May 19, 1936. A. F. SCHUMANN 2,040,959

HEAT INTERCHANGER

Filed Dec. 15, 1934

Fig. 1.

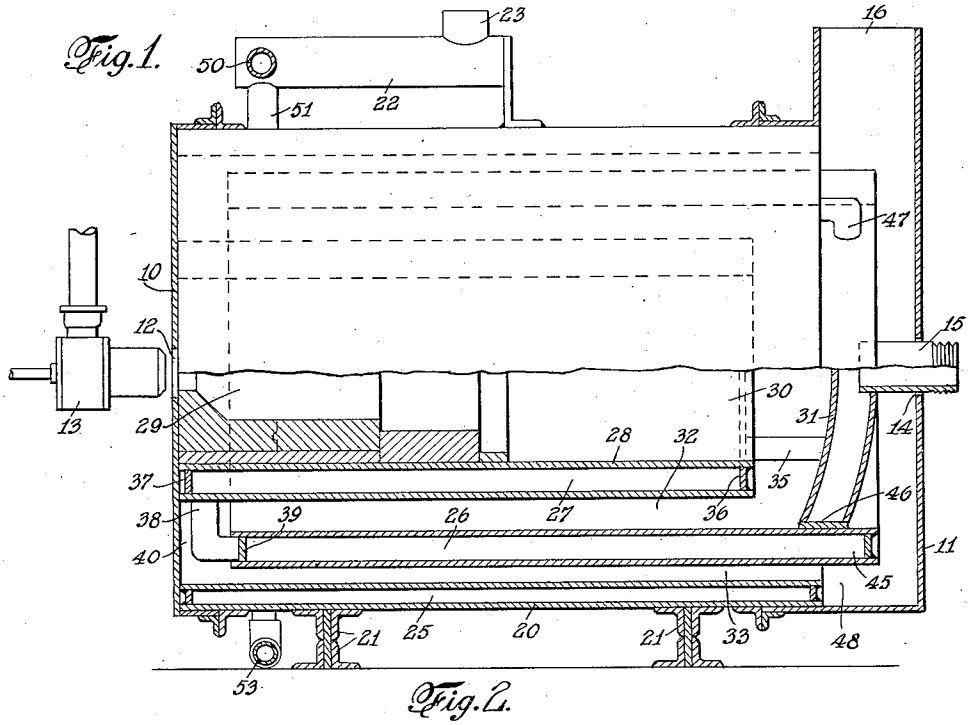
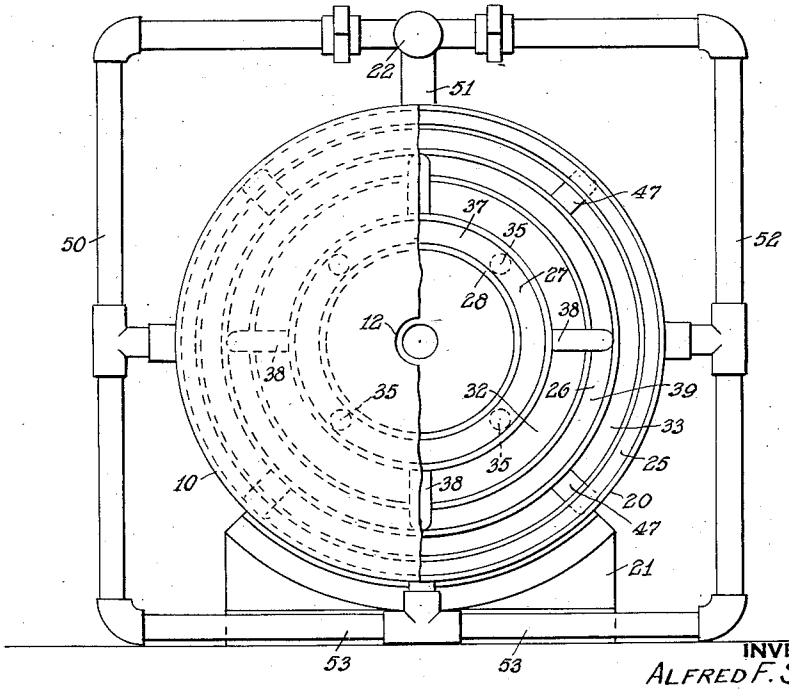


Fig. 2.



