Nov. 12, 1935. H. ANDERSON 2,020,630

PROTECTIVE LINING FOR VESSELS

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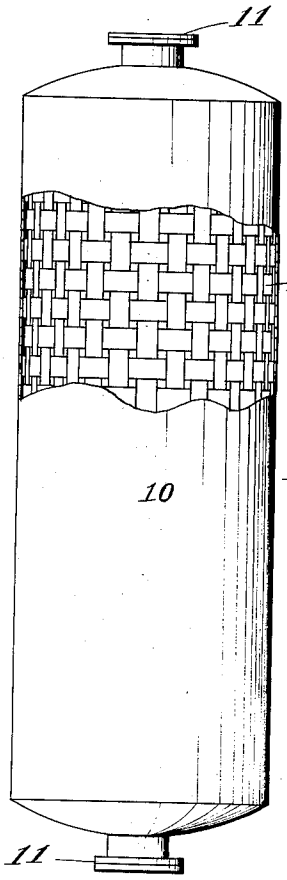


Fig. 1.

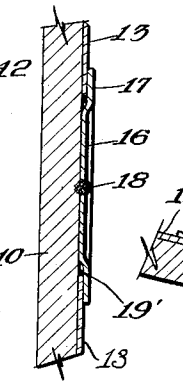


Fig. 3.

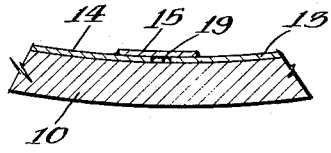


Fig. 5.

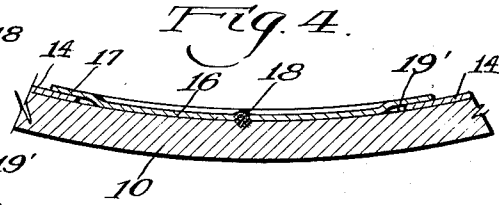


Fig. 4.

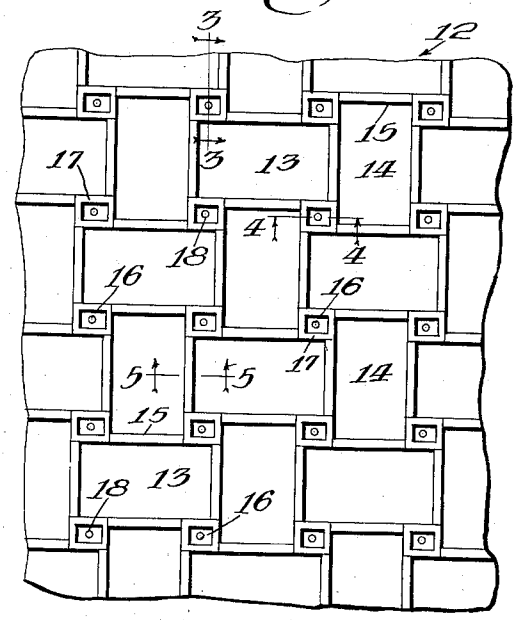


Fig. 2.

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Fig. 6.

