Dec. 6, 1966 C. E. EVANS ET AL 3,289,788

FOLDING SCAFFOLD WITH CENTRAL SUPPORT

Filed Dec. 31, 1964 2 Sheets-Sheet 1

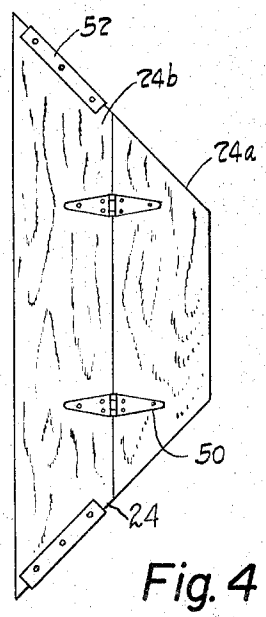


Fig. 4

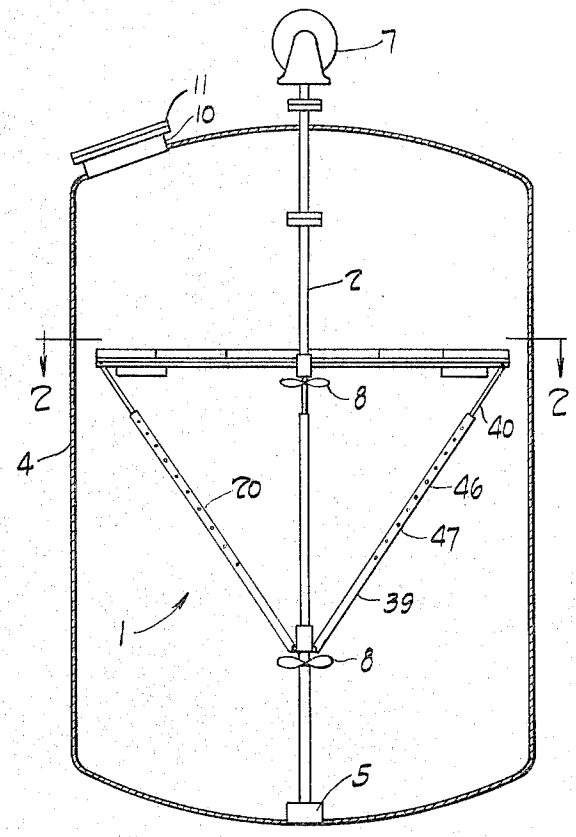


Fig. 1

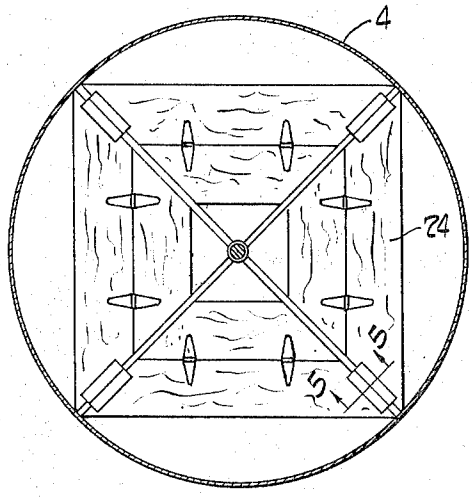


Fig. 2

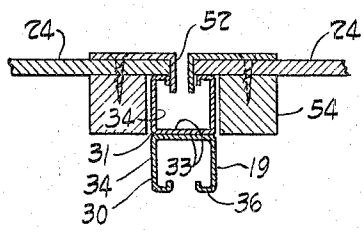


Fig. 5

INVENTORS
CHARLES EUGENE EVANS
WILLIAM ANTHONY KAPELLA
WILLIAM HAROLD HAWLEY JR.
Louis J. Weisz
ATTORNEY

Dec. 6, 1966 C. E. EVANS ETAL 3,289,788

FOLDING SCAFFOLD WITH CENTRAL SUPPORT

Filed Dec. 31, 1964 2 Sheets-Sheet 2

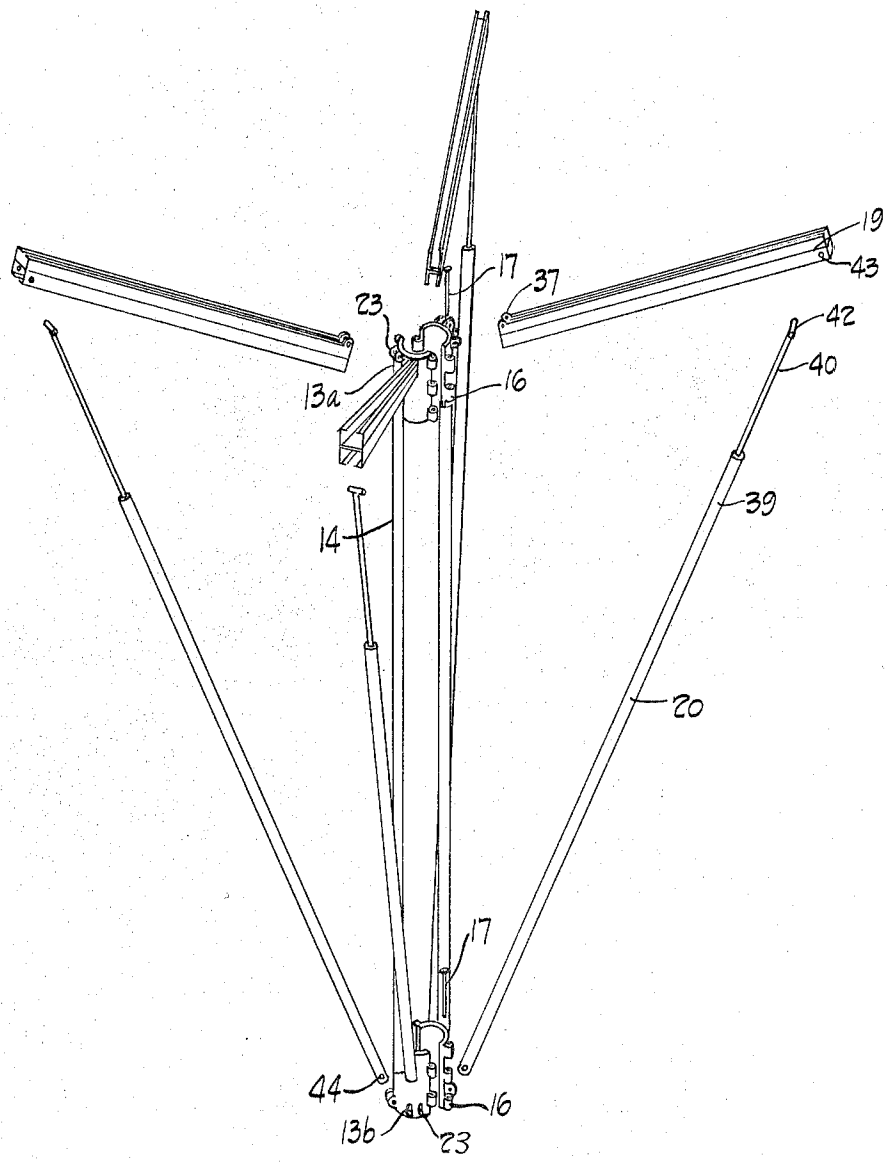


Fig. 3

INVENTORS
CHARLES EUGENE EVANS
WILLIAM ANTHONY KAPELLA
WILLIAM HAROLD HAWLEY JR.

Louis J. Weisz
ATTORNEY

United States Patent Office 3,289,788 Patented Dec. 6, 1966

3,289,788

FOLDING SCAFFOLD WITH CENTRAL SUPPORT

Charles Eugene Evans, Charleston, William Anthony Kapella, Dunbar, and William Harold Hawley, Jr., St. Albans, W. Va., assignors to Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio, a corporation of Ohio

Filed Dec. 31, 1964, Ser. No. 422,742
17 Claims. (Cl. 182—128)

This invention relates to scaffolding and more particularly to centrally supported folding scaffolding particularly useful inside agitated vessels.

