

Oct. 1, 1940.

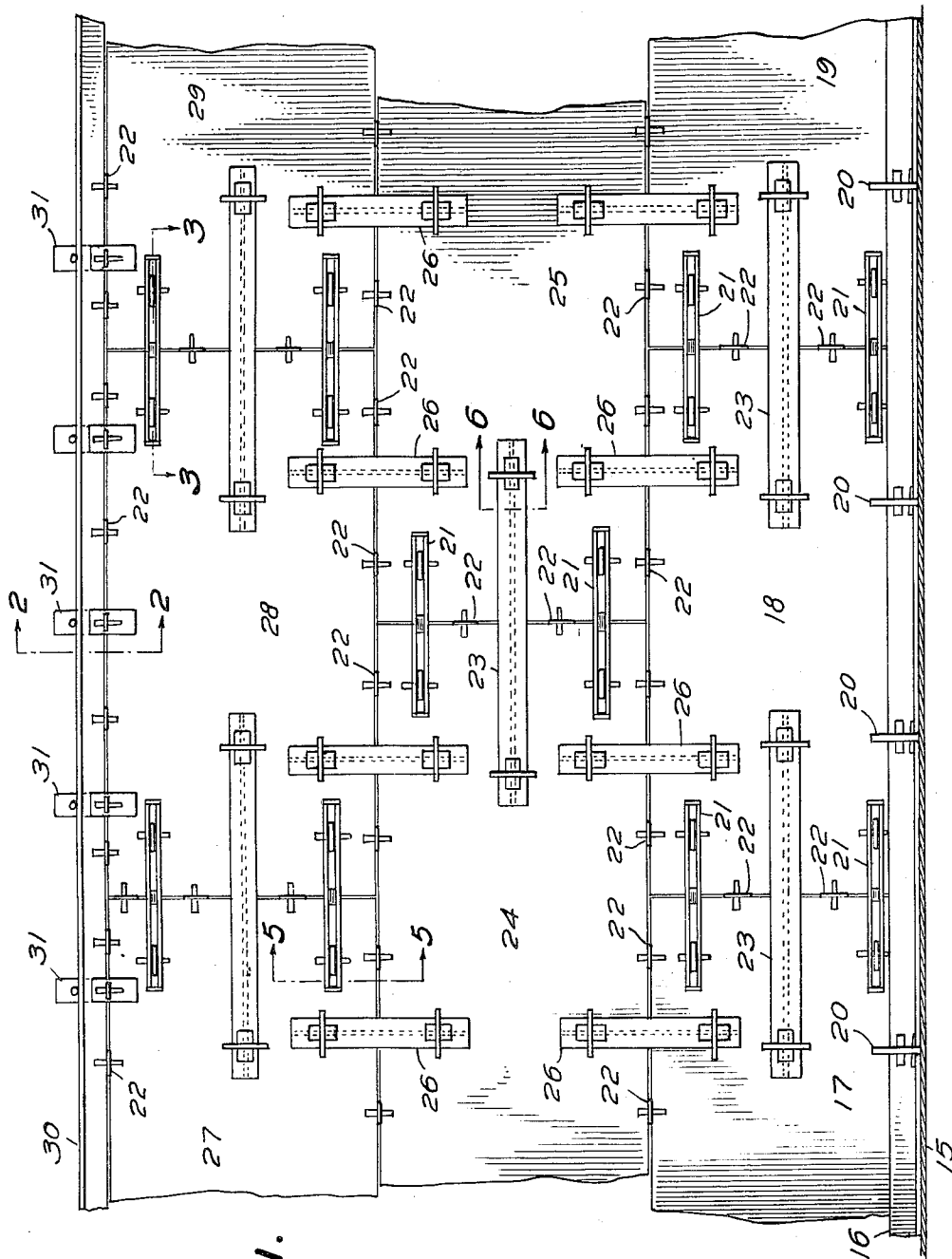
W. S. COLE

2,216,702

METALLIC BUILDING CONSTRUCTION

Filed July 19, 1939

3 Sheets-Sheet 1



INVENTOR,

WILLIAM S. COLE

BY

Arthur Middleton

ATTORNEY.

