May 26, 1959 G. PURSWELL ET AL 2,888,298

METHOD AND APPARATUS FOR SHORING UP A STORAGE TANK DURING CONSTRUCTION THEREOF

Filed March 15, 1956

Fig. 1.

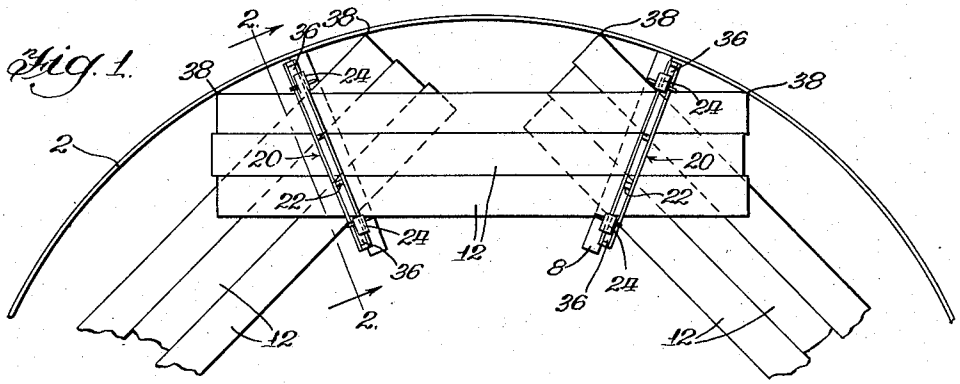


Fig. 2.

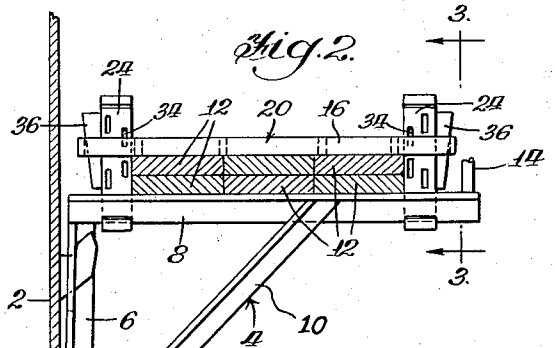


Fig. 3.

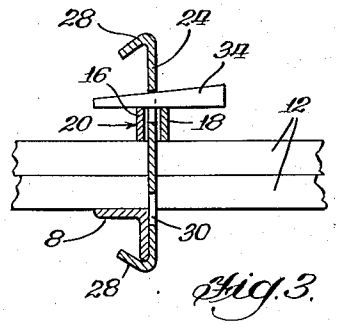


Fig. 5.

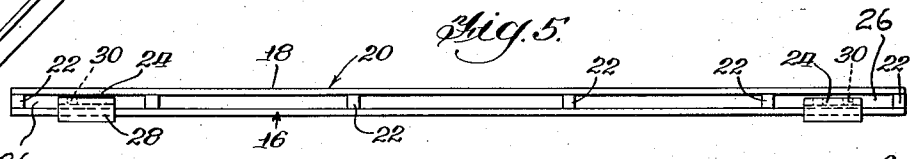


Fig. 4.

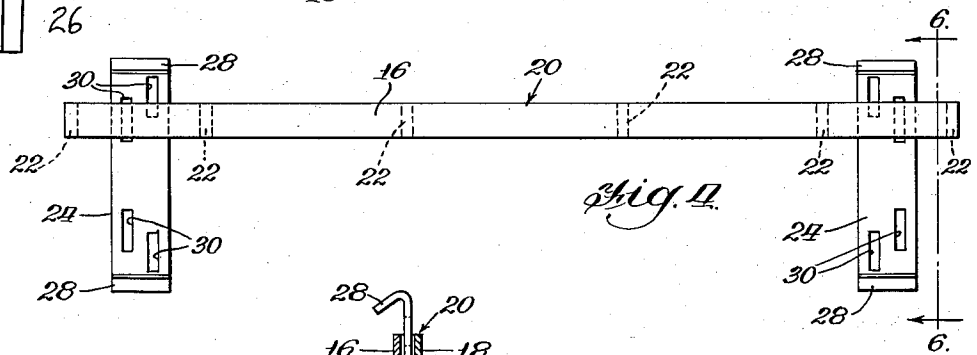
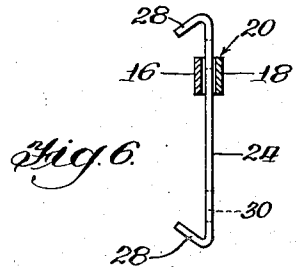


