March 13, 1956 R. L. FOWLER 2,738,094

HEAT INSULATING BOLTED TANKS

Filed Feb. 27, 1953 2 Sheets-Sheet 1

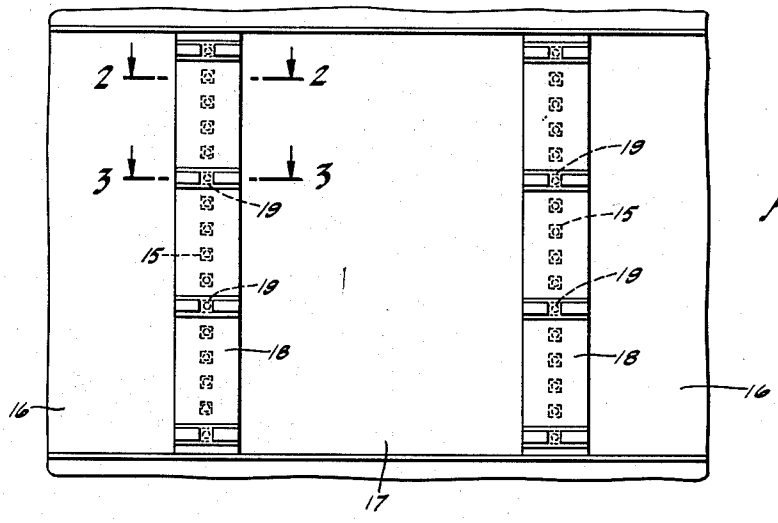


FIG. 1.

FIG. 2.

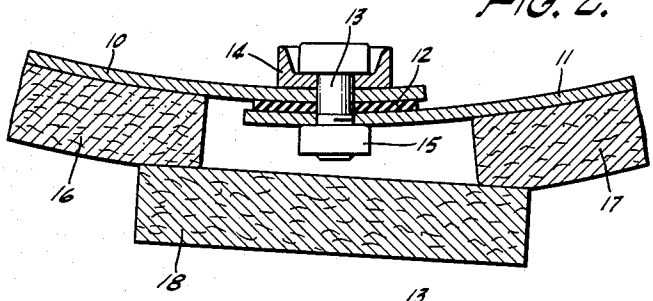
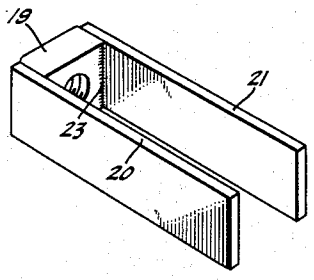


FIG. 4.



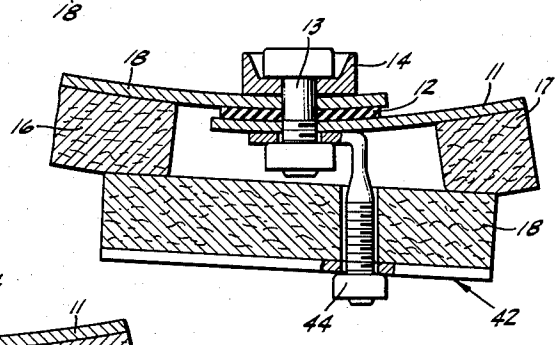


FIG. 12.

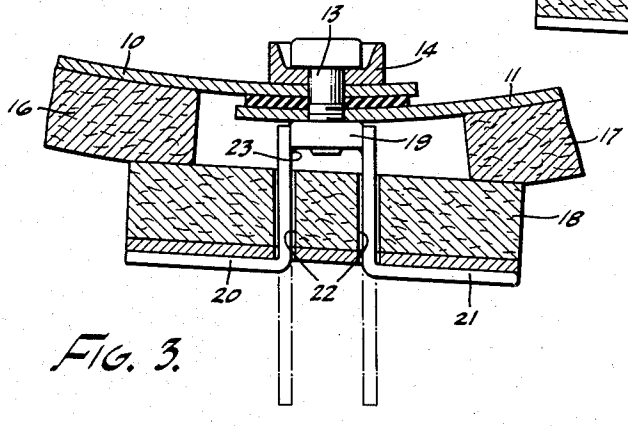


FIG. 3.

