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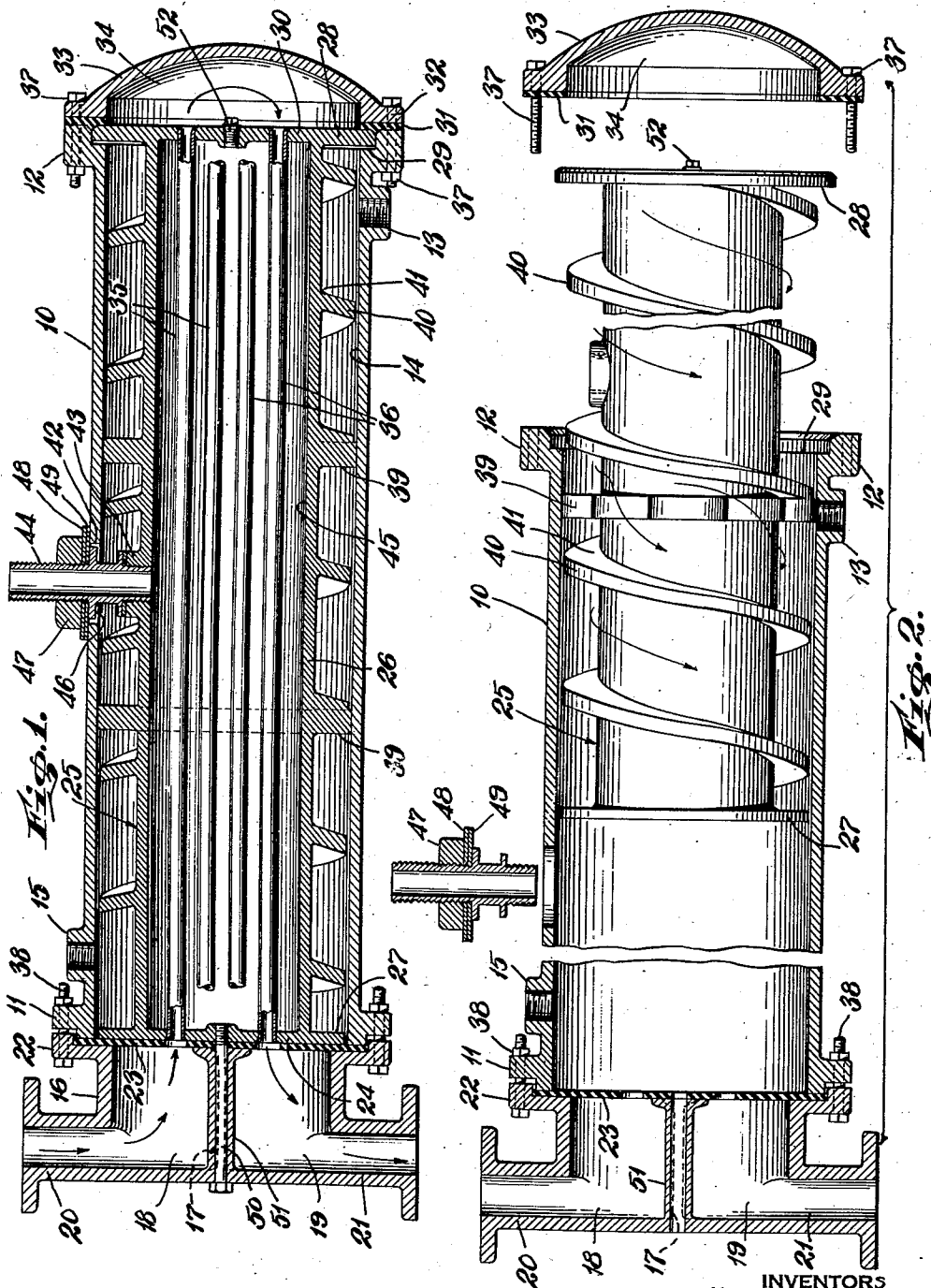


Fig. 2.

