March 8, 1949. J. JONES 2,463,880

SUPPORTING MEANS FOR STORAGE TANKS

Filed Feb. 26, 1946 2 Sheets-Sheet 1

Fig. 1.

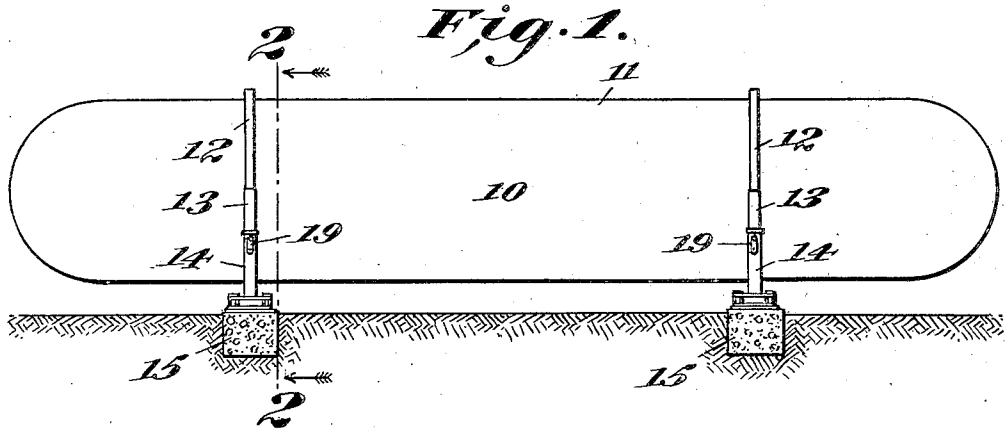


Fig. 2.

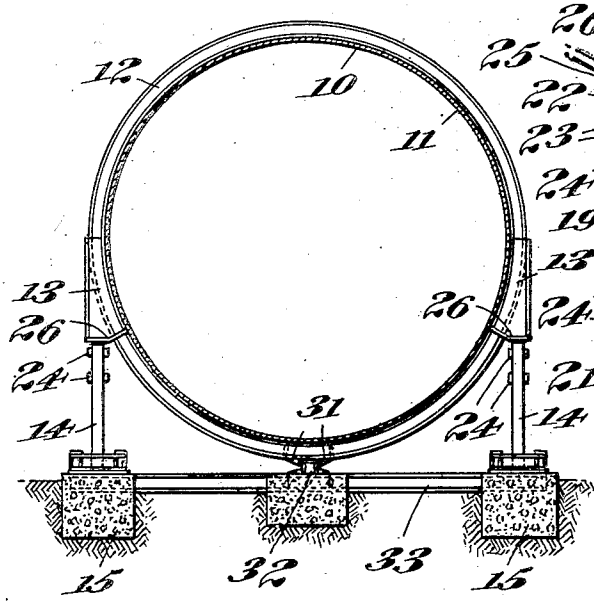
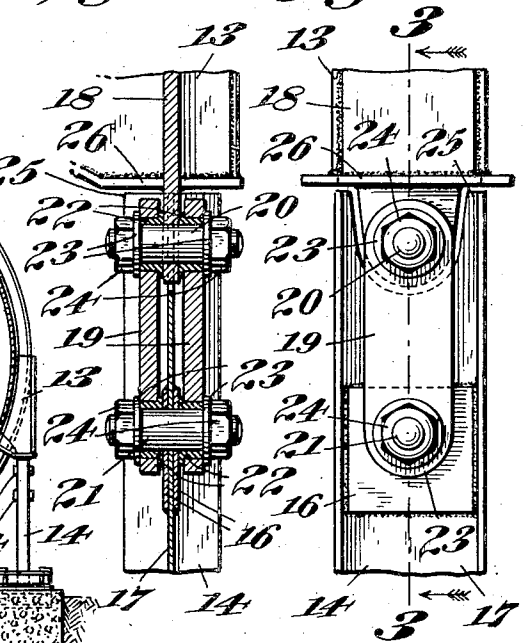


Fig. 3. Fig. 4.