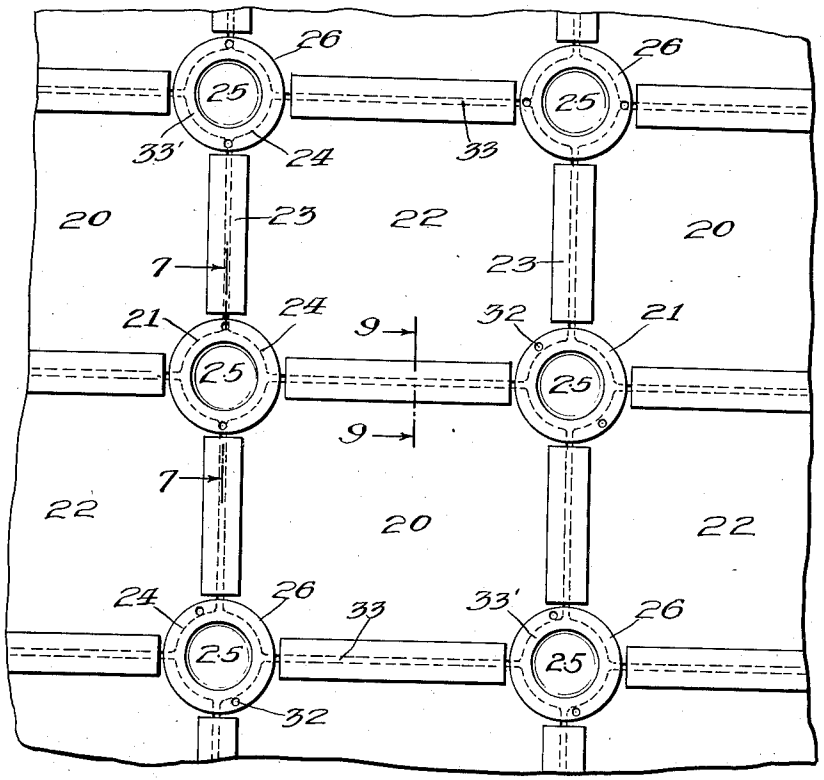


Fig. 7.

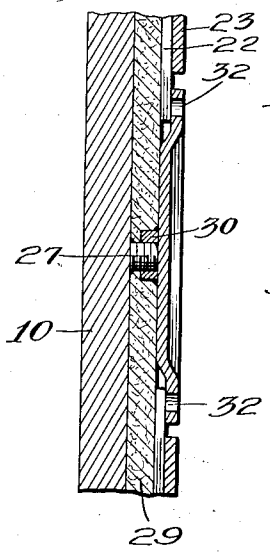


Fig. 8.

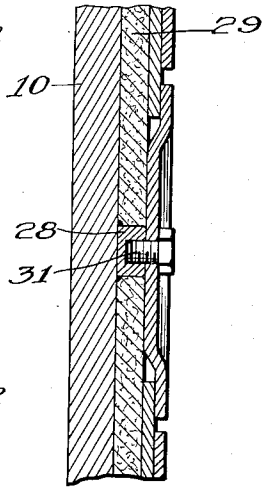
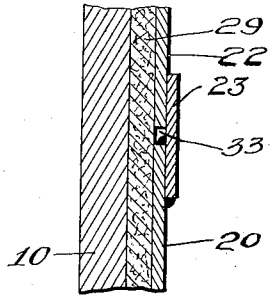


Fig. 9.



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UNITED STATES PATENT OFFICE

2,020,630

PROTECTIVE LINING FOR VESSELS

Henry Anderson, Chicago, Ill., assignor to Universal Oil Products Company, Chicago, Ill., a corporation of South Dakota

Application November 26, 1930, Serial No. 498,295

6 Claims. (Cl. 220—63)

This invention relates to an improved form of protective lining for vessels generally, and is particularly applicable for use in lining the chambers of an oil cracking process to render said chambers resistant to corrosion, excessive temperatures, and the like.

Primarily, the invention comprises a metallic lining which may be placed directly over the inner surfaces of the vessel to be protected, or may be applied over an intermediate liner, such as insulating material, gannister lining, or the like; the metallic lining being applied in such manner as to permit its free expansion and contraction due to changes in temperature.

One feature of the invention, providing for expansion and contraction of the metal liner, renders it particularly advantageous for use in vessels which are operated under high temperatures and pressures, since, by the use of this invention, a protective surface is provided which will not become warped or distorted by high temperatures.

Other and further objects and advantages of the invention will become apparent as the description thereof proceeds.

