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PROCESS FOR HEATING FLUIDS IN A STILL OR THE LIKE

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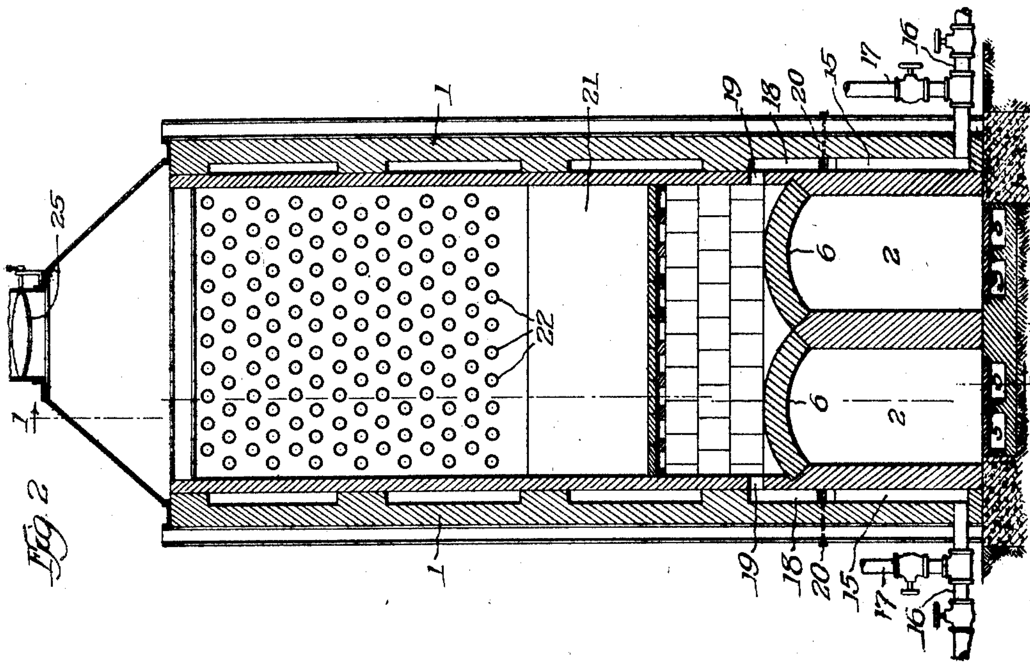

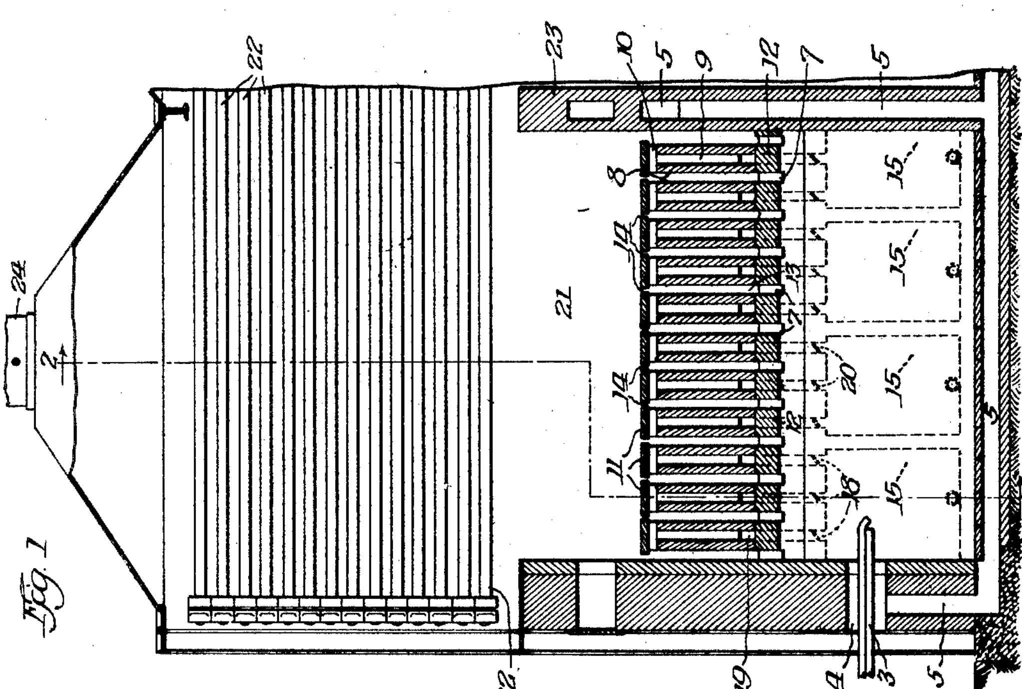

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UNITED STATES PATENT OFFICE

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PROCESS FOR HEATING FLUIDS IN A STILL OR THE LIKE

Application filed January 25, 1926. Serial No 83,544.

