment of the invention, there is shown in Fig. 2 part of a vertical tower 10 of the type previously mentioned having a series of laterally disposed bubble trays 11 therein. It can be seen that each tray is terminated short of a side of the tower to provide, with a downcomer baffle 12, an opening through which the downwardly flowing liquid passes from one tray to another. More particularly, these openings are staggered in successively arranged trays, as best shown in Fig. 2.

Each tray is provided with perforations or apertures 13 therethrough in which risers 14 are fitted to support bubble caps (not shown). With a liquid level maintained on each tray by means of weir 15 at the open end thereof, the bubble caps cause the gas flowing upwardly through the perforations to contact the liquid on the tray, in a maner well known in the art.

As previously mentioned, the trays are provided with manways 16 therethrough to permit access at different levels within the tower, and removable covers 17 for closing the manways. As can be seen from the drawings, the covers may be perforated and provided with risers to form parts of the tray. More particularly, each cover is releasably securable over its respective manway by means of the apparatus of the present invention.

In accordance with this invention, the portions of the tray edge defining the manway are supported upon surfaces **18** of members **19**, which may be angle irons or other suitable supports. These supports are also provided with portions which project into the manway and provide surfaces **20** for supporting the covers **17** in edge facing and coplanar relation to the plate-like trays.

As best shown in Fig. 3, the supports **19** are provided with openings **21** therethrough intermediate the surfaces **18** and **20** to receive the rotatable shaft **22** of a latching or fastening device, designated in its entirety by the numeral **23**, with the actuators **24** and **25** thereof disposed at opposite sides of the support, and thus carried thereby. As can be seen from Fig. 1, each tray may be provided with one or more such devices for each side of the manway or cover.

In operation, the latching devices **23** are rotatable between the position shown in Figs. 1 to 5 for securely holding the covers over the manways and another position (Fig. 6) at about 90 degrees to the securing position such that the actuator is disposed between the edges of the tray and the cover. In this latter position, the cover is no longer secured and may be lifted and removed from the manway.

Inasmuch as the latching device is carried by the tray, the cover is free from encumbrances and of the most simplied construction possible. Also, although the actuator **24** is of such construction that in the non-securing position of Fig. 6, either or both of the plate-like members, cover **17** and tray **11**, may be removed, the support **19** may, if desired, be rigidly secured to or form an integral part of the tray **11** in which case only the cover would be removable.

Examining the latching device **23** more closely, it can be seen that the shaft **22** and actuator **24** are the stem and head, respectively, of a T headed bolt, and the actuator **25** is a hexagonal nut threaded onto the stem of the bolt and welded thereto as at **26** in the position desired. In the embodiment shown, this position is determined by a spacing between cam surfaces **27** and **28** on actuators **24** and **25**, respectively, which will, in the securing position of the apparatus, provide a tight and secure joint between the cover **17** and support **19**.

It will be understood that the coplanar relationship of the upper surfaces of the cover and tray not only permits the simplified latching device construction noted above, in which opposite portions of the cam surface **27** may be substantially in a single plane, but also it permits the use of a latching device which may be turned in either rotational sense between securing and non-securing positions. Also, of course, this overall construction provides a tray upon which the water level is substantially constant.

It should be understood that this apparatus could, with certain modifications, be used for supporting plate-like members, such as the tray **11** and cover **17**, of different thicknesses. For example, the supporting surfaces **18** and **20** could be disposed on different levels in a manner to secure the upper surfaces of these members in coplanar and edge facing relation by means of the latching device shown. Also, the portions of cam surface **27** on opposite sides of the stem **22** could be disposed on opposite levels. However, it will be appreciated that this last-mentioned construction has neither the advantages of the extremely simplified T head construction nor would it permit the optional rotational operation of the latching device.

The provision of an actuator **24** with a width in one direction diametrically of the shaft less than the distance between the support surfaces **18** and **20**, which, in the embodiment shown is approximately equal to the shaft diameter, is not only instrumental in permitting this optional rotational operation of the device **23**, but also permits, if desired, removal of either or both the tray and cover in the position shown in Fig. 6.

Although the cam surface **28** of the actuator **25** merely comprises the upper surface of the bolt, the surface **27** comprises a flat portion **29** and an arcuate portion **30** arranged concentrically thereof. Thus, upon rotation to securing position, there will be no binding of the latching device on the cover, but rather the cover will be evenly compressed against support surface **20**.

As can be seen from the drawings, arcuate cam surface part **30** is curved about two axes perpendicular with respect to shaft axis as well as each other. One such axis of curvature may be perpendicular to the plane of the side face of actuator **24**, as it is shown in Fig. 3, and the other axis perpendicular to the plane of the end face thereof shown in Fig. 4. As exemplary of the magnitude of such curvatures, with a T head of 1½ inches in length and a ½ inch square cross section, the first-mentioned curvature may be about 2½ inch radius and the second-mentioned about a ¾ inch radius.

The T headed bolt and nut provide surfaces permitting manipulation by conventional tools. Obviously, a workman traversing the tower in an upwardly direction would first rotate the latching device **23** by means of actuator **25** to the position shown in Fig. 6 for releasing the manway cover. Upon lifting of the cover, the workman could pass through the manway and, if desired, replace and resecure it by rotating the latching device by means of actuator **24** to the position of Fig. 5.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. A latching device, comprising a rotatable shaft and enlarged actuating portions at spaced locations along said shaft for rotating the same, each of said portions having parallel opposed flat surfaces substantially perpendicular to the axis of the shaft, and one of said portions being elongate and having cams thereon arranged symmetrically of and beyond opposite ends of the flat surface thereon, said cams being convex with respect to the flat surface on said other portion and spaced farther therefrom than the flat surface of said one portion, and said cams also extending from beyond said outer ends of the flat surface of the one portion toward the shaft along opposite sides of said flat surface.

2. In combination, a support, a plate-like member on said support, another plate-like member on the support in edge facing relation to the first-mentioned member, said support having an opening therethrough intermediate the edges of said members, and a fastening device including a rotatable shaft extending through said opening and enlarged actuating portions at spaced locations along said shaft for rotating the same, each of said portions having parallel opposed flat surfaces substantially perpendicular to the axis of the shaft for engagement in one position with said plate-like members and said support, respectively, one of said actuating portions being elongate and having a lateral dimension diametrically of the shaft less than the distance between the edges of said members, whereby said fastening device may be rotated to another position in which both of said plate-like members may be removed from the support, said one actuating portion also having cams thereon arranged symmetrically of and

beyond opposite ends of the flat surface thereof, and said cams being convex with respect to the flat surface on said other portion and spaced farther therefrom than the flat surface of said one portion, said cams also extending from beyond said outer ends of the flat surface of the one portion toward the shaft along opposite sides of said flat surface.

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