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HEAT EXCHANGER

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6 Claims. (Cl. 257—233)

This invention relates to heat exchangers or what may also be termed preheaters, and particularly to apparatus of this type and kind adapted primarily for use in preheating fuel oil prior to the feed of such oil to oil burners; and the object of the invention is to provide an apparatus of the class described wherein the steam circulating unit comprising a plurality of pipes or coils may be quickly and easily attached and detached with respect to the casing of the apparatus without disturbing the various pipes coupled therewith; a further object being to provide a unit of the class described wherein the casing or housing of said unit forms a safety chamber or jacket surrounding the steam circulating coils or pipes to insulate and shield the steam from the oil circulating passages in the event of a leak or breakdown in the steam tubes thereby preventing contamination of the fuel oil; a further object being to provide a unit of the character described wherein the casing or cylinder thereof includes on its periphery spiral fins forming a continuous spiral oil feed passage longitudinally of the periphery thereof within the outer casing of the apparatus so as to retard the flow of oil through the apparatus and extended over the greatest possible circumference with respect to the heating medium contained therein to provide an efficient heat transfer to the fuel oil; a further object being to provide a fitting coupling the outer casing with the tube or casing of said unit and to provide, for the chamber of said unit, a safety blow-off valve in the event of the discharge of steam into said chamber; and with these and other objects in view, the invention consists in an apparatus of the class and for the purpose specified, which is constructed as more fully hereinafter described.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of our invention are designated by suitable reference characters in each of the views; and in which:

Fig. 1 is a longitudinal sectional view through a preheater made according to the invention with part of the construction shown in elevation.

Fig. 2 is a view similar to Fig. 1 showing further parts in elevation with parts of the construction broken away, and also illustrating the parts in a semi-detached relationship.

From the following description and in making reference to the accompanying drawing, the invention will be described as an oil preheater in illustrating one adaptation of the heat exchanging apparatus. It will be understood, however,

that the apparatus may be used for any purpose, and while the present apparatus is further described for use in dealing with high pressure steam as a heat medium, other heating mediums may be employed. Still further, it will be understood that any type of fluid may be circulated through the spiral passages which are provided.

In the drawing 10 represents a main casing or jacket of the apparatus which is flanged at its ends as seen at 11 and 12. At 13 is shown an inlet boss providing for the admission of oil into the chamber 14 of the jacket 10; and at 15 is shown the discharge boss from which oil or other fluid circulated through the chamber 14 is discharged. These inlets and outlets are disposed at opposite ends of the jacket 10 as clearly seen in the drawing. Coupled with the flanged end 11 of the jacket is a steam dispersing chamber 16, divided by a partition 17 into an inlet side 18 and an outlet side 19, the inlet passage to the chamber 18 being shown at 20 and the outlet of the chamber 19 being shown at 21.

Supported between the flange portion 22 of the steam chamber or header 16 and the flange 11 is a gasket 23, which is exposed for engagement with the end plate 24 of a heater unit 25. This unit comprises an elongated tubular casing 26 outwardly flanged at one end as seen at 27. The other end of the heater casing or tube 26 has a similar flange 28, enlarged to extend into a recess 29 in the face of the flange 12, the casing having an end plate 30. A gasket 31 is disposed between the flange 32 of a dome-shaped closure plate 33, secured to the flanged end 12 of the jacket 10, the gasket also bearing upon the flange 28 of the casing. The closure plate or cover 33 forms a return header chamber or passage 34 at said end of the heat exchanger so that steam passed into tubes 35 communicating with the chamber 18 is permitted to pass into other tubes 36 discharging into the chamber 19.

While only two tubes 35 and 36 are shown for illustrative purposes, it will be understood that any number of these tubes may be employed depending upon the capacity of the apparatus. In this respect, the present illustration is somewhat diagrammatic. The tubes 35 and 36 are permanently secured in the plates 24 and 30 by spinning over, welding or otherwise. It will thus be apparent that when the parts are assembled a complete unit 25 is formed.

