

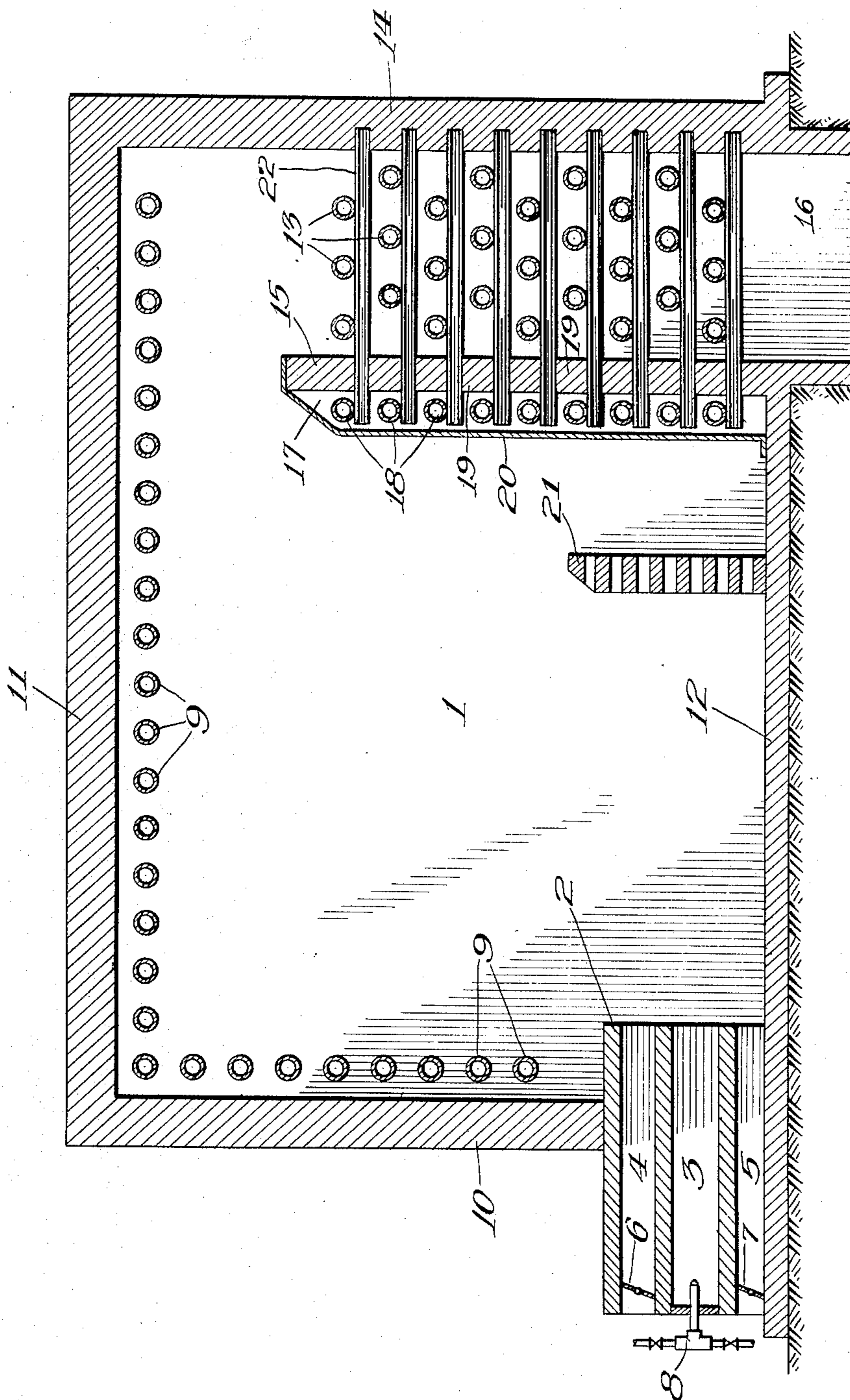
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HEATING OF FLUIDS

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UNITED STATES PATENT OFFICE

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HEATING OF FLUIDS

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This invention relates to improvements in heating fluids and refers particularly to the improved method and means of efficiently utilizing the relatively high temperatures encountered in the combustion zone of a furnace to supply heat to fluid undergoing treatment.

The concepts of the present invention permit its use in heating any fluid and the principles of the invention may be applied to any type of furnace. The embodiment herein described is, however, particularly adapted to the heating of hydrocarbon oils in either a liquid or vaporous state, or partially in both, to high temperatures such as those employed in cracking.