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HEAT INSULATING BOLTED TANKS

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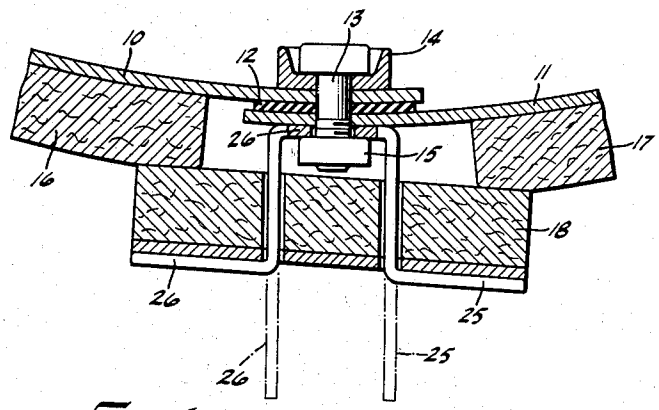


FIG. 5.

FIG. 6.

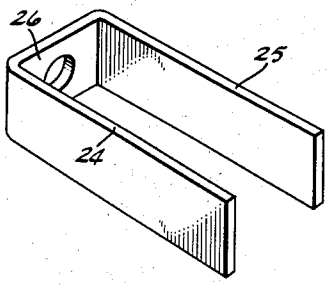
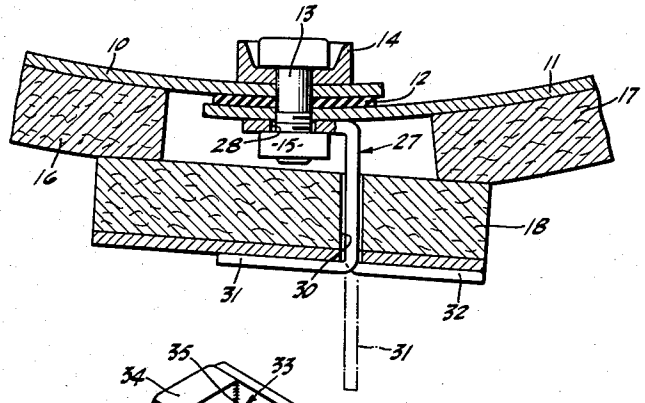


FIG. 7.



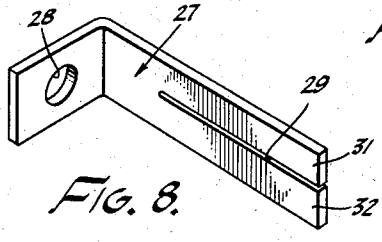
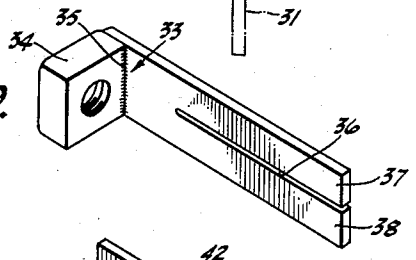


FIG. 8.

FIG. 9.



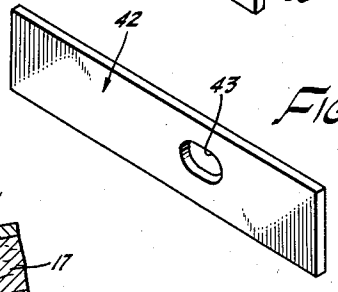


FIG. 11.

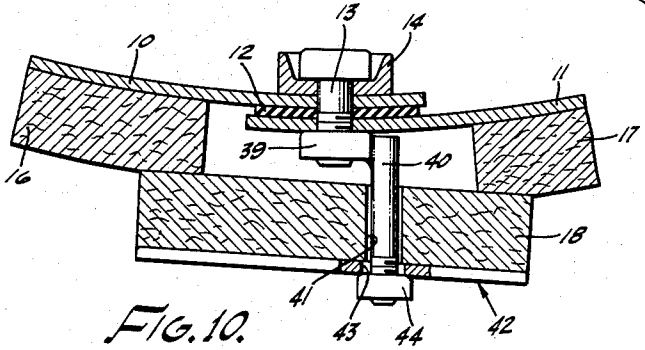


FIG. 10.

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HEAT INSULATING BOLTED TANKS

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Application February 27, 1953, Serial No. 339,297

1 Claim. (Cl. 220—9)

This invention relates to improvements in heat insulating bolted tanks.