INVENTOR
ALFRED F. SCHUMANN
BY Fred L. Schuetz
ATTORNEY

Patented May 19, 1936

2,040,959

UNITED STATES PATENT OFFICE

2,040,959

HEAT INTERCHANGER

Alfred F. Schumann, Baltimore, Md., assignor to Hauck Manufacturing Company, Brooklyn, N. Y., a corporation of New York

Application December 15, 1934, Serial No. 757,615

1 Claim. (Cl. 122—136)

The invention relates to apparatus in which two moving fluids are placed in heat-exchange relation in order that the heat of the one may be rapidly communicated to the other; and more especially to apparatus in which the two fluids are circulated therethrough by means of a succession of coaxially positioned chambers.

The invention has for an object the provision of a simple and inexpensively constructed apparatus of this nature whereby a volume of a liquid, such as oil, may be rapidly heated in passing therethrough by means of a gaseous heating medium, such as the products of combustion of a combustible gas, also directed through the apparatus.

A further object of the invention resides in the provision of heat interchange apparatus embodying a plurality of coaxial passes for the gaseous heating medium and associated with intermediate chambers for heating of the liquid which is conveyed from one liquid heating chamber to the next through a plurality of individualized streams, whereby not only is better distribution of the liquid secured but carbonization is reduced to a minimum.

Still another object of the invention resides in the novel construction of heat interchanger whereby the respective liquid heating chambers are displaced axially with respect to one another to afford thereby communication space between the successive passes for the gaseous heating medium as well as baffles to the flow thereof; and to accommodate, also, connecting means for suitable transfer of the liquid from one chamber to a succeeding one.

The invention has for a further object the provision of a distributing head for the liquid to be heated, and a novel arrangement thereof with respect to a combustion chamber of the apparatus whereby the gaseous medium directed through said chamber will be deflected by the said head uniformly to the first pass for the medium.

Another object of the invention resides in the novel arrangement whereby the liquid distributing head affords a support for maintaining the spacing of the various passes and chambers and avoids the effects of expansion and contractions due to the variations in temperature to which the apparatus is subjected.

Still another object of the invention resides in the provision of communicating pipes between successive liquid heating chambers and adapted to serve as supporting means for these chambers.

In carrying out the invention, end heads are provided to secure therebetween a shell; and the one head has an axial opening for the introduction of the gaseous heating medium, while through the opposite head is introduced the liquid to be heated, said latter head also being provided with an outlet flue or duct for spent gases. Within this structure, and about a centrally disposed combustion chamber, is housed a plurality of coaxial passes for a flame or gaseous heating medium which is directed into the combustion chamber from a suitable burner or like means, there being interposed between the said combustion chamber and the respective passes annular liquid heating chambers or intermediate fluid passes coaxially arranged in the housing with respect to said heating chamber.

A liquid-distributing head is provided at the liquid entrance end of the housing, being located over, but axially displaced from, the far end of the combustion chamber and being curved to deflect the heated gases issuing from said chamber into the initial pass. From this head extends a plurality of pipes or connections for introducing the liquid in individualized streams to the initial liquid heating chamber which surrounds the aforesaid combustion chamber, and the inner wall of this liquid heating chamber is arranged to constitute the wall of said combustion chamber.

The communicating pipes aforesaid, between the said head and the initial liquid heating chamber, serve to support said head whose circumference contacts, with a more or less loose fit only, with the next-succeeding liquid heating chamber wall; and this chamber at its corresponding end is displaced axially with respect to the first-named liquid heating chamber so as to afford a passageway for the gases into the first pass therefor. This displacement of the succeeding liquid heating chamber provides for a similar communication at the opposite end of the second liquid heating chamber and for the accommodation of the pipe connections between the said first and second liquid heating chambers, the arrangement being continued in accordance with the number of passes for the liquid desired and providing a labyrinthine or tortuous passage for both fluids.

From the final pass or liquid heating chamber, the heated liquid is collected within a suitable distributing manifold, while the spent gases are disposed of through the stack or flue provided at the header opposite the burner end of the housing.

The nature of the invention, however, will best be understood when described in connection with the accompanying drawing, in which:

Fig. 1 is a part front elevation and part vertical section of the heat interchanger.