Briefly described, the invention comprises utilizing that portion or portions of a furnace where relatively hot combustion gas and/or flame temperatures are encountered, to supply heat to the fluid undergoing treatment through a suitable protecting sheet or other barrier which may protect the fluid conduit from direct impingement of the flame and the destructive action of excessively hot combustion gases.

The attached diagrammatic drawing illustrates one particular type of furnace, such as utilized in cracking hydrocarbon oils, to which the principles of the invention have been applied and in conjunction with the following description will serve to more clearly illustrate the features of the invention. The invention is, however, not limited to the type of furnace shown in the drawing or to any other specific type of furnace.

Combustion zone 1 of the furnace may be supplied with combustible materials through one or a plurality of tunnel structures 2 having firing compartment 3 and air ducts 4 and 5, regulated respectively by dampers 6 and 7. Combustible mixtures such as, for example, fuel oil and steam may be supplied to firing tunnel 3 through burner 8. It is to be understood of course, that other types of fuel such as gas, pulverized solid fuel or the like, may be used.

Tubes 9 are disposed along the front wall 10 and roof 11 of the furnace and receive primarily radiant heat from the flame and

gases in combustion zone 1 and the surrounding walls and floor 12 of the furnace. Tubes 13 located near the rear wall 14 of the furnace receive substantially convection or fluid heat from the combustion gases passing between the tubes to flue 15, and bridge wall 15 separates the combustion zone 1 from the convection heating chamber in which is located the bank of said convection tubes.

As an embodiment of one of the primary features of my invention, bridge wall 15 may be provided with a hollow portion 17 in which are disposed tubes 18. The back 19 of bridge wall 15 may preferably be constructed of fire brick or other suitable refractory material and the front 20 may be of any suitable material capable of transmitting radiant heat to tubes 18, such as nickel-chromium bearing alloys, silichrome steel, chrome-iron or other metals capable of withstanding the high temperatures encountered in the combustion zone, or non-metallic materials such as fire clay or carborundum shapes may be employed if desired. Perforated baffle wall 21 may be provided directly in front of bridge wall 15 to break up the flame and prevent its direct impingement upon the front 20 of the bridge wall.

It is evident that in the case illustrated, the tubes 18, while protected from the destructive action of the flame and hot combustion gases in combustion zone 1, may derive the benefit of the high temperatures encountered in this zone by being supplied with heat transmitted through and/or radiated from the front 20 of bridge wall 15. It will be understood that similar benefits may be derived by constructing other walls of the furnace such as front wall 10 and roof 11 with a hollow space similar to that provided at 17 and with a protecting front similar to 20. Such embodiments are entirely within the scope of the present invention.

As another feature of the invention supporting beams 22 such as are ordinarily employed to support the tubes 13 of the convection bank may extend through bridge wall 15 and serve as supporting members for tubes 18, serving at the same time to reinforce and stiffen bridge wall 15, permitting

relatively light and inexpensive construction of the bridge wall. The light construction of bridge wall is also advantageous in cooling the furnace when its operation has
5 been discontinued as the ordinary massive bridge wall construction retains heat for a considerable period of time after the fires have been extinguished. This same feature also renders the improved furnace more re-
10 sponsive to changes in its firing.

As a specific example of the heating efficiency of that portion of the furnace wherein the features of the present invention are utilized, assuming a temperature of say 1950°
15 F. in the combustion zone and a temperature of say 750° F. in the fluid passing through the bridge wall tubes, the theoretical rate of of heat transfer is in excess of 5,000 B. t. u. per square foot per hour.

20 It is apparent from the foregoing description that my invention can readily be used in steam boilers and, in general, any fluid heating furnaces. Hence, I do not wish to be limited to the specific use described, nor the
25 the specific example given.

I claim as my invention:

1. In combination, a furnace having a heating chamber and an exit passageway for flue gases, a hollow bridge wall separating
30 said heating chamber from said exit passageway, a plurality of tubes interposed in the space provided in the hollow bridge wall, a plurality of tubes disposed in said exit passageway, and common means for supporting
35 the tubes in said hollow bridge wall and in said exit passageway.

2. In combination, a furnace having a heating chamber and an exit passageway for flue gases, a hollow bridge wall separating
40 said heating chamber from said exit passageway, a plurality of tubes interposed in the space provided in the hollow bridge wall, a plurality of tubes disposed in said exit passageway, and common means for supporting
45 the tubes in said hollow bridge wall and in said exit passageway comprising a plurality of metallic beams transversely anchored in said hollow bridge wall.

50 In testimony whereof I affix my signature
MARION W. BARNES.