Oct. 20, 1942. H. F. WEST 2,299,197

CATALYTIC UNIT

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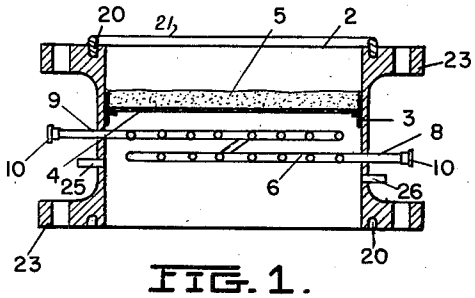


FIG. 1.

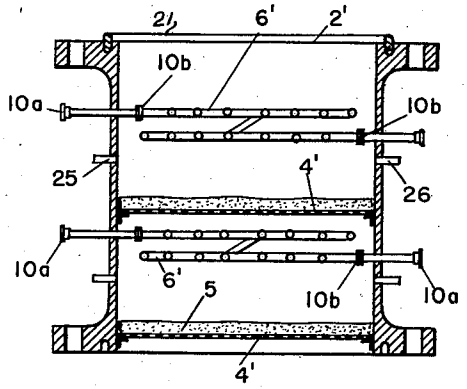


FIG. 2.

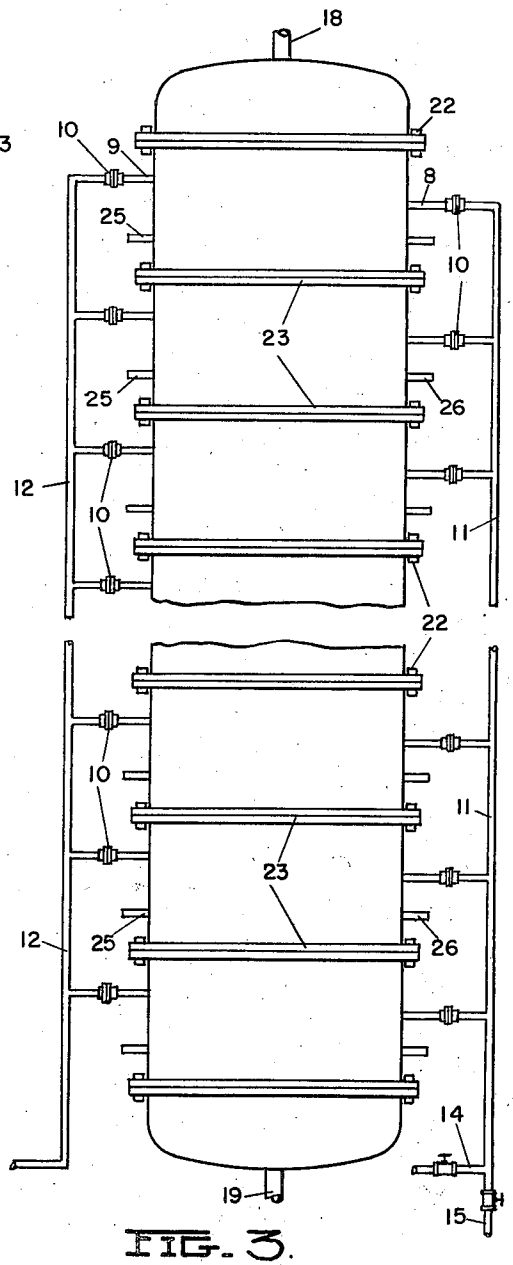


FIG. 3.

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CATALYTIC UNIT

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3 Claims. (Cl. 23—288)

This invention relates to apparatus for catalytic usage, and particularly where heat transfer, by heat addition or heat withdrawal, is desired. In catalytic usages where heat transfer is involved, it has been a matter of great difficulty heretofore to adapt the amount of catalyst in exposure such as to allow proper action, without localized over-heating or other defect in desirably even heat transfer. Furthermore, in the use of catalytic material as heretofore customary in tubes or beds, it has been impossible to obtain access to any particular limited portion of the catalytic material without having to disturb practically the whole of it. In accordance with the present invention however, it now becomes possible to apply catalytic material in unit form, such that the entire amount may be in greater or less scope as desired for any particular usage, and any desired portion of the material may be easily reached for change or other necessary attention. Other objects and advantages will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing—

Fig. 1 is a vertical sectional view of a catalytic unit in accordance with the invention; Fig. 2 is a similar view of a slightly modified form; and Fig. 3 is a vertical elevational view of the units as assembled in multiple for operation.