This invention relates to a process for heating a fluid in a still or the like. More particularly relates to a process for transmitting heat generated by combustion to a fluid which is decomposable by heat, such as a hydrocarbon oil.

An object of my invention is to apply the heat of combustion to a material which is capable of absorbing it and emitting it in the radiant form in such a manner as would raise such material to the temperature capable of effecting an intense radiation but reducing the temperature by absorbing a part of the heat transmitted to said material by heat interchange with a heat-absorbing fluid and subsequently effecting a heat interchange between the heat-absorbing fluid and the fluid which it is desired to heat as the final step in the process.

A further object is to thoroughly mix said heat-absorbing fluid with the gases of combustion so as to effect a heat interchange therewith and to effect a heat interchange between this mixture and the fluid which it is desired to finally heat.

A further object is to effect a heat interchange between the gases of combustion and said heat-absorbing fluid before they are brought into physical contact with each other in such a manner as to raise the temperature of heat-absorbing fluid to such a degree as will cause it to rise by convection with the gases of combustion.

A further object is to separate the gases of combustion and heat-absorbing fluid into a plurality of individual streams and effecting heat interchange between said gases and fluid by simultaneous, prolonged and separate contact with a heat-conducting material and subsequently bring said gases and fluid into physical contact and intermixture.

In order to carry out my process I have provided an apparatus which is illustrated in the accompanying drawings, but it is understood that my process may be carried out by other apparatus than that illustrated.

In the drawings—

Figure 1 is a longitudinal elevation partly in cross section of my apparatus taken on line 1—1, Fig. 2;

Fig. 2 is a cross section taken on line 2—2, Fig. 1.

The apparatus illustrated in the accompanying drawings is constructed as follows:—

1 are the side walls of a still which in the present instance is of the type known as a cracking still for the conversion of hydrocarbon oils. 2 are combustion chambers of the oil-burning type. Oil burners are located at 3 which are inserted through passages 4; air ducts 5 enter through the side walls 1 and lead underneath the combustion chambers 2 and discharge into passages 4. By this construction the air passing through ducts 5 receives a preliminary heating and also absorbs heat from the bottom of the combustion chambers 2 that would otherwise be dissipated and lost. Arches 6 are located at the top of combustion chambers 2 which are provided with a plurality of passages 7 through which the gases of combustion pass. Above the arches 6 are located a plurality of pairs of vertical walls so spaced relative to each other as to form passages 9 therebetween. Cross passages 10 at the outer ends of the walls 8 intersect the passages 9. Cap pieces 11 are located on top of walls 8 which form the upper wall of the passages 10 and extend beyond walls 8. The passage 9 is sealed at the bottom of the walls 8 by a member 12 of the arch 6. Passages 7 through arches 6 communicate with passages 13 formed between the pairs of walls 8. The cap pieces 11 are of such size as to extend partly across the passages 13 leaving outlets 14 from the passages 13. The cross passages 10 communicate with the passages 13 at a point below the cap pieces 11. Chambers 15 are located in the side walls 1 which are supplied with a heat-absorbing fluid through the valve controlled inlets 16. The heat-absorbing fluid may be air or any desirable fluid of this nature, such as steam.

In the construction herein shown air may be supplied through the valve-controlled inlets 16 and steam or other heat-absorbing fluid may be supplied through inlets 17. By manipulation of the valves in the inlets 16 and 17 either of said sources of supply may be used separately or combined as desired. A series of passages 18 lead from the chambers 15 through the walls 1 to the lower ends of the passages 9 with which they communicate at the points 19. Controlling valves 20 are located in the passages 18. The arches and walls described are preferably formed of a refractory material in the shape of bricks or slabs as shown. The mixture of heat-absorbing liquid and gases of combustion is delivered from the outlets 14 into a chamber 21, in the upper part of which is located a continuous coil 22 through which the fluid which it is desired to heat passes. In practice the structure shown in Fig. 1 is duplicated at the right of the wall 23 and the coil 22 extends longitudinally above the combustion chambers in both sections. Above the coil 22 are located a pair of stacks 24 provided with control dampers 25.

