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HYDROCARBON CRACKING REACTION CHAMBER

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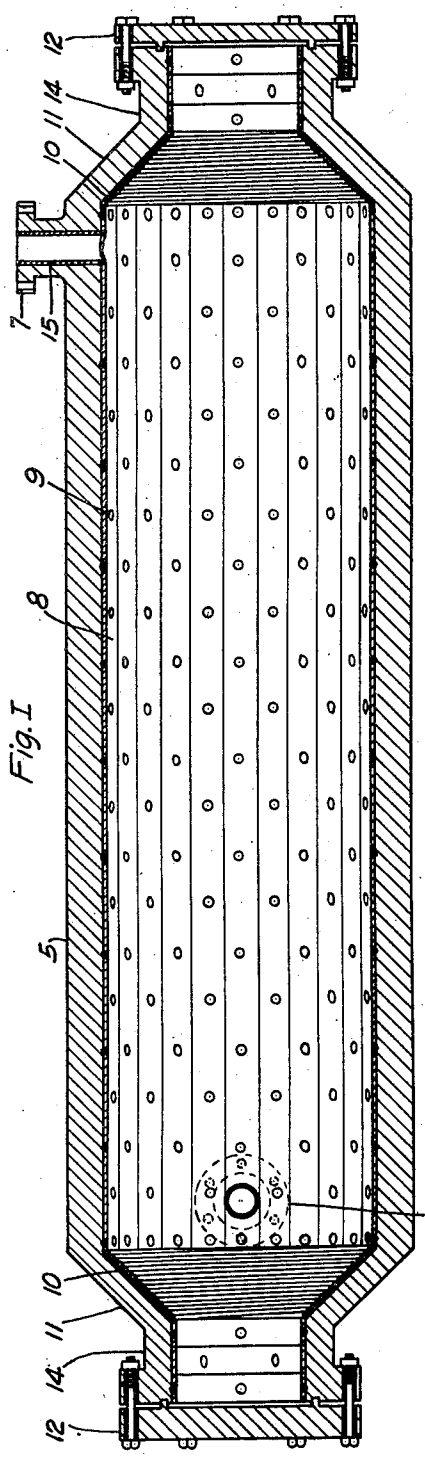


Fig. I

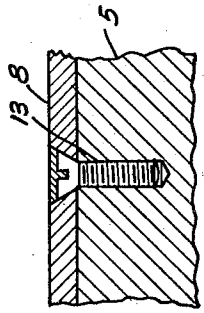


Fig. IV

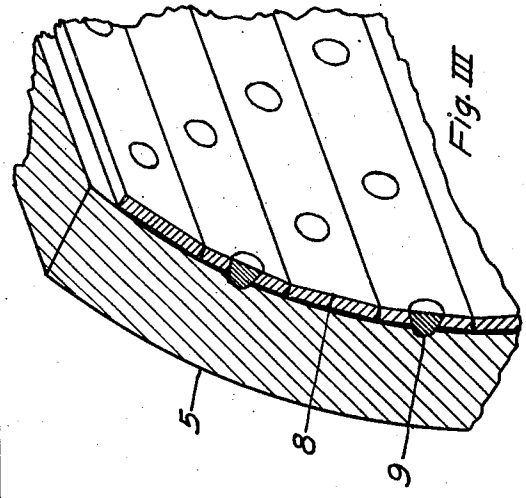


Fig. III

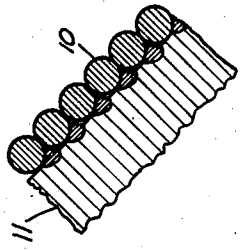


Fig. II

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HYDROCARBON CRACKING REACTION CHAMBER

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5 Claims. (Cl. 196—133)

This invention relates to containing apparatus or reaction chambers for hydrocarbon oil cracking, distilling and reforming operations for the production of thermomolecular decomposition products, such as gasoline or motor fuel stocks, and comprises containers, receptacles or the like in which hydrocarbon oils, such as petroleum oil, are contained during a cracking operation, and is more especially directed to rendering hydrocarbon oil contacting surfaces resistant to the action of corrosive agents contained in the oil or produced by thermomolecular decomposition reactions or distillation operations.

Hydrocarbons, such as shale or petroleum oils, may contain active constituents such as sulphur compounds and other bodies, which, due to their corrosive action, are particularly injurious to the metal comprising the container or reaction chamber in which the hydrocarbon oil is contained during the cracking or distillation operation. In the cracking of hydrocarbon oils thermodecomposition and molecular rearrangements occur, and due to the heat to which they are subjected, the activity of these sulphur compounds and other corrosive agents is greatly intensified, so that the receptatcle, container or reaction chamber in which they are treated is of short life unless protected by noncorrosive metals or noncorrosive liners. This corrosive feature prevails with any and all processes or any combination of the processes now employed for cracking or distilling oil. Many attempts have been made to provide suitable reaction chambers for oil cracking operations which will resist the destructive action of these sulphur compounds and other corrosive agents, but with only partial commercial success due to the high cost of material which will withstand the corrosive action of such agents.