Oct. 1, 1940.

W. S. COLE

2,216,702

METALLIC BUILDING CONSTRUCTION

Filed July 19, 1939

3 Sheets-Sheet 2

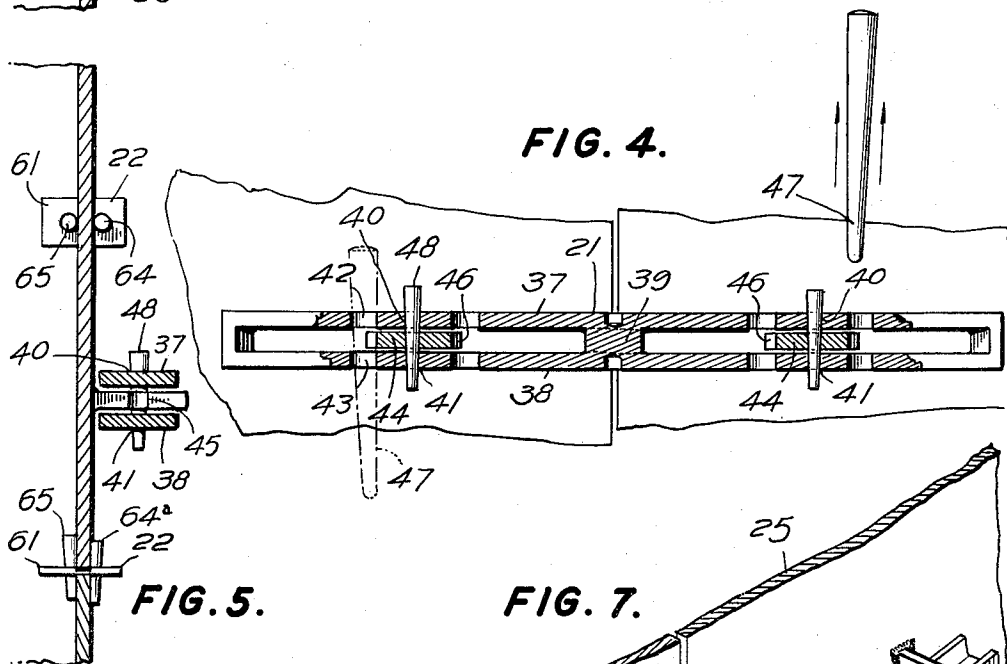
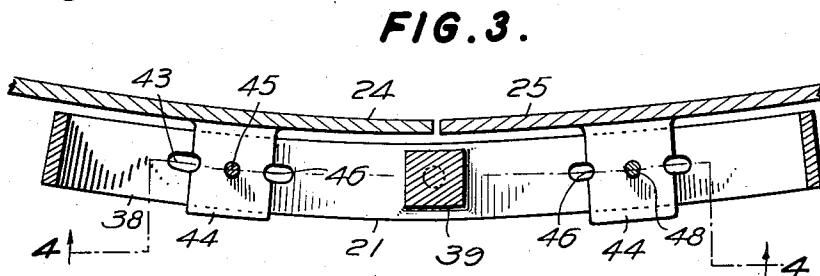
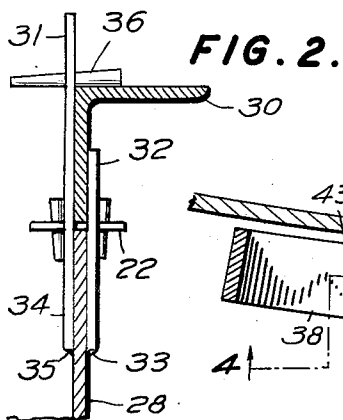


FIG. 6.