In operation the combustion chambers 2 would normally heat the arches 6 and superimposed walls to a temperature sufficient to emit intense radiant heat, but the introduction of the heat-absorbing fluid into and through passages 9 as described absorbs a portion of said heat from the arches 6 and superimposed structure by a prolonged contact with the walls 8, thus reducing their temperature so as to effect a reduction of the radiation which would otherwise be present. The gases of combustion and heat-absorbing fluid are physically mixed at the intersection of the passages 10 with the passages 13 and after emerging from the outlets 14 are discharged into the open lower end of the chamber 21, wherein they undergo a thorough heat interchange and intermixture before arriving in contact with the coil 22. The heated mixture then passes around the convolutions of the coil 22 imparting heat therefrom to the fluid contained in said coil in an even and efficient manner.

A particular advantage of my process lies in the fact that in place of intense radiant heat being applied to the lower rows of tubes comprising coil 22 in which the fluid therein cannot absorb the desired amount of heat in the short space of time it takes to pass through the said lower rows, it is transmitted to a large volume of fluid which passes around the tubes comprising the coil 22 and imparts its heat thereto in an even and efficient manner. My method of heat transference is particularly advantageous in the heating of a decomposable fluid such as hydrocarbon oil, since direct application of intense radiant heat causes a large amount of total decomposition of the oil due to local over-heating, which is avoided by my method.

Having described my invention, what I claim is:—

1. The process of heating a fluid in a still or the like which consists in generating heat by combustion, applying said generated heat to a material adapted to absorb and emit it in the form of radiant heat in such a manner as to cause the gases of combustion to pass through said material in unidirectional and prolonged streams and cause said material to become radiant, bringing said heat-absorbing fluid in prolonged contact with a heat-absorbing material in streams unidirectional and co-extensive with said streams of gases of combustion so as to cause a prolonged and uniform indirect heat interchange therewith so as to control the intensity of said radiancy, intermixing said heat-absorbing fluid with said gases of combustion substantially at the end of said prolonged contacts, passing the heated mixture thus formed into heat exchanging contact with a fluid containing means so as to heat the fluid therein and simultaneously applying said radiant heat to said fluid containing means.

2. The process of heating a fluid in a still or the like which consists in generating heat by combustion, applying said generated heat to a mass of material adapted to absorb and emit it in the form of radiant heat in such a manner as to cause the gases of combustion to pass through said material in unidirectional and pronlonged streams so as to have a prolonged contact with said mass and cause said material to become radiant, bringing a heat-absorbing fluid into prolonged contact with said mass in streams unidirectional and co-extensive with said streams of gases of combustion independently of said streams of gases of combustion so as to control the intensity of said radiancy, introducing said heat-absorbing fluid into said gases of combustion at a point substantially at the end of said prolonged contacts, passing the mixture thus formed into heat interchanging contact with a fluid-containing means so as to heat the fluid therein and simultaneously applying said radiant heat to said fluid containing means.

3. The process of heating a fluid in a still or the like which consists in generating heat by combustion, applying said generated heat to a mass of material adapted to absorb and emit it in the form of radiant heat in such a manner as to cause the gases of combustion to pass in separate unidirectional and prolonged streams through said mass in prolonged contact therewith and cause said material to become radiant, passing separate streams of a heat-absorbing fluid through said mass in unidirectional and co-extensive relation to said streams of gases of combustion so as to have prolonged contact with said mass independently of said streams of gases of combustion so as to control the intensity of said radiancy, introducing said streams of heat-absorbing fluid into said streams of gases of combustion substantially at the end of said prolonged contacts, passing the mixture thus formed into a chamber

in which said heat-absorbing fluid and gases of combustion are intimately intermixed, passing the mixture thus formed into heat interchanging contact with a fluid containing means so as to heat the fluid therein and simultaneously applying said radiant heat to said fluid containing means.

Signed at Chicago, Illinois, this 18th day of January, 1926.

JOSEPH FRANCIS DONNELLY.