

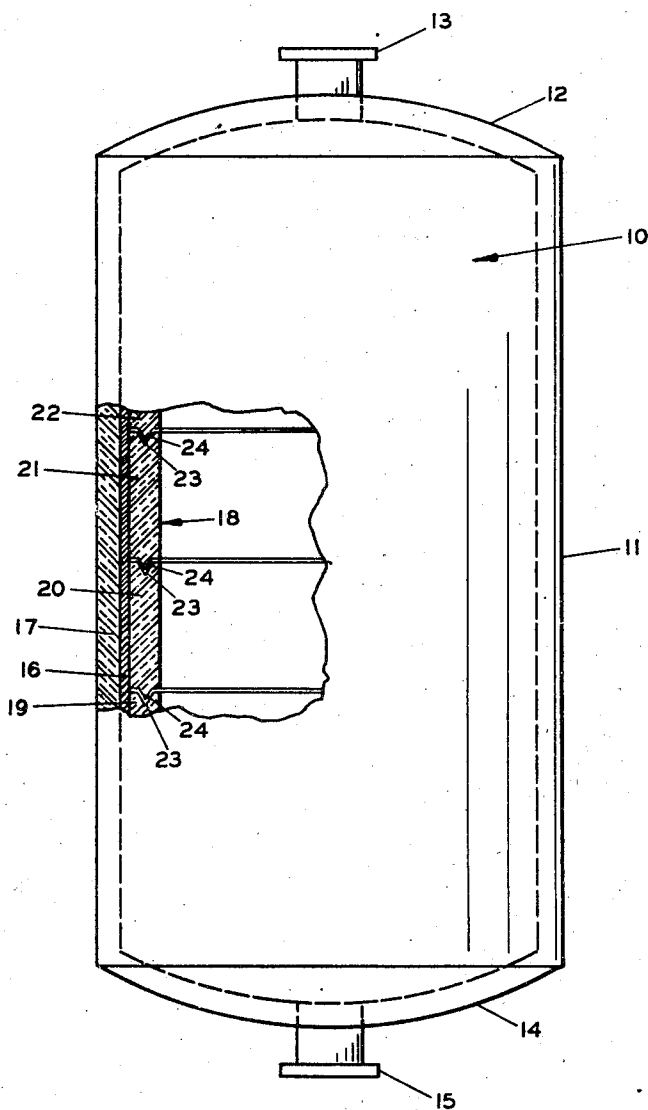
March 11, 1947.

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2,417,348

PROCESS OF LINING CATALYST CHAMBER

Filed March 29, 1943



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UNITED STATES PATENT OFFICE

2,417,348

PROCESS OF LINING CATALYST CHAMBERS

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Application March 29, 1943, Serial No. 481,031

1 Claim. (Cl. 25-155)

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This invention relates to improvements in the construction of catalyst chambers of the class employed in carrying out hydrocarbon conversions in the presence of solid catalyst material, and is particularly concerned with the improvements in the method of constructing such chambers to provide substantially fluid-tight heat insulating liners on the inner surface of the chamber.

In the course of hydrocarbon conversions over solid contact catalysts, the catalysts ordinarily undergo progressive deactivation due to the accumulation of carbonaceous residue deposits thereon, making it imperative to reactivate the catalyst at regular intervals. It is customary to reactivate a degenerated catalyst by burning off the carbonaceous deposits. As a result of the exothermic heat of combustion developed in the course of catalyst reactivation, the catalyst mass and the chamber may be raised to temperatures within the range of about 1000° to 1500° F. These elevated temperatures are attained in the presence of free oxygen-containing fluids, such as air; and by virtue thereof, ordinary metals, when directly subjected to such temperatures, deteriorate rather quickly. Moreover, high temperatures are required during the conversion period, and since the conversion is often endothermic, it is desirable to minimize heat losses in order to maintain an efficient rate of conversion. For these reasons it has become desirable and convenient to insulate the interior of the usual metal catalyst chamber with a liner of insulating material that is preferably of the refractory type. Such a liner protects the metal chamber from the detrimental effects of high temperatures, and in some cases enables the use of carbon steel instead of more expensive special alloy metals. Furthermore, the use of such a liner greatly reduces heat losses that would otherwise occur in the conversion process. Suitable heat resistant materials are preferably applied to the interior walls of the chamber by casting the same therein.