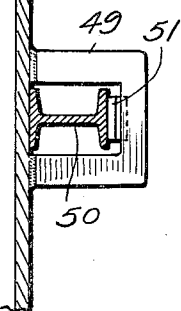
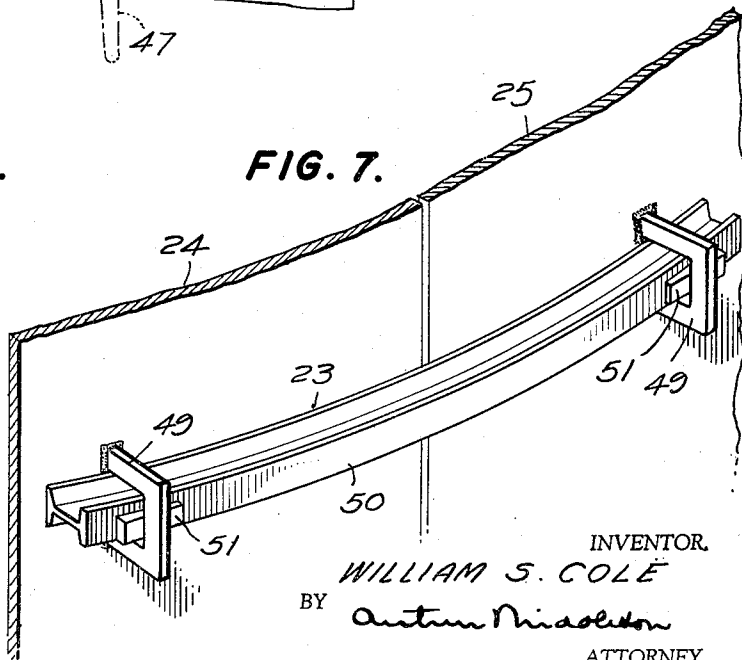


FIG. 7.



INVENTOR.
WILLIAM S. COLE
BY *Arthur M. Mason*
ATTORNEY.

Oct. 1, 1940.