It is known in the art that chromium alloys, such as chromium steel, nickel chromium steel or silicon alloys, will withstand to a high degree the corrosive action of these agents, but due to the high cost of constructing the large containers required for digesting cracking operations, commercial success has not been completely achieved, although pipe coils made of chromium alloy, substantially resistant to the corrosive action of sulphur compounds produced by cracking operations, are now used with commercial success.

Now I have discovered an improvement in the art of constructing reaction chambers, which consists of an economical and easily applied protective coating or liner for distilling, reforming or cracking apparatus, consisting of strips of corrosion resisting material such as strips of chromium alloy or silicon alloy, said strips abutting or placed in close contact with one another but not necessarily welded together), the liner strips being fastened to the shell by spot welding, split rivets or screws, although my preferred method is by spot welding through a counter sunk hole, as shown in Figure III of the drawing.

I have found that large sheets of corrosion resisting material when applied to cracking chambers or the like will not stay in conformity to the shell, as coke or carbon deposits will form and grow between the liner sheets and the shell, forcing them apart with consequent deformity of the liner. Now I have discovered that by using comparatively narrow sheets or strips, they will hold their shape and conform to the inside surface of the chamber, and after being put in operation carbon will deposit in the interstices between the strips, and will act to prevent the corrosive agents from attacking the base metal of the shell, and thus weld the whole into an integral liner resistant to corrosion. Conical surfaces may be protected by using corrosion resisting wire welded to the surfaces as shown in Figure II of the drawing, which, with the carbon deposited in the interstices after operation, will make an integral liner similar to the strips above described.

Therefore, my invention comprises lining steel, iron or other metal distillation or reaction chambers, which are ordinarily corrodible by products produced in the cracking or distillation of petroleum oils, with liners made of chromium alloy or silicon alloy, which is resistant to the action of sulphur compounds produced in cracking or distillation operations.

The object of this invention is to render containers or receptacles, such as large size reaction chambers employed in oil digesting cracking operations, resistant to the action of the corrosive agents produced by cracking or distilling hydrocarbon oil, by suitably protecting all parts of the inner surface of the container or reaction chamber that come into contact with such corrosive agents.

I have discovered that reaction chambers provided with an interior surface of metal strips or wire composed of chromium alloy or silicon alloy, which have been welded or otherwise attached to the interior surface of the chamber, are practically resistant to the action of the corrosive constituents produced in cracking or distilling operations, such as hydrogen sulphide, mercaptans and the like which act to corrode the interior surface of steel or iron reaction chambers

as heretofore constructed, and that reaction chambers having the interior surface lined with welded strips, or strips and wire, of a chromium or silicon alloy metal are practically unaffected by these active constituents produced by cracked hydrocarbon oils.

With the foregoing preliminary explanation, the preferred embodiment of my invention will now be more fully explained by reference to the accompanying drawing.

In the drawing, Figure I represents a vertical cross section of a metal reaction chamber lined with noncorrosive material in accordance with my invention.

Figure II is an enlarged cross section of a portion of the throat or tapered portions of the reaction chamber, showing the manner in which the noncorrosive wire lining is welded to the tapered parts of the reaction chamber wall.

Figure III is an enlarged isometric section of a portion of the reaction chamber wall, showing the manner in which the noncorrosive strips are spot welded to the cylindrical reaction chamber wall.

Figure IV is an enlarged portion of a section of the wall of the reaction chamber, showing an alternate manner of attaching the strips of noncorrosive metal to the reaction chamber wall by a screw connection.

In the drawing the same reference characters indicate corresponding parts in the different figures.

In the preferred form of embodiment herein illustrated by Figure I of the drawing, the reaction chamber comprises a metal cylindrical shell 5, with tapered sections 11 ending in cylindrical flange necks 14, which are closed by flange plates 12. Metal cylinder 5 is provided with flanged inlet and outlet connections 6 and 7, which are lined with push-in liners 15 made of chromium alloy metal.

Shell 5 is preferably constructed of steel of sufficient thickness to withstand working pressures up to 1500 pounds or higher, and lined longitudinally with strips of noncorrosive chromium alloy metal 8, such as chromium nickel steel or chromium steel, and/or strips of silicon alloy such as carborundum, or silicon alloys of iron, the strips preferably being welded to the steel shell at intervals by spot welding, as indicated in Figure III of the drawing by 9. However, other methods of welding or fastening the strips to the metal wall of the reaction chamber may be satisfactorily used, such as illustrated in Figure IV of the drawing, in which strips 8 are fastened to shell 5 by means of screw connections 13 counter sunk below the surface of strip 8, and the head of the screw covered with a noncorrosive chromium alloy metal filled in with a welding torch.

