

July 31, 1945.

D. B. BANKS

2,380,495

SAFETY DEVICE FOR CATALYTIC CONVERTERS

Filed Sept. 22, 1941

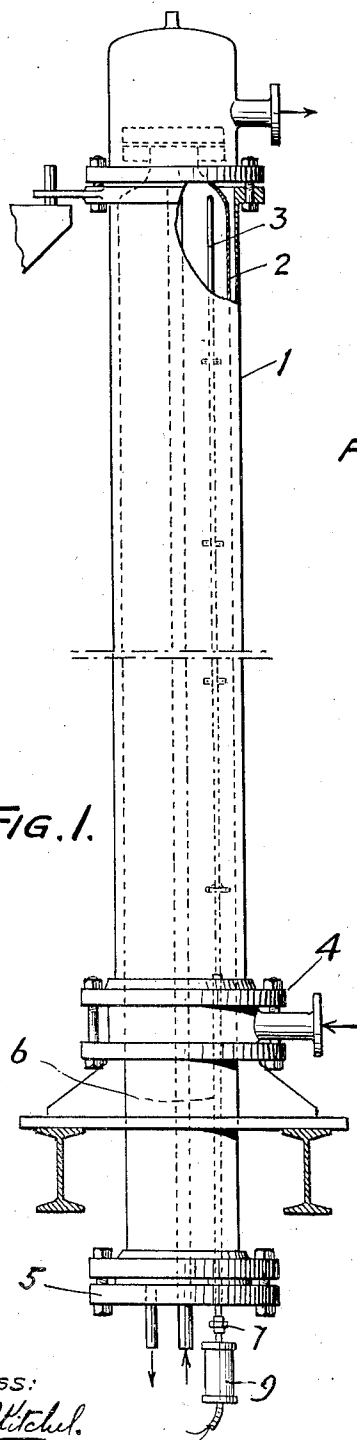


FIG. 1.

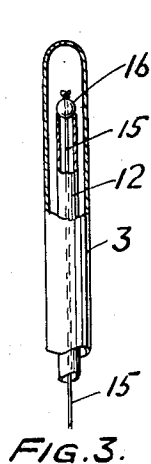


FIG. 3.

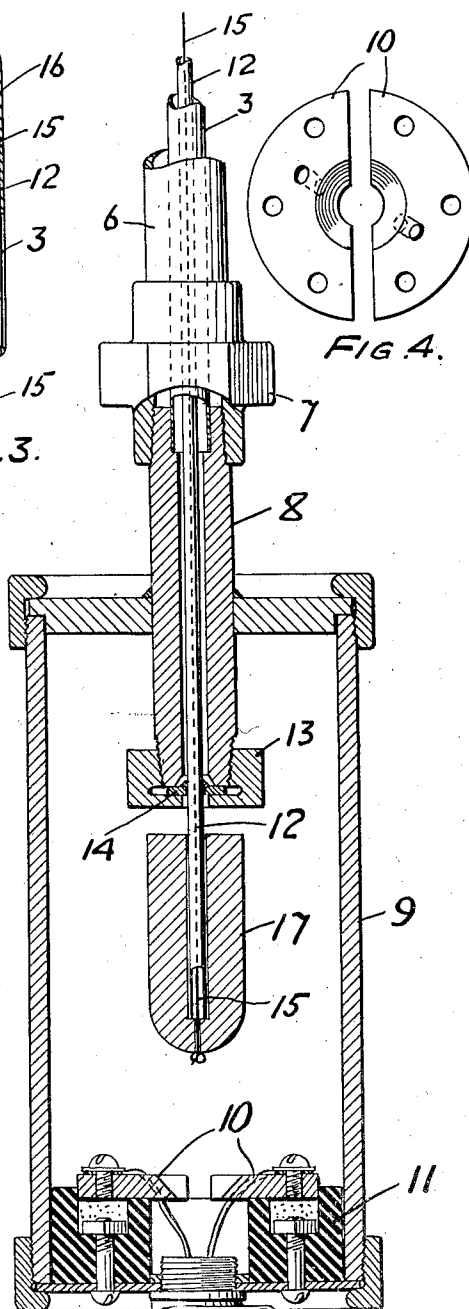


FIG. 2.

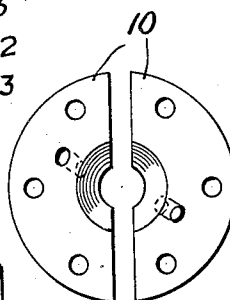


FIG. 4.

