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CORRUGATED PANELS FOR LININGS FOR VESSELS

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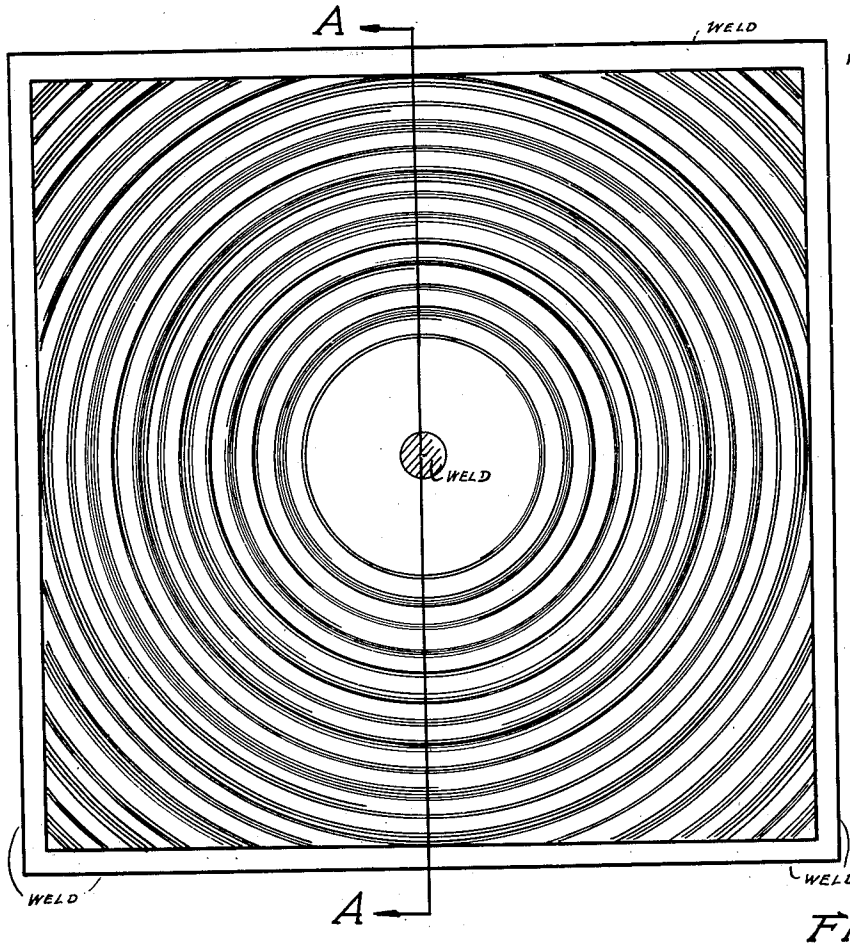

FIG.—1

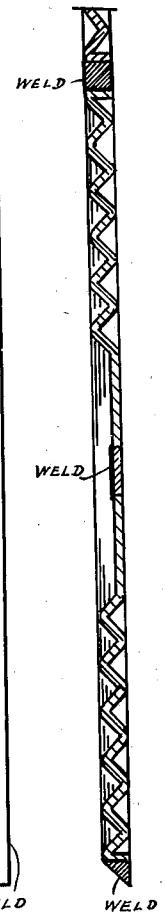

FIG.—2

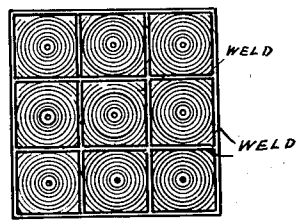

FIG.—3

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CORRUGATED PANELS FOR LININGS FOR VESSELS

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3 Claims. (Cl. 220—63)

The present invention relates to an improved lining suitable for the protection of metallic surfaces used in the processing of corrosive materials. The invention is especially directed to the protection and conservation of the surfaces of steel vessels which contact corrosive fractions in the refining of petroleum oils. The invention more particularly relates to the use of especially designed corrosion-proof panels and the method of attaching said panels to the metallic surface to be protected. The panels of the present invention comprise rectangular or square corrosion-proof panels having a plurality of concentric, circularly curved corrugations originating at the center of the panel and arranged in contiguous relation therefrom toward the peripheral edges of said panels which are attached by welding the center points of said panels and the outer edges of said panels to the surface to be protected.