Cleaning and repair of closed vessels or reaction tanks having agitators for stirring the contents therein has long presented a difficult problem, especially when, as is commonly the case, such tanks are top opening and access to the interior is only gained through a relatively small manhole or trap door. It has been customary to use ladders or to erect and disassemble temporary or makeshift scaffolding within the vessel or tank. Such procedures have proven inefficient, costly and time consuming and, even more important, unsafe because of the temporary nature of the structures used, the insecure footings for the ladders and scaffolding caused by the generally rounded bottoms frequently found in such tanks, and the location and nature of the agitator which further interfered with erection and use of ordinary makeshift scaffolding and ladders.

Accordingly, the general object of this invention is the provision of a new and improved centrally supported scaffolding.

Other objects of this invention are the provision of a new and improved temporary scaffolding supported on a central shaft, pole or the like and the provision of such a scaffolding which is easily and quickly erected and dismantled; which is sturdy, safe and economical in use; and, which is collapsible and foldable for easy handling and storage when dismantled.

Still other objects of this invention are the provision of a new and improved centrally supported scaffolding particularly adapted for use inside agitated vessels and the like, which is foldable, collapsible and reusable; which may be made in a wide range of sizes for vessels and agitators of widely varying size, diameter and impeller structure; which is quickly and easily erected and dismantled; which is rigid and safe when erected, easily disassembled, folded and collapsed for passage into or out of the vessel through even small manholes and trap doors; and, which has separable, quickly installed and removed platforms that are positively held against disengagement through lateral movement.

Still another object of this invention is the provision of a new and improved centrally supported scaffolding attaining one or more of the objects set forth above.

These and other objects and advantages of this invention will appear from the following description of a preferred form thereof, reference being had to the accompanying drawings in which:

FIGURE 1 is a schematic elevation of a centrally supported scaffolding embodying a preferred form of this invention shown in use in an agitated vessel, typical of the broad, general type of vessel for which scaffolding embodying this invention is particularly useful;

FIGURE 2 is a top view of the scaffolding of FIGURE 1, viewed along the line 2—2 of FIGURE 1;

FIGURE 3 is an exploded view, on an enlarged scale, with the platforms removed, of a slightly different preferred form of the scaffolding shown in FIGURE 1;

FIGURE 4 is a top view, on an enlarged scale, of a platform shown in FIGURE 1; and

FIGURE 5 is a broken section, viewed along the lines 5—5 of FIGURE 2, showing the platform interlock of the preferred form of this invention.

Briefly, a scaffold embodying a preferred form of this invention is adapted to be detachably mounted on and supported by a central shaft or pole and to provide a platform, at a predetermined height, for the safe and sturdy support of one or more workmen or other persons. The scaffold is quickly and easily mounted on and detached from the supporting shaft and is collapsible and foldable so that it is easily handled and readily passed into and out of relatively small manholes, trap doors and the like to the end that it may be used in reaction tanks and other vessels having small access means. In addition, the scaffold is constructed so that it is safely supported at spaced apart points on the pole or shaft, and is, therefore, useful on poles and shafts which have agitators, impeller blades or other structures protruding therefrom.

More particularly, a scaffold embodying a preferred form of this invention is indicated generally at 1 in FIGURE 1 and is shown mounted on the agitator shaft 2 of the vessel or tank 4.

Shaft 2 is supported by a foot bearing 5 and is rotated by an external motor 7 in a conventional manner. A plurality of vertically spaced, impeller or agitator blades 8 are fixedly mounted on shaft 2 to rotate therewith.

Access to the interior of vessel 4 is attained by means of a top opening manhole or trapdoor 10 which is otherwise closed, in a conventional way, by a cover 11.

Manhole 10 is of sufficient size to permit passage of a man into and out of the vessel.

Vessel 4, as described above, is old and well known in the art and, per se, is not a part of the instant invention.

As pointed out above, difficulty, inefficient waste of time and money, and undue hazard have attended the task of cleaning vessels and tanks, as typified by vessel 4, because of the problems and hazards incident to the erection, use and dismantling of makeshift scaffolding and ladders within the vessel. Yet the vessels are of such height that they cannot be cleaned, except the workmen be supported above the bottom of the vessel. And, of course, the bottom itself is, as shown, frequently curved and rounded and does not, therefore, offer a firm, safe or convenient footing for a support structure or scaffold within the vessel.