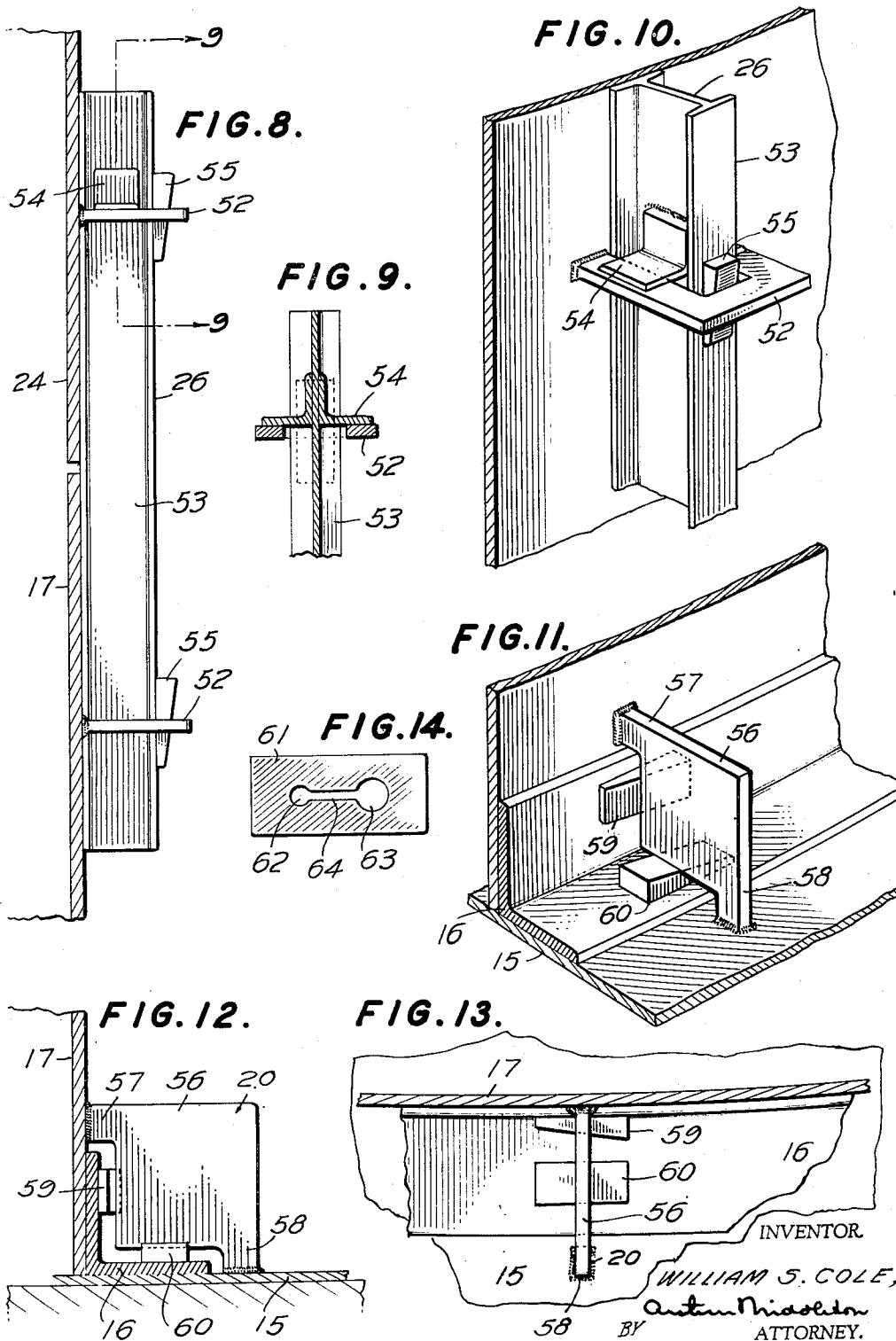
W. S. COLE

2,216,702

METALLIC BUILDING CONSTRUCTION

Filed July 19, 1939

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,216,702

METALLIC BUILDING CONSTRUCTION

William S. Cole, Carteret, N. J., assignor to Hammond Iron Works, Warren, Pa., a corporation of Pennsylvania

Application July 19, 1939, Serial No. 285,246

1 Claim. (Cl. 113—99)

This invention relates to metallic building construction. More specifically it relates to the fabrication and erection of large metallic structures, particularly tank shells, which are formed of a plurality of metal plate sections.

The invention has reference to the erection of large metallic tanks, such as oil storage tanks, which are formed of individual plate sections butt-welded to one another along their adjoining peripheral edges. Of prime importance, the invention aims to provide means for accurately and correctly positioning plate sections, with respect to one another and to other parts of a tank shell, preparatory to their being incorporated into the structure by welding.

Another object is to provide means for firmly and securely holding a plate or other element in a desired position with respect to adjoining elements while the welding operation is being performed.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and set forth in the claim hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claim, may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings:

Fig. 1 is a detailed assembly view of a portion of a tank shell having the plates and other elements secured in correct position preparatory to welding, the various positioning and clamping members embodying the features of the invention being shown in their preferred adaptations;

Fig. 2 is a sectional detail taken on the line 2—2 of Fig. 1 and shows the manner of joining a roof angle to the top edge of the uppermost ring of the tank shell;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1 and shows the application of a plate spacing adjuster of the invention;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3;

Fig. 5 is a sectional detail taken on the line 5—5 of Fig. 1 and shows in transverse section the plate spacing adjuster of Figs. 3 and 4 and also shows two of the plate spacing shims of the invention in elevation;

Fig. 6 is a sectional detail taken on the line 6—6 of Fig. 1 and shows a section through one of the shell rounding jigs of the invention;

Fig. 7 is a perspective view of the shell rounding jig of Fig. 6;

Fig. 8 is a side elevation of a plate stiffener of the invention, a part of the tank shell being seen in section;

Fig. 9 is a sectional detail on the line 9—9 of Fig. 8;

Fig. 10 is a perspective view of the upper portion of the plate stiffener;

Fig. 11 is a fragmentary perspective view showing means embodying features of the invention for joining the lowermost edge of the tank shell to a bottom angle and to the bottom of the tank;

Fig. 12 is a side elevation of the bottom joining means of Fig. 11; and,

Fig. 13 is a top plan view of the bottom joining means.

Fig. 14 is a plan view of one of the plate spacing shims of the invention.

