

Jan. 2, 1968

M. L. GREEN

3,360,895

TANK CONSTRUCTION

Filed Oct. 22, 1965

FIG. 1.

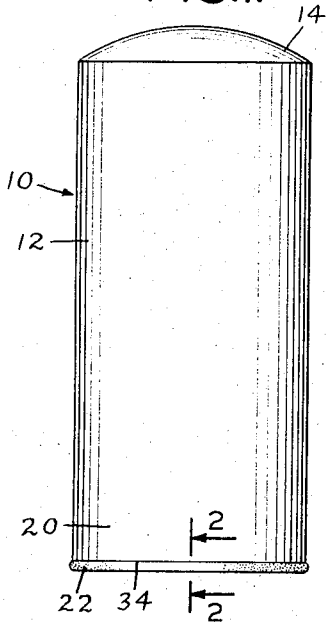


FIG. 2.

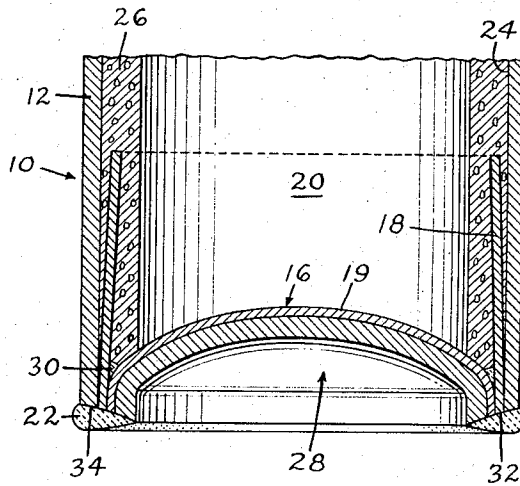


FIG. 3.

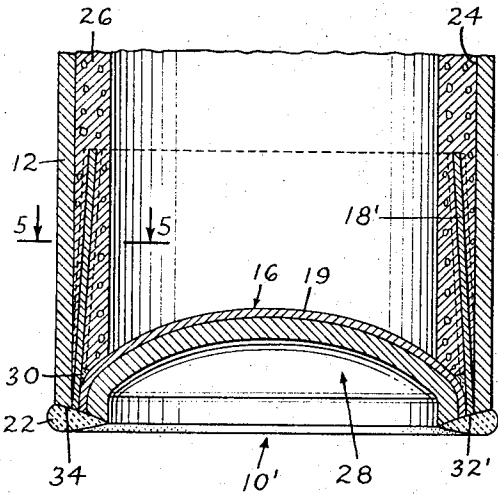


FIG. 4.

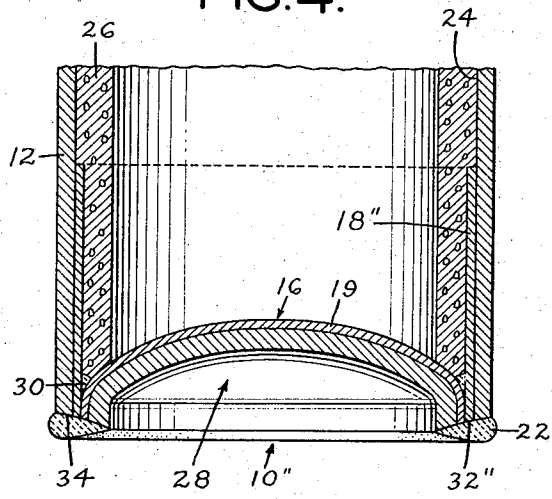
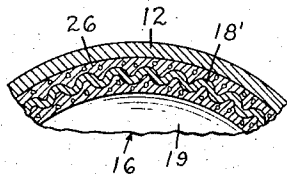


FIG. 5.



INVENTOR
MURRAY L. GREEN

BY
Bertan Frank
ATTORNEY

1

3,360,895

TANK CONSTRUCTION

Murray L. Green, Glen Cove, N.Y., assignor to Ford Products Corporation, Tarrytown, N.Y., a corporation of New York

Filed Oct. 22, 1965, Ser. No. 502,242

8 Claims. (Cl. 52-249)

ABSTRACT OF THE DISCLOSURE

The invention relates to a stone lined tank which structurally has a steel outer shell which has an upper head and a bottom head provided with a metal lining. The lined bottom head has a lower edge in communication with the lower edge of the steel outer shell. A barrier plate is disposed around the lower portion of the tank between the steel outer shell and the lower edge of the lined bottom head extends upwardly therefrom. A welded seam joins the lined bottom head to the barrier plate and the steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell. A stone lining is disposed around the interior of the steel outer shell and surrounds said barrier plate.