It is well known that in the processing of corrosive materials, particularly in the refining of petroleum hydrocarbons, a serious problem exists with respect to the corrosion of metallic vessels. This problem is greatly aggravated in processes in which high sulfur petroleum oils are processed at elevated temperatures and pressures. This corrosion problem not only materially increases the capital investment necessary for a particular operation and the operating cost, but also increases the hazard to personnel in that corrosion causes substantial weakening of the vessel with a possibility of a rupture occurring. In order to overcome or to minimize the corrosion of vessels in which corrosive materials are processed, various methods have been employed. For example, it is known to protect metallic surfaces of reaction chambers, primary towers of cracking equipment, as well as storage tanks, rundown tanks, and other equipment by lining said units with corrosion-proof materials of suitable thickness. These corrosion-proof linings have been satisfactory with respect to their chemical stability against corrosion and for their protection in this respect of the metallic surface. However, these panels heretofore employed had a serious physical defect as well as a defect in the manner in which they were attached to the surface to be protected. This was especially the case in the protection of vessels subjected to elevated temperatures and pressures or to temperature variations, which vessels are most susceptible to serious corrosion. Corrosion-proof panels heretofore utilized have been attached to the inner surface of the metallic vessel by various means. A common method was to attach flat panels such as alloy sheets and to weld said sheets in place at three or four inch spacing in a manner known as "buttonhole welding." This type of lining has not been entirely satisfactory since the expansion rate of the metallic vessel is different from the expansion rate of the lining. The lining was torn away from the shell, resulting in seepage of the corrosive liquid between the shell and the lining which further increased the corrosion rate and also required frequent shutdowns for the repair of the lining. This difficulty was overcome to some extent by providing lining elements provided with an expansion fold or flexible joint, usually at the area at which the respective sections contacted each other. This type of lining section was likewise not entirely satisfactory since the entire expansion of the entire sheet must be taken up in the expansion fold intermediate the respective sections.

I have now discovered a lining which, when attached in accordance with my method, will protect the metallic vessel from corrosion and will remain secured under extreme temperature changes. My invention may be readily seen by reference to the attached drawing showing a modification of the same. Figure 1 is a top view of an individual panel section showing the method of welding said section to the metallic surface. Figure 2 represents a view taken through section A—A showing said section attached to the metallic surface. Figure 3 illustrates a top view of several sections attached to the metallic surface and method of welding.

Referring specifically to Figure 1, the individual panel comprises corrosion-proof materials of suitable thickness. The panel is corrugated with concentric circularly curved corrugations which spread outwardly in circular curves of increasing radius from the center point to the edges of said panel. The individual panel is welded to the metallic surface to be protected along the edges of the panel and plug welded in the center. Figures 2 and 3 definitely illustrate the manner of welding the respective panels to the metallic surface and likewise illustrate the manner in which the individual panels are assembled.

The panels of my invention having concentric circularly curved corrugations spreading outwardly from a center point to the outer edges of said panel and the manner in which they are welded to the surface to be protected will permit a definite breathing of the lining when temperatures are increased or changed and thus will

prevent separation of the lining from the metallic shell due to an excessive stress being placed on a particular weld. Since the corrugations are concentric and the center of the panel is held fast, the expansion motion is uniform in all directions and the strain on the weld is therefore uniformly distributed.

The over-all sizes of the panels are preferably rectangular or square. The over-all dimensions of the panels may be widely varied and will depend upon convenience in handling, economies of manufacture, as well as upon the type and size of surface to which they are to be attached. In general, the panels are preferably from 6 to 24 inch squares. It should be understood that an allowance should be made for panels adapted for lining the heads of vessels which are ellipsoid in shape, conical, or otherwise curved. The thickness of the panels may be of any desired amount and will depend upon the particular corrosion-proof material used, as well as the service in which they are to be employed. It has been found that panels from one-thirty second to one-quarter inch thick are satisfactory in most instances. The concentric corrugations are preferably uniformly spaced from the center of said panel extending outwardly to the outer edges of said panel. The size of the corrugation, as well as the distance between the corrugations, will depend to some extent upon the range through which the temperature will vary in the service in which the panels are employed. In general, the distances between the respective corrugations should vary from one-half to two inches and the radius of the corrugation should be from one-eighth to one-half inch.

The corrosion-proof panels of the present invention may comprise any suitable corrosion-proof material. In general, it has been found that chromium-bearing steels are particularly desirable as corrosion-resistant panels for high temperature operations. Alloy steel concentrically corrugated sheets containing 18% chromium and 8% nickel are entirely desirable, as well as alloy steel sheets containing 11% to 13% chromium. It is also within the scope of this invention to use alloy steel sheets containing 4% to 6% chromium, as well as nonferrous alloys comprising 85% copper, 15% zinc, various brasses, and the like.

Although the invention has been described with reference to a specific embodiment thereof, it is not intended that it shall be specifically limited thereby as it should be obvious that various changes and modifications are possible within the broader concept as set forth in the appended claims.

I claim:

1. Vessel suitable for the processing and storage of corrosive liquids comprising a metal vessel having attached to the inner surface of the same a plurality of corrosion-proof panels, said panels having edge to edge attachments with one another and with the vessel, said panels also being attached to the vessel at a central point of the panel and being further characterized by having a plurality of concentric circular corrugations extending from the central point to the outer edges of the same.

2. Vessel as defined by claim 1, in which said edge to edge attachment with respect to panels and with the vessel is attained by welding.

3. Vessel as defined by claim 1, in which said panels are rectangular, the dimensions of which vary in the range from 6 to 24 inches.

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