The accompanying diagrammatic drawings illustrate several forms of the improved liner, as applied to the chamber of a cracking process, and in which,—

Fig. 1 is a side-elevational view of a chamber, partially in section, showing at the portion sectioned, the general appearance of a form of the liner as applied to a chamber;

Fig. 2 is an enlarged detailed view, showing in elevation the liner illustrated in Fig. 1;

Fig. 3 is a cross-sectional elevation, taken on a line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view, taken on a line 4—4 of Fig. 3;

Fig. 5 is a sectional view, taken on a line 5—5 of Fig. 2;

Fig. 6 is a detailed elevational view of another form of liner embodied in the present invention;

Fig. 7 is a cross-sectional view, taken on a line 7—7 of Fig. 6;

Fig. 8 illustrates one method of fastening the holder plates, shown in Figs. 6 and 7, to the wall of a vessel; and

Fig. 9 is a cross-sectional view, taken on a line 9—9 of Fig. 6.

Referring to Fig. 1, 10 indicates a chamber of any desired size and of conventional form, preferably adapted to withstand high temperatures and superatmospheric pressures, provided with manhole covers 11, removable for cleaning said chamber, or for any other purpose, and a form of lining within the purview of my invention, generally designated at 12.

Primarily, my invention comprises disposing a series of metallic plates to form lining 12, each possessing the quality of being unaffected by the corrosive action of liquids or vapors maintained at high temperatures and superatmospheric pressures. These metallic plates (which will hereinafter be described more in detail) may comprise sheets of metallic material of any desired weight, tensile strength or thickness, dependent upon the effect and degree of temperatures and pressures employed. I have found that the use of metallic plates with corrosion-resisting and non-staining properties, such as alloyed steels or iron, will in most instances serve to produce the result desired. In the accompanying description, a reference to "plates" will always carry with it the intention that they possess these peculiar properties, although, obviously, materials of other characteristics, such as cast iron or the like, may, if desired, be employed.

To effect a lining which will provide a substantially sealed, non-leaking protection for the interior of chamber 10 illustrated in Fig. 1, I have shown, first, a series of relatively flat, comparatively large, rectangular metal plates 13, possessing the aforementioned corrosion-resisting properties, and made from sheet or other material. Any desirable size of plate 13 may be employed. For purposes of illustration, a metal plate of about 54 inches in length, and about 23¾ inches in width, more or less, is shown. Plates 13 are preferably flat, and when laid, have their entire surfaces adjacent the chamber wall, in contact therewith.

Disposed substantially at right angles to the longitudinal axes of plates 13, in partly overlapping relation therewith, and assisting in retaining said plates in place, I may provide a second series of relatively large, rectangular metal plates 14, each possessing substantially the same general physical properties as the heretofore described flat plates 13. To dispose said plates in overlapping relation, plates 14 are provided with offset edges 15, welded or crimped on said plate 14 in any suitable manner. Offset edges 15 are restricted in their length, relative to the edge of plates 14 on which they may be disposed, permitting each of the four corners of plates 14 to be exposed without such offset edges, whereby said plates 14, when laid, are flush with plates 13. Plates 14 may conform to any desired size, but for illustration, may be about 54 inches in

length by about 23¾ inches in width, more or less.

Disposed substantially at right angles to the longitudinal axes of plates 14, and substantially parallel to the longitudinal axes of plates 13, and in overlapping relation with each of said plates, to retain said plates in place, I may provide a third series of relatively small, entirely overlapping retaining plates 16, adapted to be welded or otherwise affixed to the interior of chamber 10. Retaining plates 16 possess substantially the same physical characteristics as to corrosion and heat resistance as the aforementioned plates 13 and 14, and are provided with offset edges 17, welded or crimped on said plates in any desired manner. The offset edges 17 are disposed on each of the four edges of plates 16, extending along the entire length of each edge. Retaining plates 16 may be of any desired dimension, but for illustration, merely, a plate 16 of about 20 inches in length by about 12 inches, more or less, in width, will be relatively sufficient for use in conjunction with plates 13 and 14 illustrated above.