The present invention relates to steel tanks and more particularly to a means for reinforcing a stone lined steel tank.

Heretofore it has been known in the art of stone lined storage tanks that many inadequacies have been found. Such tanks are often heated by an external heat source and of necessity are provided with an area which is not internally stone lined. This unlined area is provided so that a non-insulated heat transfer area may be provided for the interior of the tank. The heat transfer area is generally disposed at the bottom of the tank.

It may be seen therefore that a tank has been provided in which the interior of the steel tanks were provided with side walls which were stone lined and also a non-ferrous bottom surface. The prior art practices further provided that the non-ferrous material was placed over the lower head of a tank and squeezed between the lapped end of the steel shell of the tank. The steel head and steel side shell of the tank were then welded and thereafter the tank stone lined such that only the side walls and top head were so lined.

With this manner of construction, however, water in the tank was able to seep behind the stone lining at the joint of the non-ferrous material and steel shell. One of the primary reasons for this may be seen in that the tank "breathes" (expands and contracts) because of internal pressure variations and because of this continuous expansion and contraction the stone lining at the lower most point on the side walls of the tank begins to crack allowing water to infiltrate behind the stone lining thereby causing a further deterioration of the stone lining and permitting the joint to be attacked by the water seepage. The combination "breathing" effect and the attack by the water seepage has often led to the loosening of the joint and subsequent failure of the tank.

Another form of deterioration is found in "electrolytic corrosion" which essentially arises because of the interaction of the non-ferrous lining and the steel shell of the tank. When the stone lining cracks the presence of a non-ferrous metal, steel shell and water causes a chemical reaction which attacks the steel shell, and any welded seam which may be present, thereby further contributing to the deterioration and failure of the tank.

A further difficulty results from the accumulation of sediment at the bottom of the tank which aggravates the water seepage and concomitant loosening of the joint.

2

This may occur because the accumulation of sediment creates an overheating problem in the tank which leads to an accelerated deterioration of the stone lining at the base of the tank which in turn leads to the loosening of the joint of the non-ferrous and steel outer shell, of the tank.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of a sturdy and economical barrier means at the base of the tank.

Another object of the present invention is to provide a non-ferrous reinforcing lining to aid in preventing the deterioration of the stone lining.

A further object of the present invention is to provide a barrier internally of the tank to prevent the loosening of the joint between the non-ferrous tank bottom and the steel shell of the tank.

Yet another object of the present invention is to provide a reinforced stone lining in a tank which will negate the attack of a welded joint by water seepage.

Still a further object of the present invention is to provide a reinforced stone lining in a tank which will provide a degree of flexibility when the tank "breathes" thereby minimizing the loosening effect at the welded joint of the tank.

Another object of the present invention is to provide a method of constructing a stone lined tank having a portion of the stone lining reinforced.

The aforementioned objects of the present invention, and other objects which will become apparent as the description proceeds, are achieved by providing a stone lined tank comprising a steel outer shell, said tank being provided with an upper head portion, a bottom head being provided with a non-ferrous metal lining disposed in the lower portion of the tank, said bottom head having a lower edge in communication with the lower edge of the steel outer shell, a barrier plate disposed around the lower portion of the tank between the steel outer shell and the lower edge of the lined bottom head and extending upwardly therefrom, a welded seam joining the lined bottom head to said barrier plate and said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the interior of said steel outer shell surrounding said barrier plate.

For a better understanding of the present invention reference should be had to the accompanying drawings, wherein like numerals of reference indicate similar parts throughout the several views and wherein:

FIGURE 1 is a pictorial representation of a stone lined tank.

FIGURE 2 is a cross sectional view of the tank taken along line 2-2 of FIGURE 1,

FIGURE 3 is a cross sectional view of an alternative embodiment,

FIGURE 4 is a cross sectional view of yet another alternative embodiment, and

FIGURE 5 is a horizontal section taken along line 5-5 of FIGURE 3.

With specific reference to the form of the present invention illustrated in the drawings, and referring particularly to FIGURE 1, a steel jacketed tank is indicated generally by the reference numeral 10.