The cover 33 is detachable with respect to the flange 12 by bolts 37, and other bolts 38 are employed in coupling the flange 11 with the flange 22.

The tube or casing 26 is provided at longitu-

dinally spaced intervals with two sets of circumferentially arranged projections 39 which serve to support the tube within the chamber 14 of the jacket 10. Also arranged on the periphery of the tube 26 is a continuous spiral fin 40 which forms in the chamber 14 a continuous spiral passage 41. The fins are spaced slightly from the wall of the casing 10 in the construction shown simply to avoid the necessity of having to finish the surfaces of the fin. When it is desirable to form a complete seal of the fin in the bore of the jacket 10, the same may be sufficiently large and finished for this purpose. However, in the present described use of the invention, any slight seepage of the oil circulated through the spiral passage 41 will not be objectionable. It will thus appear that the oil in entering the spiral passage 41 adjacent the inlet 13 will then flow around the tube or casing 36 through the spiral passage 41 and be discharged through the outlet 15. In this manner the progress of the oil is retarded and the oil is at the same time extended over the greatest possible area of the heater tube 26.

Centrally of the jacket 10 is formed a large aperture 42 in registering alinement with a threaded boss 43 on the tube 26 so that a fitting 44 may be coupled with the tube 26 and positively seated upon the boss 43 to form a discharge passage communicating with the chamber 45 of the tube 26. It will thus appear that in the event of a leakage or breakage in any one of the tubes 35, 36, an exhaust is provided for the steam which enters the chamber 45, and on the fitting may be arranged a suitable safety blow-off valve, not shown. The fitting 44 has a flange 46 arranged substantially in alinement with the outside diameter of the jacket 10 and fitting freely within the aperture 42 so as to compensate for longitudinal movement of the tube 26 in the jacket, and the fitting is sealed on the jacket 10 by a nut 47 operating upon a washer 48 and gasket 49.

It will appear from a consideration of Fig. 2 of the drawing that the main casing of the apparatus; that is to say, the jacket 10 including the steam chamber or header 16 may be fixedly retained in position with all of the pipe couplings therewith undisturbed in the operation of attaching and detaching the heater unit 25. This unit may be detached by simply removing the cover 33, the fitting 44, and removing a screw 50 arranged in an enlarged portion 51 of the partition 17 and engaging the end plate 24 to firmly support the casing in engagement with the gasket 23. When these are removed, the unit 25 may be pulled through the flanged end 12 of the casing as is clearly illustrated in Fig. 2. After the desired repairs have been made, the parts may be reassembled by first inserting the unit 25 into the jacket 10, securely mounting the same by the screw 50, then replacing the fitting 44 and cover 33.

In considering the apparatus as a heat exchanger generally, it will be understood that heating or cooling mediums employed may be circulated through the tubes 35, 36, or the spiral passage 41, and the fluid to be processed may likewise be circulated through either of the passages. In further uses of the invention, the chamber 45, instead of simply being an air chamber, may contain a heat transmitting or conducting medium in the form of an element or a fluid; and when fluids are utilized which are subject to evaporation, a supply or replenish-

ment of the fluid can take place through the fitting 44. When powdered or granular materials are employed, such for example as powdered copper, these may be inserted through the fitting 44 or through a plug 52 arranged centrally of the end wall 30 and accessible when the cover 33 is removed.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a heat exchanger the combination with a fixed jacket having means forming inlet and outlet chambers at one end thereof, of a circulating unit detachable with respect to said jacket, said unit being insertable and removable through the other open end of said jacket and sealed at said end by a detachable cover, said unit comprising an elongated tubular body having within the bore thereof circulating tubes adapted to communicate with said inlet and outlet chambers and with a return header chamber formed in said cover, means extending longitudinally of the outer wall of said unit forming in cooperation with the tubular body and the wall of said jacket a continuous spiral circulating passage extending from one end of the jacket to the other end thereof, and said jacket having inlet and outlet passages communicating with the ends of said circulating passage.