In contrast, the scaffolding 1, embodying this invention, is supported within the vessel 4 in a rigid and sturdy manner independent of the shape and curvature of the vessel and the bottom thereof and without resting or bearing on the vessel, per se.

To this end scaffold 1 is detachably mounted on and supported by a central pole, such as agitator shaft 2, by collar means which preferably comprise upper and lower vertically spaced collars 13*a* and 13*b*, respectively, (FIG. 3) and which neither interferes with nor is interfered with by the agitator blades 8 or other vertically spaced projections mounted on or carried by the support shaft. Collars 13*a* and 13*b*, as will hereinafter more fully appear, also provide for a strong and rigid support of the scaffold platform without waste of material or unnecessary increase in weight and decrease in maneuverability and handling ease, which would result from a single long collar, albeit, where the central pole has no agitator blades or other projections thereon, a single long collar may be used and attainment of other objects and advantages of this invention still realized. And, alternatively, collars 13*a* and 13*b* may be joined together by suitable means, such as angle irons 14, see FIGURE 3, so as to maintain the scaffold as a unitary whole and increase the strength and rigidity.

In order to provide for quick and easy mounting and removal of the collars 13*a* and 13*b* on the supporting

shaft, the collars are preferably split, as best seen in FIGURE 3, and the respective collar halves are provided with apertures which are aligned, when the collar halves are assembled, and receive a pin or pintle for holding the assembled collar together and about the support shaft, when the scaffolding is erected and in use.

To this end the split halves of collars 13*a* and 13*b* are preferably provided with a plurality of coacting gudgeons 16, at their respective edges, of the type common to ordinary hinges. Gudgeons 16 are juxtaposed and interlocked, when the collars 13*a* and 13*b* are assembled, to receive pin 17 to hold the collars assembled. Also, if desired, the gudgeons 16 at the edges of each collar half are complementarily disposed so that at one side they are as shown in collar 13*a*, at the front in FIGURE 3, and at the other side they are the reverse, as shown in collar 13*b*, at the front in FIGURE 3. In such instance, each collar half has two gudgeons at one meeting line and three at the other and two exactly similar halves can be used to form a completed collar 13*a* or 13*b*.

In order to provide a strong and rigid support for a horizontal platform upon which workmen and others can stand when using the scaffold a plurality of horizontal struts or arms 19 are mounted on the upper collar 13*a* and extend radially outwardly therefrom and an equal number of generally vertical struts 20 are supported in vertically spaced relation with the struts 19, on lower collar 13*b* and are connected, respectively, with the outer ends of struts 19. Struts 19 are held in a horizontal position by bearing upon upper collar 13*a* and by vertical struts 20 which also function to transmit at least a portion of the load on struts 19 to the lower collar 13*b* and thence to the supporting shaft.

In order to make scaffold 1 collapsible and foldable and in order to provide for selective placement and vertical spacing of the collars relative to each other so that the same may be used with shafts having agitators and blades at differing locations, when angle irons 14 are omitted from the scaffold, struts 19 and 20 are pivoted together and to the collars 13*a* and 13*b*, respectively, and in addition struts 20 are preferably of adjustable length or extensible.

To this end collars 13*a* and 13*b* are provided with a plurality of equiangularly spaced ears or lugs or pairs of ears and lugs 23, and the struts 19 and 20 are, respectively, pivotally secured thereto by suitable means such as pins or bolts, not shown. Also, if similar lugs 23 are used, for example, on both the upper and lower collars 13*a* and 13*b*, and are symmetrically spaced relative to the meeting lines or edges of the collar halves and are vertically aligned, the collar halves will also be similar in this respect and mutually interchangeable so that, in effect, a single collar half can be used as any of the four collar halves shown.

Struts 19 support platforms 24 which provide the surface upon which the user of the scaffold stands. Platforms 24 must be firmly supported on the struts 19 and to this end include means preventing lateral movement which would permit the platform to slip off the strut and fall. In addition, it is desired that the platforms in a single scaffolding be of similar construction and symmetrical so as to be interchangeable and that the platforms be quickly and easily placed in position and detached from the supporting structure and fold or collapse so as to pass easily into and out of the tank or vessel 4.