A large number of bolted steel tanks are now in use which it is desirable to cover or protect with heat insulating material. These bolted tanks are usually constructed of overlapped sections of thin steel plate between which sections a gasket is disposed. Usually on the inside of the bolted tank at each joint there is a vertically arranged channel within which the heads of the bolts are disposed. The shanks of the bolts extend through aligned apertures in the steel plate sections and through the gasket, and nuts are applied to the projecting ends of the shanks of the bolts which are disposed on the exterior of the tank. The bolts are consequently arranged in vertical rows at suitably spaced intervals around a tank. It has been customary to apply sections of heat insulating material to the exteriors of the tanks between these vertical rows of bolts and to apply battens of heat insulating material over the vertical rows of bolts which battens overlap the vertical side edges of the sections of heat insulating material. It is desirable to be able to hold the battens, and consequently the sections, of heat insulating material on the tank by means of the bolts so that whenever occasion requires that ingress be afforded into the tank it is merely necessary to detach adjacent battens and the intervening section of heat insulating material to provide a means of ingress.

An object of the present invention is to provide an improved and highly simplified and economical means for attaching the battens of heat insulating material to the tank by means of the bolts.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claim, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a partial view in side elevation of a bolted tank, illustrating the heat insulating material held in applied position thereon by one form of construction that may be advantageously utilized to hold the battens in place;

Fig. 2 is a horizontal section taken substantially upon the line 2—2 upon Fig. 1;

Fig. 3 is a horizontal section taken substantially upon the line 3—3 upon Fig. 1;

Fig. 4 is a perspective view of the type of nut utilized in that form of construction illustrated in Fig. 3;

Fig. 5 is a view similar to Fig. 3, but illustrating an alternative form of construction that may be employed;

Fig. 6 is a perspective view of a portion of the construction illustrated in Fig. 5;

Fig. 7 is a horizontal section, illustrating still another form of construction that may be employed;

Fig. 8 is a perspective view illustrating a portion of the construction shown in Fig. 7;

Fig. 9 is a perspective view similar to Fig. 8, but

illustrating still another alternative form of construction;

Fig. 10 is a horizontal section illustrating still another form of construction that may be advantageously employed;

Fig. 11 is a perspective view illustrating a portion of the construction shown in Fig. 10; and

Fig. 12 is a view showing still another form of the construction.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the conventional bolted tank has its side walls made up of sections of thin steel plate. Two of such adjoining sections are illustrated at **10** and **11** which have overlapping side edges between which there is interposed a gasket **12**. Registering holes are formed in the sections **10** and **11** and in the gasket **12** for the reception of bolts **13**. These bolts preferably have square heads which are disposed within vertically extending channels **14** that are arranged on the inside of the tank and which hold the heads of the bolts against turning when nuts **15** are tightened on the ends of the bolts which project on the exterior of the tank.

There is a large number of bolted tanks having this general construction that are now in general use. However, in many instances it is highly desirable to cover the exterior of such tanks with a heat insulating material. In so doing, in accordance with the present invention sections of heat insulating material indicated at **16** and **17** are applied to the exteriors of the plates **10** and **11**. These sections have vertical side edges that are disposed adjacent, but are slightly spaced from, the vertical rows of bolts **13**. Battens **18** of heat insulating material are disposed over the vertical rows of bolts and have their side edges in overlapping relationship to the sections **16** and **17**.

The present invention concerns itself with a simple and economical means for attaching the battens **18** in place and consequently holding the sections **16** and **17** in applied position. To this end, the form of construction illustrated in Figs. 3 and 4 consists of applying to certain of the nuts **19** bendable steel straps **20** and **21**. Certain of the nuts **15** on the bolted tank are removed and replaced by the nuts **19** and when the battens **18** are applied, holes **22** are punched or are otherwise formed in the battens. These holes enable the bendable steel straps **20** and **21** to be extended through the battens and after having been thus extended, as indicated by dotted lines on Fig. 3, the projecting portions of the straps are bent laterally. These portions consequently hold the battens in applied position and hold them pressed against the sections **16** and **17** so that the sections are also held in applied position. Whenever it is desired to remove a section of insulating material, such as for example the section **17**, in order to provide ingress into the tank, the laterally bent portions of the bent straps **20** and **21** on the nuts **19** which hold two adjacent battens in place may be straightened thus permitting removal of the batten and consequently the intervening section **17**. It will thus be appreciated that in order to apply heat insulating material to a conventional bolted tank it is merely necessary to replace certain of the nuts **15** with nuts **19** and their attached straps **20** and **21**. The straps **20** and **21** may be attached to the nuts in any preferred manner, such as for example by welding indicated at **23**.