In order to insure the structural integrity of the tank 10 the outer shell 12 may be comprised of steel. The tank 10 may be provided with an upper head portion 14 and a bottom head 16, as is well known to those skilled in the art. The tank 10 may further be provided with an inlet and outlet means (not shown) as required, however, the disposition of such inlet or outlet forms no part of the present invention.

A barrier plate 18 may be provided in the lower portion 20 of the tank 10 and may be in communication with the bottom head 16 and the outer shell 12. As shown in FIGURE 2 the bottom head 16 and the outer shell 12 may be joined by a welded seam 22 with the barrier plate 18 sandwiched between the steel outer shell 12 and the bottom head 16. The barrier plate 18 may extend upwardly along the vertical walls 24 interiorly of the tank 10. Further, the barrier plate 18 may be angled slightly toward the interior of the tank entirely around the lower portion 20 of the tank 10. Structurally therefore, the barrier plate 18 may be utilized to prevent water seepage from reaching the steel outer shell 12 of the tank 10 in the lower portion 20 thereof.

The bottom head 16 of the tank 10 is comprised of a steel outer shell portion and further may be provided with a lining 19 of non-ferrous material such as copper or the like while the barrier plate 18 may be of a similar material which exhibits resistance to corrosion when in contact with water. Yet another desirable feature of the non-ferrous material is its flexibility without sacrifice of its durability.

Structurally, the interior vertical walls 24 may be provided with a stone lining 26 which may, if desired, extend over the interior of the upper head portion 14. It should be noted, however, that the interior of the bottom head 16 is maintained free of such stone lining 26 so that an uninhibited heat transfer area 28 is provided between an external heating source (not shown) and the interior of the tank 10.

As shown in FIGURE 2 the stone lining 26 in the lower portion 20 of the tank 10 may engulf the barrier plate 18 which extends partially up the interior of the vertical side walls 24 of the tank 10. Therefore, the barrier plate 18 extending upwardly from the welded seam 22 acts as a guard to prevent any water, which may be accumulated in the lower portion 20 of the tank 10, from coming into contact with the interior of the steel outer shell 12 thereby preventing deterioration of the outer shell 12 which would lead to leakage problems. Should the stone lining 26 become porous or crack, in the lower portion 20 of the tank, the barrier plate 18 may prevent water from attacking the interior of the steel outer shell 12, at the welded seam 22, and further prevent the welded seam 22 from becoming loosened as a result of the deterioration or corrosion of the steel outer shell 12. Furthermore, with this structure, electrolytic corrosion may be minimized and it may be seen that sediment, which may accumulate in the lower portion 20 of the tank 10, will also be prevented from attacking the interior of the steel outer shell 12 because of the imposition of the barrier plate 18.

In order to provide a more secure bond between the barrier plate 18 and the steel outer shell 12 another welded, braised or soldered seam 30 may be provided in the interior of the tank 10 at the immediate or first contact point of the barrier plate 18 and the non-ferrous lining 19 of the bottom head 16. With this added seam 30, a further preventative measure may be provided to prevent the attack of water seepage upon the welded seam 22. It should be noted however, that the added seam 30 is an optional measure and is not a strict requirement of the present invention.

The method of making such a stone lined tank may also be viewed, since the positioning of the barrier plate 18 is of the utmost importance. In so constructing the tank as hereinabove described, the tank is positioned to receive the barrier plate 18, the barrier plate 18 is placed inside the tank 10 so that its lower edge 32 may be approximately even with the lower edge 34 of the steel outer shell 12. The lined bottom head 16 is placed interiorly of the barrier plate 18 and is welded, by means of a welded seam 22 around the bottom of the tank 10, and the tank is thereafter stone lined. With this method of construction, the tank 10 is structurally sound and the members comprising such tank are placed in position so that all the

members are not subjected to undue stresses during the stone lining operation.

It will be understood by those skilled in the art that alternatively, the barrier plate 18" may be fabricated and placed flush against the interior of the vertical wall 24 of the steel outer shell 12 of the tank 10, as shown in FIGURE 4. In this manner the barrier plate 18" is used as a lining for the lower portion 20 of the tank 10 and is interposed between the stone lining 26 and the vertical wall 24 of the steel outer shell 12'.

