Feb. 20, 1934. T. MONTGOMERY ET AL 1,948,391

PROTECTIVE LINING IN CRACKING VESSELS

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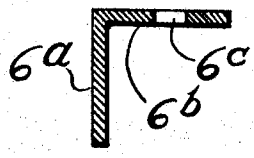


FIG.—3

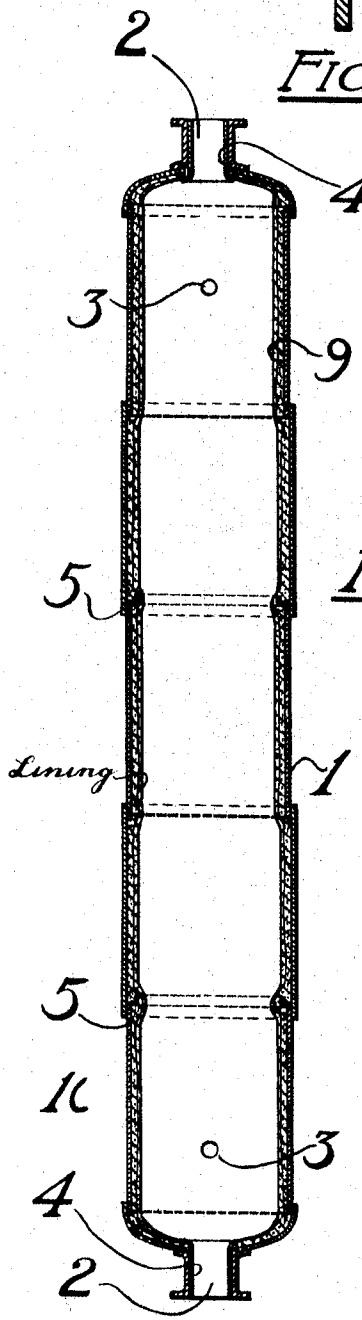


FIG.—1

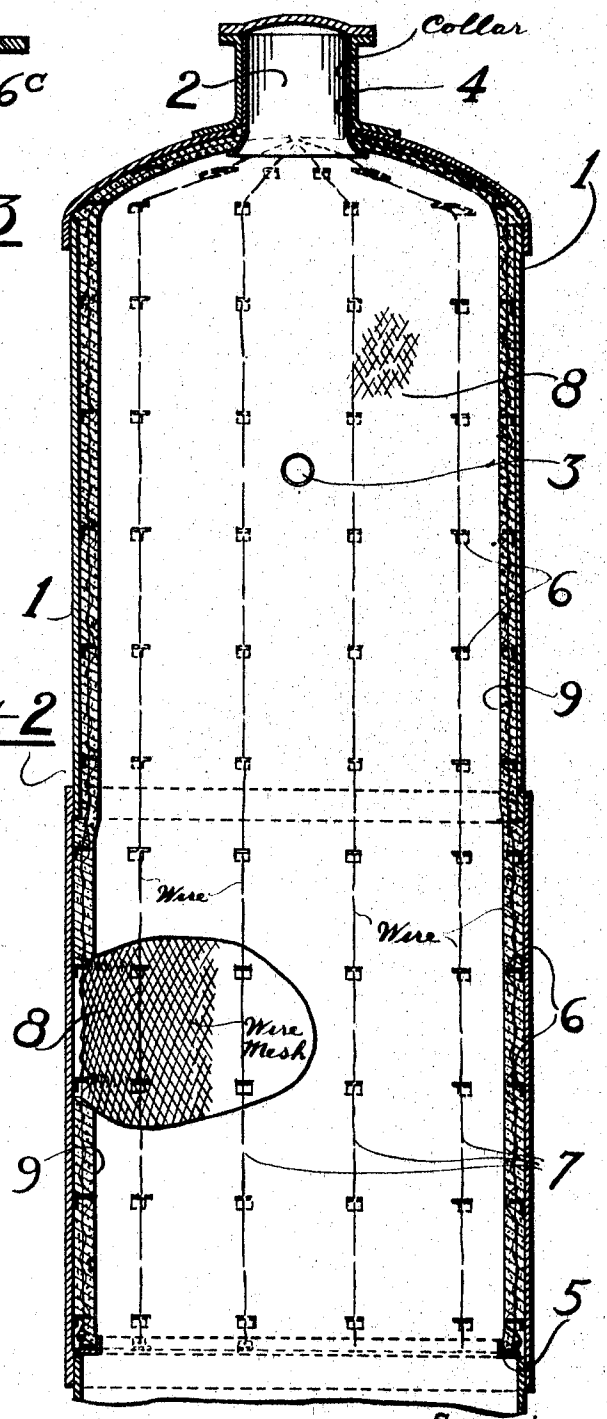


FIG.-2

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PROTECTIVE LINING IN CRACKING VESSELS

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5 Claims. (Cl. 196—133)

This invention relates to improvements in eliminating corrosion in vessels of large diameter used in connection with the cracking of oils, hereinafter referred to as cracking vessels, by means of a protective lining. Types of cracking vessels to which my invention applies are soaking drums, bubble towers, pressure stills, accumulators, etc.

The modern art of liquid phase cracking consists of heating the oil to the cracking temperature in a series of tubes arranged in a furnace, discharging the hot oil into a cylindrical reaction vessel held under high pressure in which the greatest part of the cracking takes place and thence introducing the oil into a fractionating column, usually called bubble tower, in which the separation of the lighter from the heavier constituents is carried out. The pressures usual in plant operations vary from 100–1000 lbs./sq. inch in the soaking drums and 25–100 lbs./sq. inch in the bubble towers.