As hereinbefore stated, retaining plates 16 are adapted to be welded or otherwise mounted upon the interior wall of chamber 10. One form of such mounting is diagrammatically illustrated at 18 in Figs. 3 and 4.

Upon mounting said plates upon the inner wall of chamber 10, it will be found that the faces of plates 13, 14 and 16 adjacent said inner wall will be disposed in substantially spaced relation from each other, forming expansion spaces 19 and 19', as diagrammatically shown in Figs. 3, 4 and 5. By providing said expansion spaces, stress and strain due to expansion of said plates upon application of heat to said chamber is avoided.

Through the provision of overlapping offset edges 15 and 17 on plates 14 and 16, respectively, I effect a relatively intimate, non-leaking, sealed slidable union of all of said plates, which union is unaffected by expansion and contraction of the chamber and plates due to heat extremes, permanently protecting the interior wall of said chamber from exposure to the corrosive action of liquids and vapors under treatment.

Fig. 6 is a modification of my invention, wherein a gannister or other lining may be disposed intermediate the inner wall of the chamber and a form of metal lining of my invention, and in which a series of relatively flat, substantially rectangular or other conveniently shaped metal plates 20, with arcuately cut corners 21 are shown. Said plates 20 may possess the corrosion and heat resisting characteristics heretofore referred to.

Disposed substantially parallel to the longitudinal axes of said plates 20, I may provide a second series of substantially rectangular or other desired shape metal plates 22, with partly overlapping, offset edges 23, welded or crimped on said plates. Plates 22 have their corners arcuately cut, as shown at 24, and possess the corrosion and heat resisting properties of plates 20. Offset edges 23 are restricted in their length, relative to the edge of said plate 22, leaving the arcuate edges of said plate entirely exposed and without any offset edge.

To retain said plates 20 and 22 in place, I may provide a third series of metal plates, hereinafter referred to as retaining plates 25, substantially circular in form and possessing the same qualities as to corrosion and heat resistance as said plates 20 and 22. Each of said retaining plates 25 may be provided with an overlapping, annular offset edge 26, welded or crimped to the edge of said plate 25. Retaining plates 25 are of such dimension as to conform in fitting relation within the circular space provided by juncture of arcuately-cornered plates 20 and 22, with the overlapping offset edge 26 of retaining plate 25 fitting over the arcuate corners 21 and 24 of said plates 20 and 22, respectively.

Retaining plates 25 are suitably mounted or otherwise affixed to the interior wall of a chamber by means of a stud 27 or tap 28, welded or otherwise affixed to the inner wall of said chamber, said stud and tap passing through the insulating lining 29 to engage a nut 30 or screw 31, respectively, suitably affixed or otherwise secured to retaining plate 25. An illustration of this form of mounting is diagrammatically shown in Figs. 7 and 8, but it is understood I do not intend to limit myself to these particular forms, since it is obvious other well-known expedients may be employed for mounting said plates.

To facilitate the assembly and/or mounting, adjustment or removal of plates 20, 22, and 25, I may provide upon retaining plates 25 holes or notches 32, adapted to engage any suitable instrument (not shown).

Any desired size of plates in this modification of the invention may be used. For example, plates 20 and 22 may be about 23 inches by 36 inches, more or less, and retaining plates 25 may be about 12 inches, more or less in diameter. Substantial variations of these dimensions may be made without departing from the principles of my invention.

Upon mounting the plates 20, 22 and 25 in the modification shown in Fig. 6, it will be found that their surfaces adjacent the lining disposed upon the inner wall of the chamber, will be disposed in substantially spaced relation, as represented by the dotted line in said Figure 6, forming expansion spaces 33 and 33'. Expansion spaces 33 and 33', by provision of the overlapping offset edges 23 and 26 of plates 22 and holder plates 25, respectively, are sealed thereby, effecting a non-leaking, slidable union of said plates, which is unaffected by the heat extremes to which the chamber may be subjected.