In the casting of liners of the character indicated, care must be taken to make the same substantially vapor-tight in order that the hot gases and/or vapors within the chamber may not pass through cracks and other continuous passages through the liner and reach the metal shell. When this occurs liners may be detached from the shell and the hot fluids may channel between the detached liner and the inner surface of the shell, thereby by-passing the catalyst bed. Such an eventuality results in unsatisfactory operation, heat losses through the chamber, and incomplete

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conversion of the process material. Vapor-tight liners are extremely difficult to form because of the tendency of the insulating materials, such as refractory cements, to shrink on setting after being cast in the form of a plastic mass. This is especially true in the case of relatively large chambers, and particularly those of extended length. Experience has proven that when present day methods of insulating the interior of such liners are employed, the liners tend to crack, due to shrinkage on becoming set. I have discovered that improved liners may be fabricated when they are cast in a plurality of sections on the inner surface of a side wall of a catalyst chamber to form a laminated type structure. For one thing, the stresses set up in individual sections are isolated and do not affect any adjoining sections. As will be readily apparent to those skilled in the art upon a complete examination of this invention as disclosed herein, the practice thereof affords a number of desirable advantages over the well-known catalyst chambers. The liners of my invention eliminate the possibility of objectionable cracks extending therethrough along the entire length of the chamber shell. Additionally, there is less likelihood of any cracks being formed when the insulating material sets and solidifies.

It is the primary object of this invention to provide a catalyst chamber having an inner liner of insulating material of improved construction and adapted to perform its intended functions in a wholly satisfactory manner.

Another object of this invention is to provide a sectional inner liner of cast heat-insulating material on the inner surface of the tubular wall of a catalyst chamber, which liner does not tend to become checked or cracked upon setting and in the course of normal use.

These, as well as other objects and advantages, will be readily apparent from an examination of the following detailed description taken in conjunction with the annexed drawing, wherein there is illustrated a preferred embodiment of the invention in elevation and partly in cross section particularly showing a preferred V-shaped groove and abutting tongue of insulating material.

Referring to the drawing, I have generally denoted a catalyst chamber by reference numeral 10, which chamber includes a substantially vertical side wall 11, a top wall 12 having an inlet 13 that communicates with the interior of the chamber, and a bottom wall 14 having an outlet 15 through which the conversion products are discharged from the chamber. The chamber is preferably of a conventional type

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having a removal top wall or cover which permits ready access to the interior for purposes of repair and removal or insertion of liner or catalytic materials. Side wall 11 consists of a substantially cylindrical and vertical tubular wall 10, that is fabricated from sheet or plate metal of requisite thickness and composition to withstand the temperature and pressure conditions to which it is subjected during normal operation; an external sheath of insulating material 17 preferably of the asbestos type; and an inner liner 18 of cast insulating material, preferably of the refractory type.

Inner liner 18 consists of a plurality of annular sections 19, 20, 21, and 22 that are disposed one above the other in an abutting relation, as illustrated. The upper end surface of sectional liners 19, 20, and 21 is each provided with at least one annular groove 23, preferably V-shaped, which is adapted to receive an annular tongue or projection 24 in the lower end surface of the adjacent and abutting sectional liner immediately thereabove. A coating of sealing material, such as a suitable grease, is interposed between the abutting surfaces of the sectional liners during fabrication.

In the course of the manufacture of the catalyst chamber, lower sectional liner 19 is first cast in the lower portion of metal shell 16 and is allowed to set or substantially solidify. Corresponding groove 23 is then formed in the upper surface of lower section 19, or if desired, said groove may be formed while the material of the liner is still in a plastic state. As soon as sectional liner 19 becomes substantially set, the upper end surface thereof, including corresponding groove 23, is coated with a sealing material of the character indicated above. Sectional liner 20 is then cast directly upon sectional liner 19, annular projection 24 extending into groove 23 in sectional liner 19. The procedure outlined herein is then repeated with respect to the remaining sectional liners. It will be noted that by virtue of the ring and groove arrangement at the juncture of the sectional liners an effective seal is obtained. Furthermore, should the fluid material admitted into the chamber tend to pass through this joint, it would be hindered by virtue of the extended path it would have to follow, as compared to the thickness of the liner. If desired, more than one groove and annular projection arrangement may be provided to thereby further increase said path. While I

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have disclosed the use of a suitable grease as the coating material between the sectional liners, it is to be understood that this term is used in a very broad sense and is intended to include various materials which become solidified upon being dried and/or heated so as to form a substantially fluid-tight barrier.

From the foregoing, it is believed that the method of the present invention will be readily comprehended by persons skilled in the art. It is to be clearly understood, however, that various changes in the method herein set forth, may be resorted to without departing from the spirit of the invention as defined by the appended claim.

I claim:

In the insulation of a chamber for the catalytic conversion of hydrocarbons, the process of installing refractory material for the protection of the walls of said chamber, which comprises casting a first section of hard-setting, heat-insulating, plastic material in the inner surface of the lower portion of said chamber wall, forming at least one annular V-shaped groove substantially concentric with said chamber wall in the upper edge of said cast section, allowing said first section to set and assume substantially its maximum contraction, casting a relatively narrow section of said insulating material above said first section with a tongue fitting into said groove to form a vapor-tight unannexed joint between said sections and allowing a similar period for setting and contraction, and successively repeating the operation of casting relatively narrow sections of insulation with similar setting and contracting periods of time between each successive layer to completely line the inner surface of said chamber with vapor-tight sections of insulation.

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