Fig. 2 is an end view thereof.

Referring to the drawing, 10 and 11 designate cylindrical heads of which the former is provided with an axial opening 12 to receive the flame and/or heated gases from a burner member 13 of any suitable type. The opposite head 11 is provided with an axial opening 14 into which is fitted a supply pipe 15 adapted to receive externally of the head a suitable hose connection or the like (not shown) for the liquid to be heated by the gases introduced from the burner, the gases when spent being discharged through a stack or flue 16 provided in the head 11.

Between the said heads is secured a cylindrical shell 20 and to whose underside suitable supports 21 may be attached, while at its top is shown secured a tank 22 for collecting and distributing the heated liquid, as through the outlet pipe 23. Shell 20 forms the outer wall of the last chamber 25 of a series of coaxial heating chambers for the liquid and of substantially equal length, the remaining chambers being designated by the reference characters 26 and 27. This latter liquid heating chamber 27 has its inner wall 28 constituting the wall of a combustion chamber 29 into which the burner 13 discharges and from whose opposite end 30 the flame and/or heated gases issue.

The arrangement is such, moreover, that these gases are caused to impinge against a distributing head 31 for the liquid to be heated and into which the pipe 15 discharges the supply of liquid. This head is preferably concave toward the outlet 30 so as to deflect the heating medium backwardly and uniformly through a pass 32 therefor located between the liquid heating chambers 26 and 27; and after flowing through this pass, they are redirected to a further pass 33 located between and formed by the two liquid heating chambers 25 and 26, until they finally discharge into the outer end of head 11 and through the stack 16.

The distributing head 31 is supported in part, by circularly disposed pipes 35, on a ring 36 forming the closure at one end of the liquid heating chamber 27, the said pipes 35 passing through this ring and discharging the liquid into the said liquid heating chamber in individualized streams to afford thereby a more rapid heating of the liquid and a more satisfactory distribution of the same through the chamber, as well as to minimize carbonization therein of the liquid, such as oil or other bituminous products. Chamber 27, moreover, is closed at its opposite end by a similar ring 37; and immediately from within the same extends outwardly a plurality of pipes 38 affording communication between said opposite end of the chamber 27 and the adjacent end of chamber 26, as in passing through the closing ring 39 of the said chamber 26.

It will be noted that this end of the liquid heating chamber 26 is displaced axially with respect to the corresponding end of the chamber 27 so as not only to accommodate the pipes 38 but to afford a space or duct 40 for the gaseous heating medium in flowing from its pass 32 to the next succeeding pass 33. This displacement of chamber 26 will extend its far end 45 beyond the corresponding circumference 46 of the head 31, the latter having a more or less snug fit with the inner wall of chamber 26 at the end 45, as shown, but not being rigidly attached thereto so that expansions and contractions of the said head will not cause undue stresses to occur in the heat interchanger structure. Moreover, the said head serves to maintain the spacing of the various chambers as well as assuring proper support therefor.

At the far end 45, communicating pipes 47 pass the liquid to the next succeeding and, in the present showing, final liquid heating chamber 25 which is displaced relative to the chamber 26 to accommodate the said pipes and afford a space or duct 48 for the outflowing gaseous medium. From this final pass of the heating chamber 25, the liquid is taken, from a plurality of points and by means of pipes 50, 51, 52 and 53, to the distributing manifold 22 from which it is supplied from its outlet 23 to the point of use.

It will be observed that as a result of this construction, an effective and thermally efficient heat interchange will occur, for example, for the direct heating of liquid bituminous products such as road oils, or other fluids.

I claim:

A heat interchanger comprising a central combustion chamber and means to direct therein a gaseous heating medium, said combustion chamber being surrounded by a series of coaxial, alternately arranged liquid heating chambers and passes for the gases from the said combustion chamber, a liquid distributing head for delivering the liquid to the liquid heating chamber nearest said combustion chamber, the said head being adapted to receive liquid from an external source and its inner surface being displaced from but located over the far end of the combustion chamber to direct the gases issuing therefrom to the first of the passes, and the said head also being supported by the first of said liquid heating chambers and being in contact at its circumference with the next-succeeding liquid heating chamber which extends beyond the same and is unattached thereto.

ALFRED F. SCHUMANN.