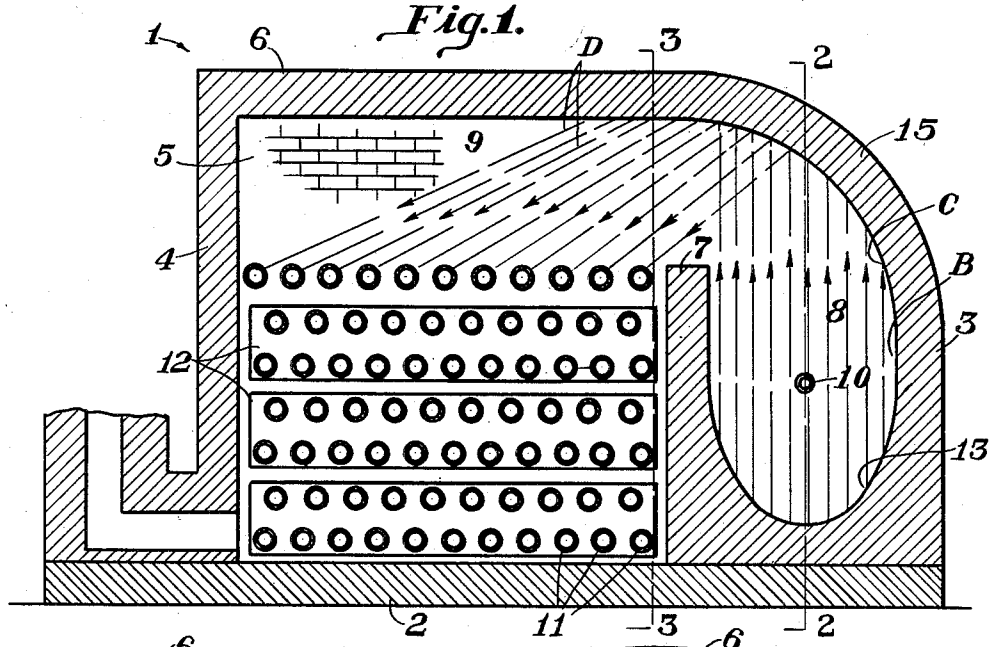
May 19, 1931. C. R. WAGNER 1,805,607

OIL HEATER

Filed July 21, 1930

Fig.1.



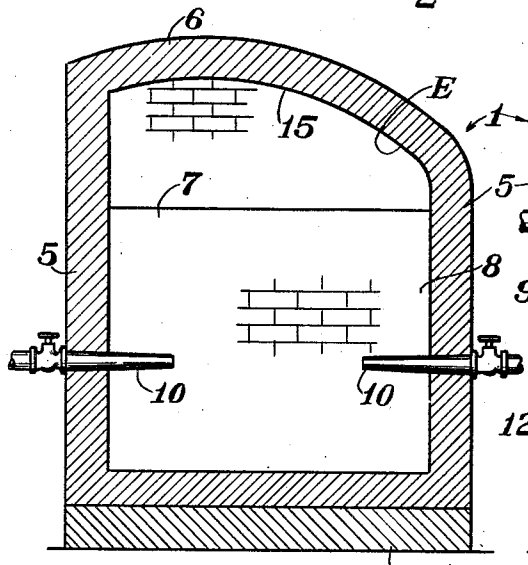


Fig.2.

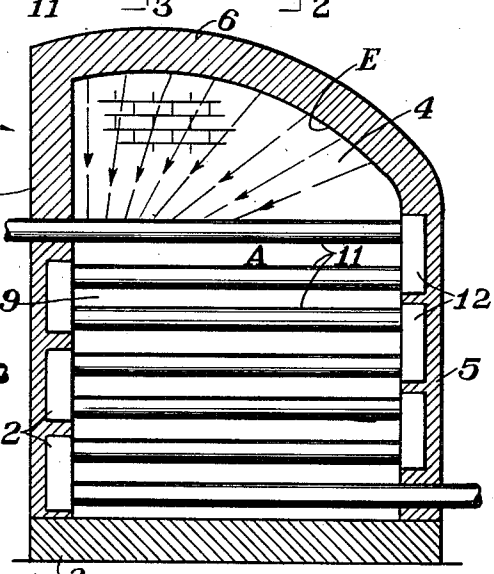


Fig.3.

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Patented May 19, 1931

1,805,607

UNITED STATES PATENT OFFICE

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OIL HEATER

Application filed July 21, 1930. Serial No. 469,402.

This invention relates to improvements in oil heating stills or converters, and an outstanding object of the invention resides in the formation of the heat reflecting walls of the furnace of the still or converter to procure a more effective distribution or concentration of the radiant heat developed within the furnace so that such heat may be directed to greater advantage on the tubes or elements through which is passed the oil or oil vapors for heat treatment, whereby such oil or oil vapors will be subjected to temperatures to produce optimum conversion conditions.