Yet another alternative embodiment, as shown in FIGURES 3 and 5, may be provided in corrugating the barrier plate 18' thereby providing additional contact area with the stone lining 26.

It will be recognized by those skilled in the art that the objects of the present invention have been achieved by providing a stone lined tank having a reinforcing plate in communication with the outer shell to prevent water seepage from corroding the outer shell and further to prevent loosening of the welded seam in the lower portion of the tank.

While in accordance with the patent statutes preferred and alternative embodiments of the present invention have been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

I claim:

1. A stone lined tank, comprising a steel outer shell, said tank being provided with an upper head portion, a bottom head being provided with a non-ferrous metal lining disposed in the lower portion of the tank, said lined bottom head having a lower edge in communication with the lower edge of the steel outer shell, a barrier plate disposed around the lower portion of the tank between the steel outer shell and the lower edge of said lined bottom head and extending upwardly therefrom, a welded seam joining said lined bottom head to said barrier plate and said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the interior of said steel outer shell and surrounding said barrier plate.

2. A stone lined tank comprising a steel outer shell, said stone lined tank being provided with an upper head portion, a bottom head in the lower portion of the tank, said bottom head being provided with an interior lining of non-ferrous metal, said lined bottom head having a lower edge in communication with the lower edge of said steel outer shell, a barrier plate composed of non-ferrous metal disposed interiorly of said steel outer shell around the lower portion of the tank between the steel outer shell and the lower edge of said lined bottom head and extending upwardly therefrom, said barrier plate being tilted toward the interior of the tank, a welded seam joining the lower edge of said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the interior of said steel outer shell and surrounding said barrier plate.

3. A stone lined tank according to claim 2 wherein said barrier plate is corrugated.

4. A stone lined tank comprising a steel outer shell, said tank being provided with an upper head portion, a bottom head being provided with a non-ferrous metal lining disposed in the lower portion of the tank, said lined bottom head having a lower edge in communication with the lower edge of the steel outer shell, a barrier plate disposed around the lower portion of the tank between the steel outer shell and the lower edge of said lined bottom head and extending upwardly therefrom, said barrier plate fitting flush against the interior of the steel outer shell, a welded seam joining said lined bottom head to said barrier plate and said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the

5

interior of said steel outer shell and covering said barrier plate.

5. A stone lined tank comprising a steel outer shell, said tank being provided with an upper head portion, a bottom head being provided with a non-ferrous metal lining disposed in the lower portion of the tank, said bottom head having a lower edge in communication with the lower edge of the steel outer shell, said bottom head being provided with a non-ferrous metal lining, a barrier plate disposed around the lower portion of the tank between the steel outer shell and the lower edge of said lined bottom head and extending upwardly therefrom, said barrier plate fitting flush against the interior of the steel outer shell, a welded seam joining said lined bottom head to said barrier plate and said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the interior of said steel outer shell and covering said barrier plate.

6. A stone lined tank comprising a steel outer shell, said stone lined tank being provided with an upper head portion, a bottom head in the lower portion of the tank, said bottom head being provided with an interior lining, non-ferrous metal, said bottom head with said lining having their lower edges in communication with the lower edge of said steel outer shell, a barrier plate composed of non-ferrous material disposed interiorly of said steel outer shell around the lower portion of the tank between

6

the steel outer shell and the lower edge of said lined bottom head and extending upwardly therefrom, said barrier plate being tilted toward the interior of the tank, a welded seam joining the lower edge of said lined bottom head to said barrier plate and the lower edge of said steel outer shell such that the barrier plate is disposed between the interior of the tank and the steel outer shell, and a stone lining disposed around the interior of said steel outer shell and surrounding said barrier plate.

7. A stone lined tank according to claim 5 wherein said barrier plate is corrugated.

8. A method of making a stone lined tank comprising of the steps of, placing a non-ferrous barrier plate interiorly of a steel outer shell, positioning a non-ferrous metal lined bottom head interiorly of said steel outer shell so that the barrier plate is between said bottom head and said steel outer shell, welding the bottom head to the barrier plate and the steel outer shell at their lower edges, and stone lining the interior of said tank without having any stone lining on the bottom head.

References Cited

UNITED STATES PATENTS

2,232,366	2/1941	Chappell.	
2,316,437	4/1943	Kercher	220—63
2,866,742	12/1958	Sutton	122—13 X

CHARLES J. MYHRE, *Primary Examiner.*