To these ends, each horizontal arm or strut 19 preferably comprises a pair of back to back channel members 30 and 31, see FIGURE 5, which are secured together and are conveniently of substantially similar structure. Channel members 30 and 31 may be formed of any convenient metal or other suitable material, and in any convenient manner, either from sheet material or by extrusion, and conveniently comprise a base 33, sides 34 and reentrant flanges 36 extending inwardly from the respective sides 34 and defining a channel opening, which, in the case of the upper channel 31, receives and holds the edges of adjacent platforms 24, as will hereinafter more fully appear.

The inner ends of channels 30 and 31 bear upon the upper collar 13*b* and so prevent the struts 19 from folding downwardly, as well as transmitting force and load to the upper collar.

Further, in order to facilitate pivoting struts 19 on lugs 23, channel 31 is provided with upstanding ears 37, see FIGURE 3.

Vertical struts 20 preferably comprise an outer tubular member 39 and an inner rod 40 slidably disposed within tube 39 and extensible relative thereto so that the scaffold may be folded when the collars are joined, as in FIGURE 3, or the collars may be spaced at different preselected distances apart when as in FIGURE 1.

In order to pivotally connect each vertical strut 20 with the corresponding horizontal strut 19, a transverse tube 42 is conveniently secured to the upper end of rod 40 and held within channel 30 by a pin or bolt, not shown, which is disposed in apertures 43 formed in channel 30 and tube 42.

Members 39 are pivoted on the respective lugs 23 on collar 13*b* by a pin or bolt, not shown, extending through the lugs and through apertures 44 formed in the members 39, respectively.

In addition, in the form of the invention shown in FIGURE 1, struts 20 are adjusted, when necessary, and force transmitted from the rod 40 to the tube 39 by any desired suitable means such as, a drift pin 46, which may be disposed in a preselected one of a plurality of apertures 47 along the length of tube 39 and against which rod 40 bears when the scaffold is erected and in use.

Platforms 24 are made of wood or other convenient material and preferably comprise two sections 24*a* and 24*b*, FIGURE 4, hinged together by hinges 50. Platforms 24 are preferably of truncated triangular shape and they are of such length that their respective edges lie on the adjacent flanges 36 of the channels 31 of adjacent struts 19.

Further, to prevent lateral movement or accidental disengagement of the platform 24 from the strut 19, as noted above, a flange 52, see FIGURES 4 and 5, is secured along each edge of platform 24. Each flange 52 seats within the channel opening defined by flanges 36 on a channel member 31. Each platform 24 is further held against lateral movement by cleats 54, or the like, fastened to the underside of platform 24, see FIGURE 5, and spaced from each flange 52 a sufficient distance to provide a seat for the adjacent flange 36. Thus platforms 24 are securely held against lateral displacement, yet may be quickly and easily placed upon or removed from struts 19 during erection or dismantling of the scaffold and the structural members of the scaffold are themselves easily erected and dismantled by insertion or removal, as the case may be, of pins 17. The scaffold disassembles and folds compactly for ease in passing it into and out of the vessel through the manhole 10 and obviously the length of struts 19 and dimensions of the platform 24 depend on the diameter of the vessel or vessels within which the scaffolding is to be used.

Modifications, changes and improvements in the preferred embodiments of the invention herein depicted and described will occur to those skilled in the art who come to understand the principles and precepts thereof. Accordingly, the patent to be issued herein should not be limited by the specific disclosures made herein, but only by the advance by which the invention has promoted the art.

It is intended that the patent shall cover, by summarization in appended claims, all features of patentable novelty residing in the invention.

We claim:

1. A folding collapsible scaffolding for mounting on a central pole or shaft comprising split collar means, means for detachably fastening said split collar means together and about said central pole or shaft, a plurality of horizontal struts extending radially from said collar means, each said horizontal strut being pivotally mounted on said collar means and comprising back to back channel members, each said channel member having a base, parallel sides extending from said base, and reentrant flanges extending inwardly from each said side and defining a channel opening, a plurality of vertical struts, equal in number to the number of horizontal struts, pivotally connected to the outer ends of said horizontal struts, respectively, and pivotally connected to said collar means in vertically spaced relation with said pivotal connections of said horizontal struts with said collar means, and a plurality of platform members, equal in number to the number of said horizontal struts, each said platform member having lateral edges and extending between a pair of adjacent horizontal struts with said lateral edges bearing upon the respective adjacent reentrant flanges thereof, a flange on each edge of each said platform member and disposed in the adjacent said channel opening of the adjacent said horizontal strut, and cleats mounted on the under side of each said platform member and disposed interiorly of the adjacent edge of said platform member and the adjacent said horizontal strut.