WITNESS:
Robert Mitchell

INVENTOR
Daniel B. Banks
BY
Bussier and Harding
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,380,495

SAFETY DEVICE FOR CATALYTIC CONVERTERS

Daniel B. Banks, Drexel Hill, Pa., assignor to Sun Oil Company, Philadelphia, Pa., a corporation of New Jersey

Application September 22, 1941, Serial No. 411,800

7 Claims. (Cl. 23-288)

The present invention relates to catalytic converters and particularly to that type of catalytic converter which is alternately on-stream and in regeneration.

In the transformation of hydrocarbons, either treating, polymerization or hydrogenation, and in other common chemical reactions, the catalyst used, regardless of the type, very often becomes contaminated by the reaction and must be regenerated either by oxidation or by chemical treatment. The regeneration operation may be either endothermic or exothermic, although most generally it is an exothermic reaction such as the oxidation of contaminants which are deposited on the catalyst during the on-stream period. The regeneration must be very carefully controlled since practically all catalysts are injured or rendered useless when heated to excessive temperatures.

A number of methods for measuring the temperatures at selected points in converters have been devised recently as well as especially designed converters to prevent such damage. Such an apparatus is described in the patent issued to me June 3, 1941, No. 2,244,599.

However, due to concentration of contaminants within the catalytic mass, or some variations in the catalyst, the regeneration reaction may develop a spot wherein the temperature may become excessive. This locus may be in such position relative to the temperature measuring devices as not to be detected until irreparable damage is caused.

The present invention has for its object the provision of a safety device whereby damage by excessive temperatures during the catalyst regenerating reaction will be prevented.

A further object is to provide a safety device which may readily be assembled or disassembled with any type of converter in which catalyst is used.

Other and further objects will appear as the description of the accompanying drawing progresses.

In the drawing:

Fig. 1 shows a side elevation of a catalytic converter with the temperature control device in place.

Fig. 2 shows a sectional elevation of the control device.

Fig. 3 shows an elevation partly in section of the upper portion of the device.

Fig. 4 shows a plan view of the electrical contact plates.

Generally stated, the invention comprises a control device of the fusible link type in con-

junction with means for closing an electric circuit which is operable to stop the operation when excessive temperature, at any point throughout the length of the catalyst bed, fuses the link.

Fig. 1 designates the outer shell of the catalytic chamber 1 having therein an inner shell 2 which contains the catalyst and provided with an inlet and an outlet tube for the admission and exit of reactants. Positioned within the inner chamber 2 is a tube 3 having the top thereof closed and extending at the bottom to a point entirely outside the outer case 1. Since the inner case 2 extends only to the flange 4, the tube 3 between the lower tube sheet 5 and the flange 4 is positioned within an outer tube 6 shown in dotted lines only. The outer tube 6 extends to a point outside the casing and has a threaded coupling 7 thereon. The lower end of the tube 3 is fastened to a nipple 8 which is screwed into the coupling 7. Fixedly secured to the nipple 8 is a switch box 9 having therein contacts 10 mounted on insulating material 11. The contacts 10 are shown in plan view in Fig. 4. Positioned within the closed tube 3 is a smaller metallic tube 12, preferably of the type used to house thermocouple leads, which are flexible and capable of being inserted within the tube 3 without disassembling the case. The inner tube 12 is secured in position by threaded coupling 13 and washer 14, which is welded to the tube 12. Within the tube 12 an aluminum or other low melting point wire 15 is suspended by means of a ball 16 positioned on the upper end of the tube 12. On the lower end of tube 12 a weight 17 is slidably mounted and affixed to the lower end of the wire 15.

In operation, if the temperature of the catalyst, either during the time it is on-stream or in regeneration, exceeds the melting point of the wire 15, the wire will part and permit the weight 17 to slide down the inner tube 12 and close the circuit between the switch elements 10, thereby operating an alarm or relay means, which in turn would operate any desired control means in taking the case off-stream or for increasing the flow of the cooling fluid to the annular space between the outer casing 1 and the inner casing 2 of the catalytic converter 1. Such alarm or relay means are known in the art and, since they form no part of my invention, require no description or illustration. In case the wire 15 is melted by excessive temperature and the weight 17 dropped, it may be easily replaced by removing the outer casing 1 and the coupling 13. Due to the flexible nature of the tubing 12, it is easily insertable through the nipple 8 and tube 3 after a new wire

15 has been placed therein, even though the lower tube sheet 8 may be only a few feet from the ground.

While a single fusible wire 15 has been shown and described, it may in some cases be desirable to have the element 15 made up of a series of links having alternate fusible and non-fusible sections, so that the specific location of any hot spot may be determined by the position of the link which fuses.