Inventor

Jonathan Jones.

By R. S. C. Dougherty

Attorney

March 8, 1949. J. JONES 2,463,880

SUPPORTING MEANS FOR STORAGE TANKS

Filed Feb. 26, 1946 2 Sheets-Sheet 2

Fig. 5.

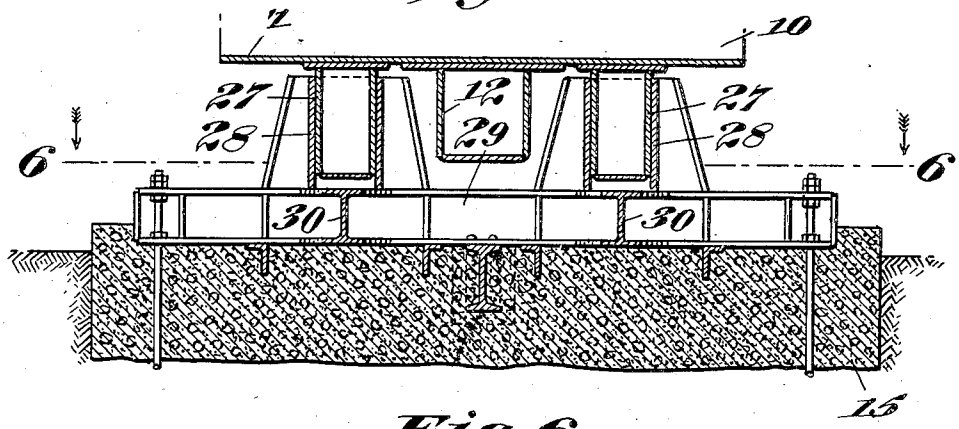


Fig. 6.

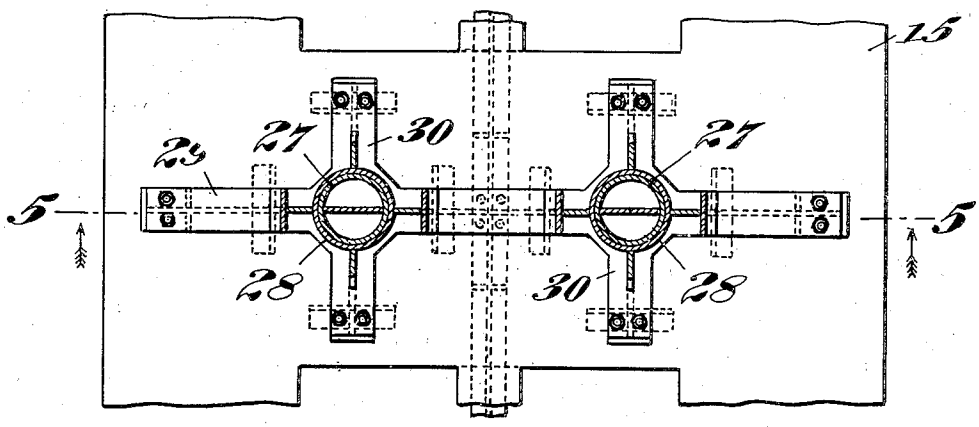


Fig. 7.

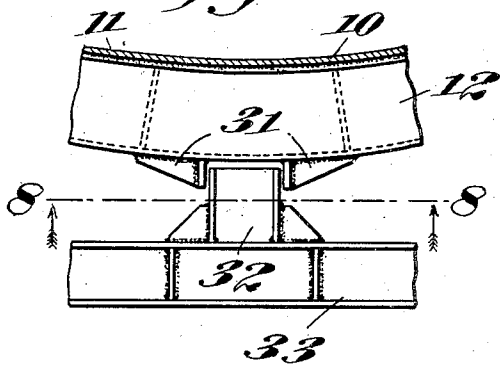
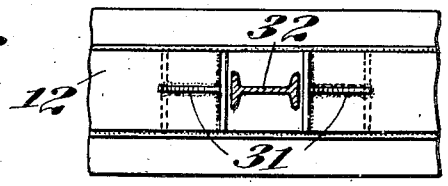


Fig. 8.