Fig. 6.



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METHOD AND APPARATUS FOR SHORING UP A STORAGE TANK DURING CONSTRUCTION THEREOF

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Application March 15, 1956, Serial No. 571,673

5 Claims. (Cl. 304—12)

The invention relates to a novel method and apparatus that may be used to facilitate the field erection of storage tanks.

As is well understood by those skilled in the art, storage tanks of the field variety are usually erected on the site by crews skilled in handling large steel plates and other steel sections during erection. In the usual instance, a base is prepared and the tank is erected by securing to the base a cylindrical ring of rolled plates and thereafter positioning and securing successive vertical rings to the ring immediately below. Tanks of this type are frequently four to eight rings high, each ring usually having a vertical dimension of six to eight feet. It will be understood, that tanks of this nature may be up to forty to fifty feet high and may have a horizontal diameter up to 200 or more feet. Construction of this nature requires work during an extended period of time and it frequently happens that local climatic conditions change considerably between the start and the finish of the erection of the single tank.

One of the more pressing dangers in such erection is the possible instance of high winds during this construction period. During such construction, the tank shell is without any substantial structural bracing and high winds, acting against the large surface area of the unfinished shell, have frequently caused the shell or portions thereof to collapse or to be so damaged as to require removal and replacement of certain of the shell plates.

Tanks of this nature have been constructed for many years, and the only method of avoiding this wind damage, heretofore used in the art, was to anchor or brace the incomplete shell by a plurality of guy lines secured to the top of the highest shell plate and staked in "dead man" fashion at a point spaced some distance from the base of the shell. A single such guy line is, of course, not sufficient, and, depending on the size of the tank, a plurality of such guy lines have frequently been required. On any given tank, the guy lines are usually put into place at the end of each working day, to forestall against wind damage during the night when the field crews are not present. In addition, it often occurs that the guy lines may have to be put into place during the working day, whenever the wind velocity reaches a rate believed to be dangerous to the incomplete structure. Furthermore, the guy lines must be relocated as each ring is added to the tank.

This "guying up" is obviously an expensive and time consuming operation in that the services of several men for several hours are required to install the lines. The lines must be utilized during construction of open top type tanks until the final wind girder is positioned at the top of the tank near the end of the construction period. On cone roof tanks the guy lines are used until the internal structural supports and rafters are in place offering rigid support to the shell.

It is also familiar to those skilled in the art, that the construction of field erected tanks requires the use of scaffolding secured to the tank shell at progressively higher intervals to offer a working area for the crews as they progressively install each higher shell plate ring.

With the above in mind, it is the general object of my

invention to provide a method and apparatus for eliminating and/or substantially reducing the necessity of using guy lines to support the tank shell during field erection and thereby considerably reducing the labor expense involved in field tank construction.

It is a specific object of the invention to utilize, via my novel method and apparatus, the working area scaffold as a rigid member to reinforce the incomplete tank shell and provide resistance to any potential wind damage.

It is a further specific object of the invention to provide a novel clamping arrangement to quickly secure the scaffold and particularly the planks thereof to each other and to the tank shell so that the scaffolding itself provides the necessary reinforcing member to resist wind damage.