Generally speaking, the invention embraces the use of various clamping and holding devices for adjusting, positioning, and securely holding in place plate metal sheets to be incorporated in a tank shell, in such manner that the said plates are held in a desired predetermined relationship with respect to other plates in the structure and to other elements of the shell. In constructing a tank shell, through the use of the clamping and adjusting devices of the present invention, the tank bottom may be fabricated upon the ground or other suitable foundation as is customary. Thereafter suitable bottom angles may be secured to the peripheral edge of the bottom and the lowermost ring of the plate sections joined thereto in a manner to be presently described. The plates of the succeeding rings may then be elevated into position in any suitable manner but it is preferable that they be moved into correct horizontal and vertical alignment through the employment of plate carrying and positioning devices such as shown and described in my co-pending application Serial No. 270,436.

Referring to Fig. 1 of the drawings, there will be seen an assembly of a portion of a tank shell having the plates and other elements thereof secured in correct position and adjustment by the devices of the present invention and ready for the various elements of the shell to be welded to the adjoining elements so as to provide a strong, rigid and relatively unitary structure. The numeral 15 indicates the tank bottom preferably constructed of a plurality of plate sections welded together and resting upon the ground or upon a suitable prepared foundation such as is well-known in the art. In the illus-

trated embodiment it is understood that the bottom 15 is circular in plan and a bottom angle in the form of an angle iron 16 is laid upon the bottom adjacent its periphery and extends completely around the same. The bottom angle 16 may be welded or otherwise secured to the bottom 15. In order to hold the bottom angle 16 firmly in the desired position while the same is being joined to the bottom, and in order to hold the lowermost ring of the shell, composed of the plate sections 17, 18 and 19, firmly in place against the angle 16 preparatory to being secured thereto, use is made of the bottom angle clamps 20 embodying features of the present invention.

In order to draw the adjoining vertical edges of the plates 17, 18 and 19 together and assure of their being spaced correctly for the performance of the desired welding, the plate spacing adjusters 21 of the present invention are used and in conjunction therewith plate spacing shims 22 are employed between the adjoining plate edges so that the said edges may be drawn tightly against the shims 22 and thus spaced correctly with no chance of error. In order to provide the correct bow to the plate sections 17, 18 and 19 so that the tank shell will have the desired circular contour, the shell rounding jigs 23 of the present invention are secured in place as shown.

After the said lowermost ring is set up as just indicated, the plates of the next higher ring are then raised into a position above the upper edge of the lowermost ring and are preferably moved into a desired longitudinal alignment by means of the plate carriers described in my said co-pending application. The plates of this ring should preferably be arranged so that joints between the same bisect the plates of the lower ring and also of the next higher ring. In other words, the various plates forming the tank shell are generally arranged in the well-known staggered relationship. The plates 24 and 25 of the second ring having been raised above the lowermost ring, additional plate spacing shims are inserted between adjoining edges of the respective plates 17, 18, 19 and 24 and 25, after which the plates 24 and 25 are lowered until they rest upon the shims 22 and are therefore spaced the desired distance from the edges of the lowermost plates. The adjoining vertical edges of the plates 24 and 25 are now drawn together as previously described by means of plate spacing adjusters 21, spacing shims 22 being inserted between the edges for the purpose previously mentioned.

Thereafter vertical shell stiffeners 26 may be secured in place to hold the plates 24 and 25 vertically and firmly in precise alignment with the plates 17, 18 and 19. The ring including the plates 24 and 25 is also given the correct curved contour by means of the shell rounding jigs 23.

The plates of each of the succeeding rings of the shell are incorporated into the structure in the same manner as previously described, so further detailed discussion of the additional rings would be merely repetitive. The plates 27, 28 and 29, in the illustrated embodiment, represent plates of the topmost ring of the shell, it being understood, of course, that there may be any desired number of rings, three being illustrated herein for the purpose of convenience.

To the uppermost edges of the plates 27, 28 and 29 is secured a top angle 30 in the form of an angle iron which is circular in plan and extends completely around the upper edge of the shell, its purpose being the support of a suitable

roof or cover for the tank. This top angle is maintained correctly spaced from the upper edge of the plates 27, 28 and 29 by the use of the spacing shims 22 and is held firmly in position preparatory to welding to the topmost ring by means of the top angle holders 31.