Inventor

Jonathan Jones.

By R. S. C. Dougherty.

Attorney

Patented Mar. 8, 1949

2,463,880

UNITED STATES PATENT OFFICE

2,463,880

SUPPORTING MEANS FOR STORAGE TANKS

Jonathan Jones, Bethlehem, Pa., assignor to Bethlehem Steel Company, a corporation of Pennsylvania

Application February 26, 1946, Serial No. 650,323

7 Claims. (Cl. 248—146)

1

The present invention relates to a novel supporting means for horizontal cylindrical storage tanks.

One object of the invention is to provide support for a pressure storage tank, having a relative length considerably greater than its diameter, by suspending said tank in at least two lateral planes.

Another object of the invention is to provide for the support of a cylindrical tank so that the weight is distributed over supports arranged in at least two lateral planes.

Another object of the invention is to provide at least two lateral planes of support for a horizontal cylindrical storage tank so arranged as to permit limited longitudinal expansion or contraction of the tank shell without applying bending moment to the supports or to the tank shell in the portion immediately adjacent the supports.

Still another object of the invention is to provide supports for a horizontal cylindrical tank which while permitting limited longitudinal expansion or contraction of the tank shell, due to climatic conditions or temperature changes, at the same time will provide a secondary means of support which will function should the primary means of support prove ineffective.

In the accompanying drawings:

Figure 1 is a side view of the tank showing the location of the supports.

Figure 2 is a cross sectional view on line 2—2 of Figure 1.

Figure 3 is a cross sectional view of the link and pin connection taken on line 3—3 of Figure 4.

Figure 4 shows the link and pin connection at the top of the supporting columns.

Figure 5 shows a somewhat enlarged longitudinal sectional view of the fixed anchorage of the tank.

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 5.

Figure 7 shows an enlarged transverse sectional view at the movable anchorage of the tank.

Figure 8 is a horizontal sectional view taken on line 8—8 of Figure 7.

Referring to the drawings more in detail 10 designates a horizontal cylindrical tank with a shell 11 and ring girders 12 with brackets 13 for transferring the tank load to the supporting columns 14. The columns are rigidly supported on foundations 15. These columns 14 are shown as H-sections but it will be apparent that I-beams, pipes, angle irons or other sections may be used. At the upper end of the columns, pin plates 16

2

are welded to the column web 17. The plate 18 which is welded to the bracket 13 so that it forms an integral part thereof transfers the tank load to the links 19 by means of the upper pin 20, and from the links the load is carried to the columns by means of the lower pin 21. Bronze bushings 22 and bronze washers 23 are provided on each pin, standard pin nuts 24 are also used.

Under normal conditions this system of pins and links carries the load of the tank and its contents and permits a limited longitudinal movement of the upper pin relative to the lower pin, for example, 1¼" or 1½" in either direction without serious consequences but it is obvious that an excessive longitudinal movement of the tank would throw the vertical line of compressive force from the upper pin so that it would pass outside of the lower pin thus causing the load to be dropped. Such a condition might occur as the result of a violent shock, as for example, an earthquake. To provide for such a contingency a secondary or emergency support is provided which consists of a seating arrangement at the top of the column. The column top 25 is a small distance below the base plate 26 of the bracket 13 so that there is a clear space of perhaps $\frac{1}{16}$" under normal conditions and a limited movement due to temperature changes will not bring the base plate 26 into seating position upon the column top 25 but when the hinge 19 moves through an abnormal arc the bracket base plate will be brought into seating position upon the top of the column and the tank load will be supported directly upon the column.