I claim as my invention:—

1. A protective lining for vessels, comprising in combination an initial series of relatively flat corrosion resistant metal plates cooperatively arranged with respect to a second series of corrosion resistant metal plates, said second series of plates being provided with overlapping offset means extending over the edge portions of said initial series of plates and adapted to solely retain the same in cooperative relationship therewith, and a third series of corrosion resistant metal plates having offset, overlapping means extending over further edge portions of said initial and second series of metal plates, the plates of said third series being directly secured to the inner walls of a vessel and retaining all of the plates in all of said series in relatively fixed operative position as a liner.

2. A protective lining for vessels, comprising in combination an initial series of relatively flat corrosion resistant metal plates cooperatively arranged with respect to a second series of corrosion resistant metal plates provided with offset, overlapping edges extending over edge portions of said initial series of plates and adapted to solely retain the same in cooperative relationship, a third series of corrosion resistant metal plates

provided with offset, overlapping edges extending over further edge portions of said initial series of plates and edge portions of said second series of plates and fixedly secured to the inner walls of a vessel to retain all of the plates in all of said series in relatively fixed relation, all of said plates being spacedly disposed from each other at their point of terminus in the plane of the series.

3. A protective liner for the interior of a chamber, comprising in combination, an initial plurality of relatively thin, spacedly disposed metal plates, a second and associated plurality of relatively thin, spacedly disposed metal plates provided with offset edge portions adapted to extend over and overlap edge portions of said initial series of plates, and an associated third plurality of spacedly disposed metal plates provided with offset, overlapping edges extending over edge portions of said initial and second series of plates, the several plates in said third series being fixedly secured to the internal walls of said chamber and constituting the securing and retaining means for maintaining all of the plates of said series in co-operative relationship upon the internal walls of said chamber.

4. A protective liner for the interior of a treating chamber, comprising in combination, an initial plurality of flat relatively thin, spacedly disposed corrosion-resistant metal plates, a second and associated plurality of relatively thin, flat, spacedly disposed corrosion-resistant metal plates provided with offset edge portions adapted to extend upon and overlap portions of the edges of said initial series of plates, and an associated third plurality of spacedly disposed, corrosion-resistant metal plates provided with offset overlapping edges extending over the remaining edge portions of said initial and second series of plates, the several plates of said third series being fixedly secured directly to the internal walls of said chamber and constituting the securing and retaining means for maintaining all of the plates in each of said series in co-operative relationship upon the internal walls of said chamber.

5. A protective lining for employment within a metal chamber, comprising in combination, an initial series of relatively flat, corrosion resistant metal plates disposed in spaced relationship from each other, a second series of spacedly disposed plates, arranged at right-angles to the longitudinal axes of said initial series, provided with partial offset, overlapping edges adapted to extend over a portion of the edges of said initial flat series of plates, and a third series of corrosion resistant metal plates provided with offset overlapping edge portions adapted to extend over the exposed edge portions of said initial and second series of plates, said third series of plates being fixedly secured to the internal walls of said chamber and constituting the securing means for maintaining all of the plates in all of said series in co-operative engagement upon the walls of said chamber.

6. A corrosion-resistant lining adapted for use within metal chambers, comprising in combination, a plurality of corrosion-resistant flat plates having portions of their edges overlapped by extending, offset edges of a second plurality of corrosion resistant plates, and a third plurality of corrosion-resistant plates fixedly secured directly to the internal walls of said chamber, the edges of said third series being offset and overlapping the remaining exposed edges of the first plurality of plates and the unextended edges of the second plurality of plates, the terminals of adjacent plates in the plane of the series being spacedly disposed, and said fixedly secured plurality of plates constituting the securing and retaining means for maintaining all of the plates of each plurality in co-operative relationship upon the internal walls of said chamber.

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