It is a practical experience that the cracking vessels are subject to corrosion which considerably shortens the time for which they may be kept in service with safety. The corrosion lowers the tensile strength of the vessels which is especially dangerous on account of the high pressure obtaining in them. For this reason, the refiners have found it necessary to either take the corroded vessels out of service or to employ them in cracking units working at a lower pressure. It becomes therefore evident that an efficient protection of the cracking vessels is of considerable importance for the oil industry.

We have discovered that an absolute protection of cracking vessels against corrosion is obtained by applying a concrete lining of cement and sand upon their inner surface. The following example will serve to illustrate our method, reference being had to the accompanying drawing, in which

Fig. 1 is a longitudinal section of a soaking drum with a complete protective lining on its inner surface;

Fig. 2 shows the upper part of Fig. 1 enlarged with details of a partial protective lining;

Fig. 3 shows section of a clip to be referred to below.

The vertical soaking drum which is most usual in liquid phase cracking consists of an elongated cylindrical steel vessel 1 with upper and lower manholes 2, and outlet and inlet openings 3, for the oil. Before the lining is applied, the drum should first be thoroughly cleaned of all oil, coke and rust, etc. The finishing cleaning should be done by sand-blasting. It is not necessary to obtain a special sand-blasting equipment as the cement gun referred to below can be used for this operation. Blasting-sand or the like should be used for blasting. The next step is the application of certain reinforcing elements for the cement mortar. Such reinforcements may comprise the collars 4, the L's 5, the clips 6, the wires 7 and the wire mesh 8. The collars 4 have the purpose of protecting the edge of the concrete lining at openings such as the manholes at the same time affording a protection of the covered surface against corrosion. They may be made in 3 sections of still bottom steel or some special steel such as "Enduro" and secured to the surface by 3 longitudinal and 1 circumferential welding. The L's (5) may be welded all around the edge of the several sheets, of which the wall of the drum is made up. They are especially advantageously used in cases, when only part of the drum is provided with inner lining, as shown in Fig. 2, for the protection of the edge of the lining. The clips 6, of Fig. 3, consist of a side plate 6*a* and a bottom plate 6*b* with hole 6*c*. They are welded at regular intervals upon the drum surface as seen on Fig. 2. The main reinforcing element for the concrete is the wire mesh 8 covering the whole surface to be concreted and held on by means of wires 7 laced through the holes 6*c* of clips 6.

After the drum is cleaned and provided with the reinforcements, the cement mortar is applied. There may be mixed for the mortar one part of Portland cement with 2 parts of sand. The sand should preferably pass through a No. 10 sieve since coarse sand would cause a higher percentage of loss by rebound. The mortar may be applied by any of the known methods; however, we found that application by means of a cement gun (guniting) is usually preferable to troweling due to the greater density and adhesion of the mortar layer. The cement gun is well known in the art. It consists of an apparatus in which the cement and sand mixture is forwarded by means of compressed air together with a regulated amount of water under pressure and sprayed with force upon the surface to be covered with the concrete layer. The finishing may be done with trowel or wood float so as to obtain a hard smooth surface. A concrete layer of 1 to 3 inch thickness may be applied as protection for soaking drums. Numeral 9 designates the concrete layer. A movable platform may be provided for the working men and their tools during the operations of cleaning and lining the soaking drum. The morning following the concreting, a water spray

is turned into the top of the drum and the surface kept wet for about 7–10 days. The soaking drum is then ready for use.

There is a main corrosion band above the liquid level. Accordingly we have found that soaking drums used in liquid phase cracking which have their oil outlet opening near the top of the drum, may be well protected against corrosion by lining only the upper 2/5ths of their inner surface with concrete as shown in Fig. 2. Such partial lining may be advantageously employed on the Burton cracking stills. The inner protective lining on the upper part of the shell only does not interfere with the heat transfer through the lower part, which is heated.

Soaking drums, bubble towers, etc. are usually covered with a layer of asbestos or other heat insulating material (not shown on the drawing) to prevent loss of heat to the atmosphere. An inner concrete layer, besides acting as a protection against corrosion, also forms a heat insulating layer and is valuable in keeping down the temperature of the steel wall, thus increasing its tensile strength.

It is obvious that various modifications may be made on the above described method of eliminating the corrosion in cracking vessels without departing from the spirit of the invention as specified in the following claims.

We claim:

1. In a device for the heat and pressure treatment of hydrocarbons, a shell adapted to contain the hydrocarbons under pressure, and concrete lining the interior of the shell in liquid tight relation thereto.

2. In a device for the heat and pressure treatment of hydrocarbons, a shell adapted to contain the hydrocarbons under pressure, and reinforced concrete lining the interior of the shell in liquid tight relation thereto.

3. In a device for the heat and pressure treatment of hydrocarbons, a shell adapted to contain the hydrocarbons under pressure, concrete lining the interior of the shell in liquid tight relation thereto, and means carried by the shell for interlocking engagement with spaced portions of the concrete.

4. In a device for the heat and pressure treatment of hydrocarbons, a shell adapted to be partly filled with liquid hydrocarbons under pressure, and a lining substantially impervious to the compressed hydrocarbons disposed in the portion of the interior of the shell above and extending to substantially only the normal level of liquid in the shell.

5. In a device for the heat and pressure treatment of hydrocarbons, a shell adapted to contain liquid hydrocarbons under pressure, material substantially impervious to the hydrocarbons lining the interior of the shell above and extending to substantially only the normal level of liquid in the shell, and an annular ring carrier by the shell engaging the edge of the lining adjoining the normal liquid level.

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