In the construction illustrated in Figs. 5 and 6, instead of attaching straps to the sides of a nut a bendable U-shaped steel strap is provided having parallel arms **24** and **25** that are connected together by an apertured portion **26**. In this form of construction certain of the nuts **15** can be removed from their respective bolts

and the apertured portion **26** can be applied over the shanks of such bolts. The nuts **15** can then be re-applied and the batten **18** can be applied over the arms **24** and **25**, as is illustrated in dotted lines on Fig. 5. The projecting portions of the arms **24** and **25** can then be bent laterally to hold the batten **18** in place.

In the construction shown in Figs. 7 and 8, the attaching means consists of an angular section **27** formed of bendable strap metal. One arm of this angular section is apertured as at **28** so that it may be slipped over certain of the bolts **13** and the nut **15** re-applied. The other or long arm is longitudinally split as indicated at **29**. When the batten **18** is applied only a single aperture **30** need be formed therein to accommodate each long arm of each angular member. When the batten has been applied the two sections **31** and **32** on opposite sides of the split **29** can be bent laterally in opposite directions to hold the batten in place.

The form of construction illustrated in Fig. 9 differs from the form of construction shown in Figs. 7 and 8 by having the arm **33** welded or otherwise secured to the side of a replacing nut **34** such as by welds **35**. This arm is longitudinally split as indicated at **36** to provide two bendable arms **37** and **38**. In the use of this construction certain of the nuts **15** are replaced by the nut **34**, and when the batten **18** is applied the two arms **37** and **38** are bent laterally in opposite directions.

In the form of construction illustrated in Figs. 10 and 11, certain of the nuts **15** are replaced by nuts **39** which have studs **40** welded or otherwise secured to the side thereof. In using this form of construction, when the batten **18** is applied apertures **41** are punched or are otherwise formed therein to receive the studs **40**. Apertured plates **42** having apertures **43** which receive the studs are applied against the outer sides of the battens **18** and nuts **44** which are applicable to the studs are tightened against the outer sides of the plates.

In the construction shown in Fig. 12 the attaching means is in the form of an eye-bolt, the head of which is bent laterally so that the eye is receivable over the bolt of the tank and is capable of being retained thereon by the nut. The threaded shank of the eye-bolt may have a nut, such as the nut **44**, applied thereto and will function in the same manner as the construction shown in Fig. 10. In this form of construction substantially the only difference between the construction and that shown in Fig. 10 is that the stud or shank, instead of being welded directly to the nut **39**, is equipped with a laterally bent eye which can be retained on the bolt of the tank by the nut **39**.

In the constructions shown in Figs. 3, 5 and 7, it is usually desirable to interpose between the insulation and the laterally bent portions of the retaining means suitable washers as illustrated.

In all of the above described constructions it will be appreciated that a relatively simple and economical construction is provided which enables the balance of insulating material to be attached to the tank by constructions which are held in place by the bolts of the tank. In some instances, certain nuts of the bolts of the tank must be removed and replaced. In other instances such nuts are merely removed to permit of the application of the attaching structure, after which the same nuts are again applied to their respective bolts. In all forms of construction, although the battens are firmly held in positions, it is possible to remove the battens whenever occasion requires the removal of one or more sections of heat insulating material to provide ingress to the tank.

Various changes may be made in the details of construction without departing from the spirit and scope of the invention as defined by the appended claim.

I claim:

In a tank, plates forming the body of the tank and connected by lap joints, bolts extending through lapping portions of the plates at the joints, sheets of insulation overlying the exterior of said plates and having parallel edges extending along opposite sides of the joints but terminating short thereof, battens of insulation bridging the gaps between said edges, angular eye bolts, each eye-bolt having a single eye loosely positioned over a bolt and having a threaded shank extended outwardly along the side of the bolt and through the batten in spaced relation to but approximately parallel to the axis of the bolt, a nut on each bolt for tightening the eye of the eye-bolt against the joint and tightening the joint, and nuts on the threaded shanks for tightening the battens in place.

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