The anchor shown in Figs. 5 and 6 which holds the tank in position both laterally and longitudinally consists of two pieces of pipe 27 attached to the bottom of the tank shell by welding or other suitable means. These pipes 27 have a sliding fit into pipe sections 28 rigidly mounted upon foundation members 29 and 30 which in turn are embedded in or anchored to the concrete base 15. This arrangement is used at one end of the tank only which may be designated the fixed end.

In Figs. 7 and 8 the anchor for the expansion end, which permits longitudinal movement of the tank is shown. It consists of a pair of brackets 31 welded to the ring girder 12. A section of I-beam 32 is firmly attached to a foundation member 33 between the brackets 31 so that the tank is free to move longitudinally but is held from transverse movement by the brackets 31. While a practical method of anchoring the tank is shown, this feature does not constitute a part of the invention.

The secondary support at the top of the supporting columns is operative only should a severe shock, such as an earthquake, displace the anchoring means so that an abnormal longitudinal movement of the tank occurs. Such an emergency device is extremely desirable since tanks of this type are used in areas where structures are designed and built to withstand earth tremors.

While a hinged connection is shown between the columns and the tank at both ends, it will be apparent that the hinged feature of the column may be dispensed with at the end of the tank having the fixed anchor and a rigid connection between the brackets 13 and the columns 14 employed.

While I have shown but one form of my invention it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Supporting means for a tank, said means comprising at least two pairs of vertical legs resting upon and rigidly supported by a foundation, an anchor located midway between the columns comprising each pair of legs, a hinged connection between the columns and the tank shell to permit longitudinal movement of the tank, and means at the top of each column to provide a seat which will engage and support the tank should excessive longitudinal movement occur.

2. Supporting means for a tank, said means comprising two pairs of vertical legs resting upon and rigidly supported by a foundation, brackets for transferring the load from the tank shell to the columns comprising each pair of legs, at least one pair of columns having hinged connection to the brackets, and means at the top of hinged columns to support the tank should excessive movement of the hinge occur.

3. Supporting means for an elongated tank body, said means comprising at least two pairs of vertical columns rigidly supported on a foundation and having hinged connections to the tank, said hinged connections comprising links and pins to permit limited horizontal movement of the tank and seats at the top of the columns to receive the tank load only when enough horizontal movement occurs to bring the tank into contact with said seats.

4. Supporting means for a horizontal cylindrical tank, said means comprising two pairs of vertical columns rigidly supported on a foundation and receiving the tank load from brackets oppositely disposed on the circumference of the tank shell, at least one pair of columns having hinged connection to the brackets, the top of the hinged columns running up to approximately the under side of said brackets whereby an emergency seat is formed to receive the tank load should excessive movement of the hinge occur.

5. Supporting means for a horizontal cylindrical tank, said means comprising at least two pairs of vertical legs rigidly supported on a foundation and having hinged connections to the tank, an anchor located between the columns comprising each pair of legs, each of said anchors preventing lateral movement of the tank and one anchor only preventing longitudinal movement while the other, or others, permit limited longitudinal movement, and seating means at the top of the hinged columns to support the tank should excessive movement of the hinge occur as a result of the anchors being displaced due to an unusually violent shock.

6. Supporting means for a horizontal cylindrical tank, said means comprising two pairs of vertical columns rigidly supported on a foundation and receiving the tank load from brackets oppositely disposed on the circumference of the tank shell, at least one pair of columns having hinged connections to the brackets, the top of the hinged columns running up to approximately the under side of said brackets thereby providing stop means to limit the movement of the tank in spaced relation to the foundation should excessive movement of the hinge occur.

7. Supporting means for an elongated tank body, said means comprising at least two pairs of vertical columns rigidly supported on a foundation and having hinged connections comprising links and pins to permit limited horizontal movement of the tank and seats at the top of the columns to receive the tank load and provide stop means to limit the movement of the tank in spaced relation to the foundation only when enough horizontal movement occurs to bring the tank into contact with said seats.

JONATHAN JONES.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,375,442	Sandberg	May 8, 1945