What I claim is:

1. In a catalytic converter, the combination with a chamber adapted to contain the catalyst and having an inlet and outlet for admission and exit of reactants and otherwise enclosed, of a device for preventing damage to the catalyst comprising a fusible element, devices supported by the chamber and supporting the fusible element at its upper end, switch means outside and below said chamber, means, also outside said chamber, suspended by said fusible element and operable to close said switch means upon fusion of said fusible element, a rigid tube fixedly positioned in said chamber and extending substantially throughout the length thereof and adapted to be embedded in the catalytic mass, said fusible element extending from said switch-closing means into said rigid tube and substantially throughout its length, whereby any localized excessive temperature in the catalytic mass will effect fusion of said element at the locus of said excessive temperature and the release of the switch-closing means.

2. In a catalytic converter, the combination with a chamber adapted to contain the catalyst, of a safety device for preventing damage to the catalyst comprising a fusible wire extending substantially throughout the length of said chamber and at one end beyond and below the same, switch means, means suspended by said fusible wire operable to close the switch means when the temperature of the catalytic mass at any point of the length of the chamber exceeds the melting point of the fusible wire, a flexible tube enclosing the fusible wire and from the upper end of which, near the upper end of said chamber, the fusible wire is suspended, a rigid tube fixedly positioned in the chamber and surrounding the flexible tube and wire, means supporting said flexible tube, said flexible tube being severable from said supporting means and, with the fusible wire contained therein, being insertable within and removable from the rigid tube through the lower end of said chamber.

3. In a catalytic converter, the combination with a chamber adapted to contain the catalyst, of a safety device for preventing damage to the catalyst comprising a fusible wire extending substantially throughout the length of said chamber and at one end beyond and below the same, switch means, means suspended by said fusible wire operable to close the switch means when the temperature of the catalytic mass at any point of the length of the chamber exceeds the melting point of the fusible wire, an inner tube enclosing the fusible wire and supporting it at its upper end, a rigid tube fixedly positioned within the chamber and enclosing the inner tube and fusible wire, a connection between the lower end of the rigid tube and the lower portion of the inner tube whereby the latter is supported near its lower end above said switch-closing means, said connection between the rigid tube and the inner tube being

severable to allow the removal of the inner tube and also its replacement, with a new fusible wire, through the lower end of the rigid tube.

4. In a catalytic converter, the combination with a chamber adapted to contain the catalyst, of a safety device for preventing damage to the catalyst comprising a fusible wire extending substantially throughout the length of said chamber and at one end beyond and below the same, switch means, means suspended by said fusible wire operable to close the switch means when the temperature of the catalytic mass at any point of the length of the chamber exceeds the melting point of the fusible wire, an inner tube enclosing the fusible wire and supporting it at its upper end, a rigid tube fixedly positioned within the chamber and enclosing the inner tube and fusible wire, an outer tube secured in fixed relation with and surrounding the rigid tube below the lower end of said chamber, a nipple depending from said outer tube and connected with the lower end of said inner tube, and means removably securing said nipple to the inner tube.

5. In a catalytic converter, the combination with a chamber adapted to contain the catalyst, of a safety device for preventing damage to the catalyst comprising a fusible wire extending substantially throughout the length of said chamber and at one end beyond and below the same, switch means, means suspended by said fusible wire operable to close the switch means when the temperature of the catalytic mass at any point of the length of the chamber exceeds the melting point of the fusible wire, an inner tube enclosing the fusible wire and supporting it at its upper end, a second tube surrounding the inner tube and fusible wire, means supporting the second tube in fixed relation with the chamber, a nipple whose upper end connects with the lower end of the second tube and whose lower end is removably connected with the inner tube and a switch box carried by the nipple and carrying said switch means.

6. In a catalytic converter, the combination with a chamber adapted to contain the catalyst, of a safety device for preventing damage to the catalyst comprising a fusible wire extending substantially throughout the length of said chamber and at one end beyond and below the same, a rigid tube in fixed relation to the chamber and enclosing that part of the fusible wire extending within the chamber, switch means, means suspended by said fusible wire operable to close the switch means when the temperature of the catalytic mass at any point of the length of the chamber exceeds the melting point of the fusible wire, a flexible tube enclosing the fusible wire and supporting it at its upper end, a nipple outside said chamber above said suspended means and surrounding the said flexible tube and fusible wire, means independent of said tube and wire to support the nipple, and a removable coupling connecting said nipple and tube and holding the tube and wire in position to operate, whereby, after said wire is fused and the switch means closed, the coupling may be removed, a new wire inserted from the bottom through the nipple and into and through said chamber and the coupling reapplied to the nipple and tube.

7. The construction defined in claim 2 in which the support for the upper end of the fusible wire comprises means on said end closing the upper end of the flexible tube.

DANIEL B. BANKS.