When the various elements of the tank shell have been clamped in their ultimate positions as just described, welding of the various adjoining edges may then proceed until all joints have been securely joined together. Thereafter the various clamping, spacing and adjusting devices of the invention may be removed, leaving a fabricated tank shell which is a strong, rigid and substantially unitary structure.

In order to illustrate clearly the arrangement and operation of the various clamping and adjusting devices of the invention, each of these devices has been shown in detail in Figs. 2 to 14 of the drawings, and detailed descriptions of these various devices will now follow:

Fig. 2 shows the top angle holder for use in joining the uppermost ring to the top angle 30. The top angle holder comprises a flat plate 32 which is placed flush against the inner face of the plate 28 so that it extends somewhat above the upper edge of the said plate. Thereafter, the plate 32 is welded at its lower edge to the plate 28 as indicated at 33. At the opposite face of the plate 28 there is positioned a plate 34, welded to the plate 28 at 35 and extending a substantial distance above the upper face of the angle iron 30 as clearly seen in the figure. At an appropriate point, which is slightly above the upper face of the angle iron the plate 34 is provided with a perforation adapted to receive a wedge 36. It will be understood that spacing shims 22 are inserted between the top angle and the upper edge of the plate 28 and, with the top angle holding device in position as just described, driving of the wedge 36 through the opening in the plate 34 will force the top angle downwardly until it bears against the shim 22. Thereafter the angle 30 will be held securely and firmly in position spaced the correct distance from the edge of plate 28.

Figs. 3, 4 and 5 show the application of the plate spacing adjusters 21. These adjusters comprise a pair of spaced bars 37 and 38 which are joined together at their ends and also preferably joined and strengthened at a central point as indicated at 39. The bars 37 and 38 are provided with aligned openings 40 and 41 which are flanked by pairs of elliptically-shaped openings 42 and 43. To adjoining plates, for instance, 24 and 25, there are welded lugs 44 which have a central perforation 45 and which have concave niches or grooves 46 in their opposite edges. After the lugs 44 are welded to the respective plates the spacing adjuster 21 is placed over the lugs so that the sides of the adjuster 37 and 38 straddle the lugs. Thereafter wedges 47, which are elliptical in cross-section, are inserted through respective openings 42 and 43 in the spacing adjuster 21. It is understood that wedges 47 may be inserted through all of the pairs of elliptical openings, although it will generally be sufficient to use only one adjacent each lug 44. It will be apparent that, with a wedge 47 inserted through the openings adjacent one of the lugs 44 as seen in Fig. 4, the driving of another wedge 47 through openings adjacent the other lug 44, as indicated in Fig. 4, will draw the lugs 44 and their attached plates 24 and 25 toward one another or force the same further

apart, depending upon the manner in which the wedges 47 are used. Thus the aligned edges of plates 24 and 25 may be readily adjusted to a desired relationship and can be correctly positioned by being secured against the plate spacing shims 22 as will be readily understood. The lugs 44 and the respective openings 40 and 41 in the plate adjuster 21 may be so arranged that the edges of the plates 24 and 25 will be correctly spaced when these said openings register one another. This condition may be readily brought about by manipulation of the wedges 47 whereupon the tapered pins 48 may be driven through the openings 40, 45 and 41 and the wedges 47 withdrawn, thus the plates will be held in the desired specific relation.

In Figs. 6 and 7 will be seen one of the shell rounding jigs of the invention. In the employment of this device there is welded to adjacent plates 24 and 25 a yoke 49. A metallic shape, here indicated as an I-beam 50, which has been previously rolled to the desired curvature, is inserted through yokes attached to the adjoining plates and the plates drawn up tightly against the beam 50 by the employment of wedges 51 in a manner which will be readily apparent. Thus, the plates 24 and 25 are bowed and forced to assume a uniform curvature. It is understood, of course, that the shell rounding jigs 23 may be employed on either the outside or the inside of the shell.