In the conversion or molecular decomposition of petroleum oils at temperatures in excess of substantially 1000° F., it is necessary to quickly and almost instantly raise the temperature of such oil or oil vapors as the latter enter the initial pass or bank of heating tubes from approximately 750 to 1000° F. for the purpose of securing efficient cracking of the oil and also for the purpose of eliminating or minimizing the liberation of free carbon within said tubes or elements. It has been found that free carbon is released copiously in vapor phase systems of oil conversion when the oil is within a temperature range of between 600 and 1000° F. and, therefore, in order to heat the oil rapidly to conversion temperatures in excess of 1000° F. as quickly as it enters the tubes or elements of a still or converter, the present invention comprehends the design of the walls of the furnace or other heater so that the radiant heat developed in the furnace will be directed toward and concentrated on the entrance portions of said oil circulating tubes. This serves the purpose of effecting the desired rapid raise in temperature of the oil from sub-conversion to conversion temperatures. Since radiant heat is absorbed from ten to fifteen times faster than convected heat, I have discovered that by curving the walls of the furnace in relation to a focal position defined by the source of heat, the desired direction of propagation of the radiant heat with respect to the heating tubes or elements is obtainable, with the result that said radiant heat is reflected, so that by directing this heat upon the initial pass of converter tubes the resultant rapid rise in the temperature of the oil vapors under treatment is secured and generally improved conversion conditions provided.

For a further understanding of the invention reference is to be had to the following description and the accompanying drawings wherein:

Figure 1 is a vertical longitudinal sectional view taken through a furnace setting of an oil still or heater constructed in accordance with the present invention,

Figure 2 is a transverse sectional view taken on the plane indicated by the line 2—2 of Figure 1, and

Figure 3 is a similar view on the line 3—3 of Figure 1.

Referring more particularly to the drawings the numeral 1 designates an oil heater or furnace in its entirety. The specific type of heater illustrated is that type commonly known as a tube still and consists of a setting formed from fire brick or other heat resisting material. Preferably, the setting comprises a bottom wall 2, front and back walls 3 and 4 respectively, longitudinally extending transversely spaced parallel side walls 5—5 and a top or crown wall 6. Within the setting there is arranged a transversely extending bridge wall 7, the upper end of which terminates below and in spaced relation from the top or crown wall 6. The bridge wall serves to divide the setting into burner and tube compartments 8 and 9 respectively. Arranged within the burner compartment is one or more groups of oil burners 10 which in operation comprise the heat source.

Disposed horizontally within the tube compartments 9 are oil conveying tubes or elements 11. The upper or inlet pass of these tubes is designated by the letter A. Oil or vapor enters this upper pass of tubes at one end thereof and after passing or circulating through the tubes in the bank A, such oil or oil vapor is transferred to the next succeeding lower bank of tubes by means of return bends or headers 12 and the circulation of the oil then continues in a like manner through the succeeding lower passes or banks of tubes, until the oil or oil vapors have reached the de-

sired temperature and the desired reactions have taken place wherein what is known as the cracking of the oil is effected. Cracking, as is well known, is the term employed to designate the molecular decomposition of oils having a higher boiling point into oils of lower boiling point. Thus in the vapor phase methods of oil conversion, to which the present heater is particularly adapted, oils or oil vapor are introduced into the initial pass A of the tube bank at a temperature of approximately 750° F. and after being subjected to the heat of the furnace, the oils in vaporous form leave the outlet or lower pass of tubes at a temperature of, for example 1150° F. The velocity and temperature of the oil vapors being determining factors in the rate of conversion.

As previously stated, we have discovered that in the operation of a system of this character it is necessary in the procuring of the best conversion conditions and in minimizing the deposition of free carbon in the tubes of the converter, to secure a rapid and approximately instantaneous rise in the temperature of the oil vapors as soon as the latter enter the first pass of tubes. The principles underlying this process have been set forth in the co-pending application filed jointly by C. R. Wagner, R. Stahl and J. B. Weaver, Ser. No. 196,884, filing date June 6, 1927, now U. S. Patent 1,763,609. In the design of a practical commercial structure for carrying out this process the furnace or heater shown herein has the bottom of the burner compartment 8 curved to produce a substantially parabolical reflecting surface 13 the burners 10 being disposed in what may be termed the focal center of this surface. The surface 13 is preferably formed from a smooth vitrified material of high heat resisting properties such as carborundum or silica, and the relation and form of the surface 13 with respect to the burners 10 are such as to reflect the heat upwardly in substantially straight parallel lines as indicated at B upon the crown or roof surface 15 of the burner compartment.