Tapered sections 11 of the reaction chamber are preferably lined with noncorrosive chromium alloy wire 10, welded to the inner wall as illustrated in Figure II of the drawing. Cylindrical necks 14 of the reaction chamber are also lined with noncorrosive chromium or silicon alloy strips, as shown in Figure I of the drawing, and attached to the inside metal wall by spot welding or screw connections as illustrated in Figures III and IV, or these necks may be lined with noncorrosive metal wire and attached by welding to the inside metal wall as illustrated in Figure II.

The reaction chamber thus described may be attached to any oil heating system known in the art, and heated oil passed therethrough at any desired temperature or pressure necessary for the production of cracked oil products without corrosive action to the chamber.

While the process herein described is well adapted for carrying out the objects of the present invention, it is to be understood that various modifications and changes may be made without departing from the spirit of the invention, and the invention includes all such modifications and changes as come within the scope of the appended claims.

I claim:

1. A hydrocarbon reaction chamber adapted for use in cracking and reforming hydrocarbon oils under superatmospheric pressure at high temperatures, the chamber comprising a metal cylinder with tapered cylindrical flanged ends, inlet and outlet pipe connections attached to said chamber for passing oil therethrough, a protective lining for said chamber consisting of strips of non-corrosive metal alloy fastened to the cylinder wall, non-corrosive metal alloy wire welded to the tapered section of the chamber, said strips and said wire abutting one to another to make an integral complete internal surface, and push-in liners for the inlet and outlet connections made of non-corrosive metal alloy positioned abutting to and integral with the chamber lining, to render the inner surface of the chamber and connections thereto resistant to the corrosive action of sulphur compounds produced by cracking and reforming hydrocarbon oils.

2. A hydrocarbon reaction chamber adapted for use in cracking and reforming hydrocarbon oils under superatmospheric pressure at high temperatures, the chamber comprising a metal cylinder with tapered cylindrical flanged ends, inlet and outlet pipe connections attached to said chamber for passing oil therethrough, a protective lining for said chamber consisting of strips of chromium alloy metal welded to the cylinder wall, chromium alloy metal wire welded to the tapered section of the chamber, said strips and said wire abutting one to another to make an integral complete internal surface, and push-in liners for the inlet and outlet connections made of chromium alloy metal positioned abutting to and integral with the chamber lining, to render the inner surface of the chamber and connections thereto resistant to the corrosive action of sulphur compounds produced by cracking and reforming hydrocarbon oils.

3. A hydrocarbon reaction chamber adapted for use in cracking and reforming hydrocarbon oils under superatmospheric pressure at high temperatures, the chamber comprising a metal cylinder with tapered cylindrical flanged ends, inlet and outlet pipe connections attached to said chamber for passing oil therethrough, a protective lining for said chamber consisting of strips of chromium alloy metal spot welded through spaced countersunk holes with a non-corrosive metal alloy filler to the cylinder wall, chromium alloy metal wire welded to the tapered section of the chamber, said strips and said wire abutting one to another to make an integral complete internal surface, and push-in liners for the inlet and outlet connections made of chromium alloy metal positioned abutting to and integral with the chamber lining, to render the inner surface of the chamber and connections thereto resistant to the corrosive action of sulphur compounds produced by cracking and reforming hydrocarbon oils.

4. A hydrocarbon reaction chamber adapted

for use in cracking and reforming hydrocarbon oils under superatmospheric pressure at high temperatures, the chamber comprising a metal cylinder with tapered cylindrical flanged ends, inlet and outlet pipe connections attached to said chamber for passing oil therethrough, a protective lining for said chamber consisting of strips of chromium-nickel-steel alloy metal welded to the cylinder wall, chromium-nickel-steel alloy metal wire welded to the tapered section of the chamber, said strips and said wire abutting one to another to make an integral complete internal surface, and push-in liners for the inlet and outlet connections made of chromium-nickel-steel alloy metal positioned abutting to and integral with the chamber lining, to render the inner surface of the chamber and connections thereto resistant to the corrosive action of sulphur compounds produced by cracking and reforming hydrocarbon oils.

5. A hydrocarbon reaction chamber adapted for use in cracking and reforming hydrocarbon oils containing sulphur compounds, under superatmospheric pressure at high temperatures, the chamber comprising a metal cylinder with tapered cylindrical flanged ends, which is corrodible by said sulphur compounds, inlet and outlet pipe connections attached to said chamber for passing oil therethrough, a protective lining for said chamber consisting of strips of chromium alloy metal welded to the cylinder wall, chromium alloy metal wire welded to the tapered section of the chamber, said strips and said wire abutting one to another to make an integral complete internal surface, and push-in liners for the inlet and outlet connections made of chromium alloy metal positioned abutting to and integral with the chamber lining, to render the inner surface of the chamber and connections thereto resistant to the corrosive action of sulphur compounds produced by cracking and reforming hydrocarbon oils.

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