2. The scaffolding according to claim 1 in which said vertical struts comprise an inner rod member and an outer tubular member in telescopic relation therewith and said vertical strut members are movable and extensible relative to each other.

3. The scaffolding according to claim 1 in which said collar means comprises upper and lower, vertically spaced collars, each said collar comprises two halves, rigid connector means interconnect each half of a said collar with the corresponding half of the other said collar, said horizontal struts are pivotally connected to said upper collar, and said vertical struts are pivotally connected to said lower collar.

4. The scaffolding according to claim 1 in which said collar means comprises upper and lower, vertically spaced collars, said horizontal struts are pivotally connected to said upper collar, and said vertical struts are pivotally connected to said lower collar.

5. The scaffolding according to claim 4 in which each said collar comprises two halves, said collar halves have edges forming meeting lines, gudgeons at each edge of each said collar half, said gudgeons interlocking with the gudgeons of the opposite collar half to receive a pin for connecting said collar halves together, said gudgeons on a collar half being complementary to each other, whereby said collar halves are similar and interchangeable with respect to said gudgeons.

6. The scaffolding according to claim 5 in which said struts are pivotally connected to said collars on lug means, and said lug means are equiangularly spaced about said collars and symmetrically spaced relative to said edges of each said collar half, whereby said collar halves are similar and interchangeable.

7. The scaffolding according to claim 1 in which said struts are equiangularly spaced about said collar means.

8. The scaffolding according to claim 1 in which each of said platform members comprise a plurality of sections hinged together on lines extending transversely of said edges.

9. A folding collapsible scaffolding for mounting on a central pole or shaft comprising collar means, means for detachably fastening said collar means about said central pole or shaft, a plurality of horizontal strut means extending radially from and pivotally connected to said collar means, a plurality of vertical strut means, equal in number to the number of horizontal strut means, pivotally connected to the outer ends of said horizontal strut means, respectively, and pivotally connected to said collar means in vertically spaced relation with said connections of said horizontal strut means with said collar means, and platform means extending between and supported on adjacent horizontal strut means, respectively.

10. The scaffolding according to claim 9 in combination with a vessel having an agitator shaft in which said agitator shaft comprises said central shaft or pole.

11. The scaffolding according to claim 9 in which said vertical strut means comprise inner and outer telescopically related members one of which is connected to a horizontal strut means and the other of which is connected to said collar means.

12. The folding collapsible scaffolding according to claim 9 in which said platform means comprises a plurality of platforms, equal in number to the number of horizontal strut means, and each said platform extends between a pair of adjacent horizontal strut means and has lateral edges supported on said adjacent horizontal strut means, respectively.

13. The scaffolding according to claim 12 in which each said platform comprises a plurality of sections hinged together on lines extending transversely of said edges.

14. The scaffolding according to claim 12 with means preventing lateral displacement of said platforms relative to said strut means respectively.

15. The scaffolding according to claim 14 in which said last named means comprises upwardly opening channel means in each said horizontal strut means and flange means at each end of each said platform and disposed in the adjacent said channel means.

16. The scaffolding according to claim 9 in which said collar means comprises upper and lower, vertically spaced collars, said horizontal strut means are pivotally connected to said upper collar, and said vertical strut means are pivotally connected to said lower collar.

17. The scaffolding according to claim 16 in which each said collar comprises two halves, and rigid connector means interconnect each half of a said collar with the corresponding half of the other said collar.

References Cited by the Examiner

UNITED STATES PATENTS

1,071,177	8/1913	Reichert	182—128 X
1,197,999	9/1916	Beckett	182—187
1,231,823	7/1917	Weasler	182—187 X
1,251,066	12/1917	McClanahan	182—128 X

FOREIGN PATENTS

594,501	6/1959	Italy.

REINALDO P. MACHADO, *Primary Examiner.*