2. In a heat exchanger the combination with a fixed jacket having means forming inlet and outlet chambers at one end thereof, of a circulating unit detachable with respect to said jacket, said unit being insertable and removable through the other open end of said jacket and sealed at said end by a detachable cover, said unit comprising an elongated tubular body having within the bore thereof circulating tubes adapted to communicate with said inlet and outlet chambers and with a return header chamber formed in said cover, means extending longitudinally of the outer wall of said unit forming in cooperation with the tubular body and the wall of said jacket a continuous spiral circulating passage extending from one end of the jacket to the other end thereof, said jacket having inlet and outlet passages communicating with the ends of said circulating passage, said tubular body forming around said circulating tubes a chamber sealed at the ends of said tubular body, and means forming a passage opening into said chamber.

3. A heat exchanger of the class described comprising a main jacket, a centrally partitioned header cover detachable with respect to one end of the jacket, a cover plate detachable with respect to the other end of the jacket, a unit detachable with respect to said jacket upon the removal of said cover plate, said unit comprising an elongated tubular casing spaced with respect to the walls of said jacket to form a circulating chamber between said unit and jacket, said unit having end walls closing the ends of said circulating chamber, said header cover forming in conjunction with one end wall of the unit intake and discharge chambers, said cover plate forming in conjunction with the other end wall of the unit a return header for a medium circulated through said first mentioned inlet and discharge chambers, a plurality of circulating tubes arranged in and extending longitudinally of said unit in communication with said inlet and discharge chambers, and said jacket having inlet

and outlet passages in opposite ends thereof communicating with the circulating chamber.

4. A heat exchanger of the class described comprising a main jacket, a centrally partitioned header cover detachable with respect to one end of the jacket, a cover plate detachable with respect to the other end of the jacket, a unit detachable with respect to said jacket upon the removal of said cover plate, said unit comprising an elongated tubular casing spaced with respect to the walls of said jacket to form a circulating chamber between said unit and jacket, said unit having end walls closing the ends of said circulating chamber, said header cover forming in conjunction with one end wall of the unit intake and discharge chambers, said cover plate forming in conjunction with the other end wall of the unit a return header for a medium circulated through said first mentioned inlet and discharge chambers, a plurality of circulating tubes arranged in and extending longitudinally of said unit in communication with said inlet and discharge chambers, said jacket having inlet and outlet passages in opposite ends thereof communicating with the circulating chamber, and a fitting coupled with said jacket and unit casing providing a passage communicating with the chamber of said casing.

5. In heat exchangers of the class described, the combination with an outer jacket open at one end and a detachable cover closing said open end, of a circulating unit detachable with respect to said jacket through said open end, said unit comprising an elongated tubular body having connected end walls, said end walls being of greater diameter than the diameter of said body forming circumferential end flanges on said body,

said unit forming in said jacket a chamber closed at the ends of the jacket by said end flanges, a spiral fin connected to and extending longitudinally of said body to form a spiral circulating passage in said chamber opening through opposite ends of said jacket, means extending longitudinally through said tubular body and spaced with respect to the walls thereof forming other circulating passages opening through opposite end walls of said body, said end walls forming within the tubular body a chamber around said first named means, and means detachable with respect to said body and jacket forming a fluid connection with said last mentioned chamber.

6. In heat exchangers, the combination with a main jacket having a partitioned header cover at one end and a header cover detachable with respect to the other open end of said jacket, of a circulating unit freely detachable with respect to said jacket through said open end, said unit comprising an elongated tubular body having connected end walls, said end walls including radially extending circumferential flanges, said unit forming in said jacket a chamber closed at the ends of the jacket by the end flanges of said unit, said end walls forming within said tubular body a chamber, means mounted in said end walls and extending through said body chamber and opening into said header covers forming circulating passages in said body chamber, means detachable with respect to said body and jacket forming a fluid connection with said body chamber, and said outer jacket having means establishing fluid intake and discharge for the first named chamber.

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