These and other objects of the invention will become apparent in the course of the following description, and from an examination of the associated drawings, wherein:

Figure 1 is a fragmentary plan view of a tank under construction incorporating the invention,

Figure 2 is a sectional view taken along line 2—2 of Figure 1,

Figure 3 is a sectional view taken along line 3—3 of Figure 2,

Figure 4 is a detailed view of the clamping arrangement employed,

Figure 5 is a top view of the structure shown in Figure 4, and

Figure 6 is a view taken along 6—6 of Figure 4.

Describing the invention in detail, attention is directed to Figure 1 wherein the numeral 2 indicates a portion of the tank shell in the process of field erection. A plurality of scaffold supporting brackets 4 may be secured in any conventional manner, such as by welding, to the tank shell 2 in approximate horizontal alignment. In the preferred embodiment, these brackets 4 are mounted around the entire internal periphery of the tank shell whereby a supported working area around the entire tank shell is provided. It will be understood by those skilled in the art, that the brackets 4 or similar brackets may be secured to the outer surface of the shell of the tank whereby a scaffolding around the outer periphery of the tank shell is provided. In each case the herein disclosed invention may be utilized. It will be further understood that as each successively higher ring of shell plates is added to the tank, the scaffolding may be raised and repositioned to an area of adjacency with the then working area of the tank shell. In the alternative, new scaffolding may be mounted on each vertical ring, leaving the lower scaffolding in fixed position on the tank until construction is finished.

Each bracket 4 comprises a vertical member 6, having secured to its upper end a horizontal member 8, said horizontal member 8 preferably being of L section as seen in Figure 3. An angularly arranged supporting bar 10 is secured at opposite ends to the bars 6 and 8 to provide the rigid, triangular scaffolding bracket.

A plurality of planks 12 are positioned on the horizontal bar 8 of the bracket 4. In the preferred embodiment, these planks 12 are usually wooden boards of equal physical dimensions. As shown in the figures, the planks 12 will overlap each other at each supporting bracket 4. A vertical abutment or boss 14 is secured to the end of each bar 8, to prevent the planks 12 from accidentally falling off the bracket 4.

As was mentioned above, the scaffold arrangement described is a necessary incident to tank construction, in that it provides a working area for the field crews during tank erection. As presently utilized, the scaffold arrangement offers nothing more than a working area and has no other function during tank construction.

It is the purpose of this invention, to so secure the

scaffold, and particularly the scaffold planks 12, to each other and to the tank shell, whereby the scaffold will become a rigid reinforcing member for the tank shell as well as providing a crew working area. Thus, the use of the mentioned guy lines may be eliminated or substantially reduced. While the arrangement may be secured in many ways, such as by bolting, to each other and to the bracket, the invention incorporates a particularly novel clamp which utilizes friction to quickly form the reinforcing member. In this manner the scaffold need not be designed for tanks having specific diameters but can be readily accommodated to tanks of varying diameters.

Directing attention to Figures 4 through 6, it will be seen that the clamp preferably comprises a horizontal locking bar 16, said bar may be made up of spaced parallel bars 18 and 20 having a plurality of spacer segments 22 fixedly securing bars 18 and 20 together. At opposite ends of locking bars 20, vertical tie bars 24, 24 are mounted in vertically movable relationship therewith by being slidably received within the formed slot 26. The tie bars 24 have their opposite ends bent in hook-like fashion as at 28, 28 the purpose of which will hereinafter be described. Each tie member or bar 24 is provided with a plurality of vertically off-set, vertically extended wedge receiving slots 30.