Referring more particularly to the drawing, there is shown in Fig. 1 a unit 2 comprising a hollow section, which may be circular or rectangular as may be preferred, and which contains supporting or bracket means 3 upon which is carried a tray 4 of grid or mesh character so as to be pervious, and supporting a mass of pervious catalytic material 5. Such trays are preferably loosely mounted within the unit so as to be capable of easy removal for changing of the contents, etc. In association with the tray, in or near, is some suitable heat transfer means. Thus, desirably, adjacent the tray of catalytic material, preferably below, is a heat transfer coil 6 having its turns suitably disposed for uniform effect upon the tray of catalytic material and having inlet and outlet ends 8, 9. These connect by separable means or unions 10 to supply and discharge connections, which may be individual and involving valves, or more conveniently headers 11, 12. The former is in communication through valve controlled connections 14, 15, with sources of heating and cooling fluids respectively. Depending upon the particular catalytic material in the trays and the temperature desired the heating means may be steam or high temperature agents such as molten salts, such as sodium nitrite, sodium nitrate, potassium nitrate, etc., flue gas, electrically applied heat, etc., and the cooling fluid may be water or brine, etc. Inlet and outlet connections 18, 19, are provided for the material to be catalyzed, in vapor or liquid form, as preferred. The units are assembled in sealed assembly, that is the joints between units are suitably tight to prevent escape of material from within, or leakage of air from without, and gaskets may be employed, fitting the opposed surfaces of the assembled units, or preferably the units are provided with facial grooves 20 and suitable sealing rings 21, as of soft steel or other desired material may be positioned by the grooves for tight sealing. The units are held together by suitable securing means. For instance, bolts 22 through matched holes in the flanges 23.

In some instances it is desirable to provide a plurality of trays 4' in a unit 2'. The heat transfer coils 6' may again each have its own separable connections 10a for joining to the headers 11, 12. Inside unions 10b facilitate placement and removal.

The units being provided with such catalyst as is desired, for instance oxide catalysts of chromium, aluminum, silicon, etc., for aromatization or action upon hydrocarbons or on alcohols, etc., and the units being assembled and connected up as indicated, the material to be catalyzed is passed therethrough. As will be seen from the arrangement provided, the catalytic material is in uniformly relatively thin mass at each point, and the material to be catalyzed may pass therethrough readily. For some uses I apply different catalysts in different or alternate trays. My construction particularly favors such combinations. For reactions requiring supply of heat, the heating fluid is passed through the heat transfer coils in controlled amount. For operations requiring removal of heat, the cooling fluid is provided as required. Especially, I may apply heating at some points and cooling at others. In each instance, a particularly effective transfer is had, by reason of the arrangement with relation to the catalytic material, and also because of the multiple feeder control. The products of reaction pass off

through the outlet of the apparatus, to fractionators or other apparatus as desired. For some uses, additional pipe connections **25, 26** in each unit are desirable, as for instance for feed and discharge of air. And, if preferred, these instead of being individually valve-controlled, may be connected to manifolds analogous to manifolds **11, 12**, to simplify operation.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. Catalytic apparatus comprising hollow assemblable cylindrical units with and flanges and take-up bolts, grooves in the faces of opposed flanges adjacent the bolts, rings engaging in the opposed grooves, spaced superposed removable trays for catalytic material in each unit, means for maintaining the catalytic material at a uniform temperature, including heat transfer coils outside of but between adjacent trays, and means for providing access to trays under coils, including easily demountable coil connection unions within the unit.

2. Catalytic apparatus comprising hollow assemblable cylindrical units with end flanges and take-up bolts, grooves in the faces of opposed flanges adjacent the bolts, rings engaging in the opposed grooves, removable trays for catalytic material within the units, and means for maintaining the catalytic material in each unit at a uniform temperature including heat transfer coils in each unit outside of but between adjacent trays.

3. A catalytic unit assemblable unit to unit in number desired, spaced superposed removable trays for catalytic material in each unit, means for maintaining the catalytic material at a uniform temperature, including heat transfer coils outside of but between adjacent trays, and means for providing access to trays under coils, including easily demountable coil connection unions within the unit.

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