Figs. 8, 9 and 10 show details of the plate stiffeners 26. In utilizing these devices yokes 52 are welded in alignment on vertically adjacent plates, for instance 17 and 24. A metallic shape, preferably an I-beam 53, is inserted downwardly through the aligned yokes 52. Adjacent the upper end of the beam 53, at either side of the web thereof, there is welded or otherwise secured a lug 54 which may conveniently take the form of an angle section as clearly seen in the figures. These outstanding lugs or ears 54 will, of course, engage with and rest upon the legs of the uppermost yoke 52 and thus hold the beam 53 against vertical displacement downwardly. Appropriate wedges 55 are driven into a space allowed between the outer flange of the beam 53 and the head of the yoke 52, thus securely and tightly drawing the beam 53 against the plates 17 and 24. The device will thus hold the upper plate in a vertical manner and in alignment with lower plate 17 and will also serve to stiffen the entire construction.

Figs. 11, 12 and 13 show the bottom angle clamp for securing the bottom angle and the lowermost ring in position against the bottom of the tank.

In utilizing this device, after the bottom 15 is fabricated, the bottom angle 16 is placed in position around the periphery of the bottom and plates, illustrated by the plate 17, are erected against the angle iron. A clamping device 20 is then welded to the bottom 15 and to the plate 17. This clamping device 20 takes the form of a substantially square plate 56 having relatively short legs 57 and 58 extending at right angles to one another. The leg 57 is welded to the plate 17 and the leg 58 to the bottom 15 as clearly seen. Thereafter appropriate wedges 59 and 60 are driven between the inner face of the upstanding leg of the angle 16 and the adjacent

edge of the clamping device 56, while other wedges are driven between the upper face of the horizontal leg of the angle and the adjacent edge of the clamping device. Thus, the plates of the lower ring, the peripheral angle 16 and the bottom 15, are all securely and firmly clamped together so that permanent joining of the angle to the bottom and to the plates of the lowermost ring may be proceeded with and completed with the utmost efficiency.

The plate spacing shims utilizable between adjoining edges of all of the plates, are illustrated in Fig. 14. These shims consist of a flat plate member 61 which has a central opening which might conveniently be described as key-hole shaped. In other words, this opening really consists of a relatively small perforation 62 and a somewhat larger perforation 63, the two being joined by a slot 64. The openings 62 and 63 might be separate but it is more convenient to merely punch the key-shaped opening through the plate 61. In utilizing these shims they are placed between adjoining plate edges so that the opening 62 appears at one face of the plates and the opening 63 at the other. A tapered pin 64a may then be driven into the small opening 62 and another tapered pin 65 may be inserted into the opening 63, as indicated in Fig. 5 of the drawings. Obviously, forcing of the pin 65 downwardly within the opening 63 will exert a wedging effect upon opposite faces of the adjoining plate sections and will securely hold the shim in position.

Thus it will be apparent that the plate clamping and adjusting devices of the present invention may be used at various localities in a tank shell being constructed and any of these devices may be utilized and others dispensed with according to desire or exigencies of the occasion. It is understood, of course, that after the various welds have been made and the tank structure has been permanently completed, the various wedges heretofore described may be driven out, the quickly detachable elements or clamping devices removed or withdrawn, whereupon the various yokes and lugs which were welded to the tank plates for the purpose of holding the clamping devices may be easily knocked away from the plates and disjoined therefrom by means of a suitable hammer or sledge.

What is claimed is:

A device for adjusting the horizontal spacing of plates being incorporated in a metallic tank construction comprising, lugs adapted to be welded to adjoining plates, said lugs having a central opening and a concave niche in an edge thereof, a plate spacing adjuster including a pair of spaced substantially parallel bars having aligned openings therethrough, some of said openings being elliptical in shape, said adjuster adapted to be placed over and straddle said lugs when the same are welded to adjoining plates, wedges which are substantially elliptical in cross-section and adapted to be inserted through said elliptical openings and to cooperate with the niches in said lugs to thereby force the same and the plates welded thereto toward or away from one another, and tapered pins adapted to be inserted through aligned openings in said adjuster and through the opening in said lugs.

WILLIAM S. COLE.