To utilize the method and apparatus of the herein disclosed invention and to provide reinforcement of the tank shell under construction, the brackets 4 are first securely mounted in position on the tank shell. The planks 12 are then supportably mounted on the brackets 4 with the ends of the planks in overlapping relationship with each other. With the planks 12 in such position, the clamping arrangement is then located with a locking bar 20 in overlying relationship to the planks 12 (Figure 3), and the tie bars 24 in embracing relationship with the outer edges of the planks. The lower hook portion 28 of each tie bar 24 is arranged to embrace the downwardly extending flange of the bar 8 (Figure 3). Tapered wedge keys 34 are then inserted in the appropriate key receiving slot 30 of each tie member 24, and driven inwardly to vertically clamp the planks 12 between the locking bar 20 and horizontal bar 8. Other tapered keys 36 are positioned within the slot 26 outwardly of each tie bar 24 and driven firmly into position, to clamp the boards 12 tightly between the tie bars 24 in a horizontal direction. With the scaffolding fixedly locked in place in this manner, a rigid reinforcing member is provided for a portion of or the entire tank shell. I have further discovered that to increase the reinforcing effectiveness of the arrangement the ends of the scaffold boards nearest the shell are preferably arranged to engage the shell surface as at 38, 38. It is also preferable that the tie bars 24 bear on both the adjacent planks 12 at the vertical line of juncture between the upper and lower overlapping planks, thus applying horizontal clamping pressure to both the upper and lower planks. It will also be noted that the upper hook portion 28 of tie bar 24, is provided to prevent the tie bar from accidentally becoming disassembled from the locking bar 20.

It will be understood that I have provided a novel method and apparatus for quickly and easily temporarily reinforcing a tank shell during field erection which utilizes certain structure that is already present and a necessary incident to such field erection. The result is a considerable reduction in the field labor involved in avoiding potential wind damage to the tank under construction. A further advantage to the invention disclosed occurs when tanks are constructed in confined built up areas with the result that adjacent structures interfere with proper positioning of guy lines, obviously, the invention here eliminates the need for extensive guying up space in that the tank is shorted up entirely within its own area, this solving this difficulty.

The foregoing description is by way of illustration and not limitation and the herein disclosed invention may be subject to various modifications without departing from the spirit thereof or the scope of the appended claims.

We claim:

1. In an arrangement for temporarily reinforcing the shell of a field erected storage tank during construction thereof, the combination of a plurality of supporting brackets temporarily secured to the shell at spaced intervals and around the entire periphery of the shell, a plurality of independent plank members arranged in end-to-end adjacent relationship and extending between and supported by the brackets to form a continuous scaffold around the entire periphery of said shell, and a plurality of means interconnecting the plank member ends and the respective brackets to fixedly secure the ends to each other and to the respective brackets whereby the scaffold forms a temporary rigid reinforcing member for the shell.

2. An arrangement according to claim 1, wherein each bracket is provided with a substantially horizontal bar to support the plank members, and each means comprises a locking bar to overlie the plank member ends, at least one tie member movably associated with one of the bars, said tie member being lockingly engageable with the other bar, and means in driving wedge engagement with the tie member and one of said bars to fixedly and frictionally clamp the related plank members between the bars.

3. In an arrangement for temporarily reinforcing the shell of a field erected storage tank during construction thereof, the combination of a plurality of scaffold supporting brackets secured to a continuous shell ring in spaced relation to each other, each bracket having a horizontal bar, scaffold planks extending between the various brackets and having their adjacent ends in overlapping relationship with each other and supported by the horizontal bars, locking bars having slots in the ends thereof and arranged to overlie said plank ends, tie members slidably received in the slots at opposite ends of each locking bar and arranged to receive the plank ends therebetween, hooks on at least one end of the tie members operable to grasp the related horizontal bar, wedge keys drivingly interposed between the tie members and locking bar whereby the planks are fixedly clamped between the locking bar and the horizontal bar and the tie members, whereby the arrangement provides a temporary rigid reinforcing member for the shell.

4. In an arrangement for temporarily reinforcing the shell of a field erected storage tank during construction thereof according to claim 3, wherein certain of said planks have portions thereof directly engaging the shell.

5. As an article of manufacture, a clamp for use in an arrangement of the type described, said clamp comprising an elongated locking bar having slots adjacent the opposite ends thereof, tie members movably received in said slots for movement in a direction substantially perpendicular to the long axis of said locking bar, wedge means receivable in the slots outboardly of said members, hook portions formed on adjacent ends of said tie members, each of said tie members having a plurality of elongated linearly off-set wedge receiving slots therein, and other wedge means selectively receivable in said last mentioned slots.

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