This roof surface is also of peculiar configuration and, as shown in Figure 1, the said roof surface is curved longitudinally to produce a semi-parabola curve as at C. This curve is so shaped that the radiant heat striking the same is reflected, as indicated at D, upon all of the tubes disposed in the upper tube bank A, or, in other words, the rays D are distributed throughout the length of the tube compartment 9. In addition to the longitudinal curvature of the roof surface 15, the latter is transversely curved, as shown in Figure 2, so that the radiant heat developed within the burner compartment instead of being uniformly distributed upon each of the tubes in the pass A throughout the full length of such tubes, such radiant heat will be directed or concentrated upon the entrance portion of the tube A for a distance of substantially one-third of their length. The transverse curvature of the roof surface 15 is such as to secure this distribution of the radiant heat for the purposes specified, the letter E being employed to designate the roof curvature when viewed in transverse section as shown in Figure 2.

By constructing the furnace so that the radiant heat will be concentrated upon the entrance portion of the initial tube bank the desired rapid elevation in the temperature of the oil vapors entering the converter is secured with the result that the converter may be maintained in continuous operation for extended periods of time without requiring frequent shut-downs to remove clogging carbon deposits which would otherwise be present if the temperature of the oil vapors were not controlled as set forth. It will be understood that all of the heat reflecting surfaces are rendered as smooth as practicable and are formed from refractory materials having heat resisting properties sufficient to permit of the employment of the high furnace temperatures and in this connection I have found carborundum or silica sufficient to meet practical requirements.

What is claimed is:

1. In an oil heater, a wall structure formed to comprise side, front, back, bottom and top walls composed of refractory materials and defining an enclosed heating space, a bridge wall extending transversely of said space and having the upper edge thereof terminated below said top wall, the bridge wall serving to divide the heater into burner and tube compartments, burner means disposed in said burner compartment, stationary relatively horizontally extending rows of oil heating tubes mounted in connection with the walls of said tube compartment, the bottom of said burner compartment being substantially of parabolical form to reflect heat rays from said burner means substantially vertically upward upon the top wall of the heater, said top wall being curved longitudinally of said burner compartment to reflect heat rays incident thereon substantially downwardly and angularly upon all of the tubes comprising the upper row of tubes disposed in said tube compartment, and said top wall being additionally curved transversely of the heater to reflect said heat rays incident thereon in a concentrated manner upon the oil entrance portions of the tubes comprising said upper row.

2. In an oil heater, a furnace comprising a setting formed to include a transversely extending bridge wall which divides the setting internally into burner and tube compartments, burners disposed within said burner compartment, a bank of horizontally arranged tubes in said tube compartment, and a top wall provided in connection with said

setting and arranged over said burner compartment and tube compartment, said top wall over said burner compartment being longitudinally curved to reflect radiant heat upon the tubes comprising the upper row of the tube bank, and said top wall being additionally curved transversely to reflect such radiant heat upon the oil inlet portions of said upper row of tubes.

3. In an oil heater, a furnace setting formed to include an internally situated bridge wall which divides the setting internally into burner and tube compartments, a burner situated within said burner compartments and a plurality of horizontally arranged tubes disposed in rows or passes within said tube compartments, the walls of said burner compartments being curved to concentrate through reflection the radiant heat developed within said burner compartment upon the oil inlet ends of the tubes comprising the upper pass in said tube compartment.

4. In an oil heater, a furnace setting comprising bottom, front, back, side and top walls, a transversely extending bridge wall situated within said setting and having its upper end terminated below said top wall, said bridge wall serving to define within said setting a burner compartment and a tube compartment, a burner disposed within said burner compartment, and a plurality of horizontally arranged rows or passes of tubes situated within said tube compartment, said top wall being curved longitudinally and transversely to concentrate the radiant heat developed within the furnace upon the entrance portion of the upper pass of tubes situated within said tube compartment.

5. In an oil heater, a furnace setting formed to include spaced burner and tube compartments, said compartments being separated by a transversely extending bridge wall, a burner situated within said burner compartment, the bottom of said burner compartment being of parabola form to reflect heat rays upwardly upon the top wall of said furnace setting, said top wall over said burner compartment being curved longitudinally to reflect the heat rays directed thereon downwardly and angularly upon the upper pass of tubes in the tube compartment, and said top wall being curved transversely to direct the heat rays upon certain of the ends of the tubes comprising said upper pass, in order that the developed radiant heat within said furnace will be concentrated upon the entrance portions of said tube bank to effect a more rapid heating of the oil passing through this portion of the tube bank than in the remaining portions thereof.

In testimony whereof I affix my signature.

CARY R. WAGNER.