Feb. 5, 1963 H. JACOBS 3,076,449

AIR HEATER OR RECUPERATOR

Filed Jan. 3, 1961

FIG. 1

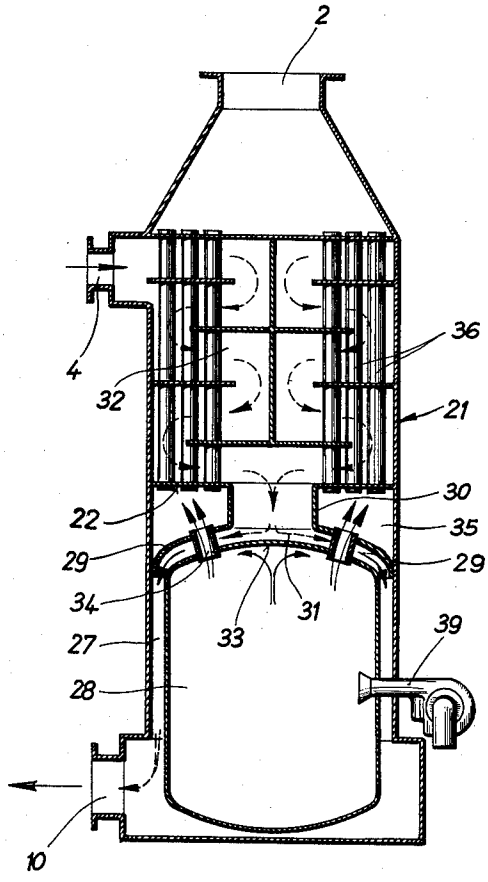
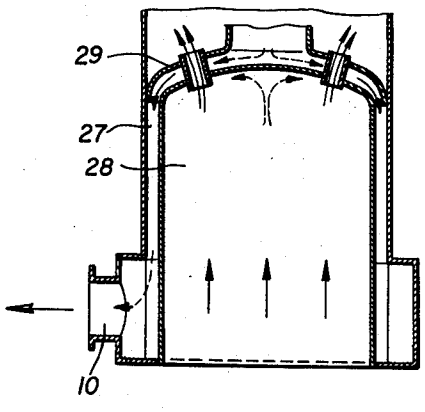


FIG. 2



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United States Patent Office 3,076,449 Patented Feb. 5, 1963

3,076,449

AIR HEATER OR RECUPERATOR

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Filed Jan. 3, 1961, Ser. No. 80,295
Claims priority, application Germany Jan. 5, 1960
3 Claims. (Cl. 126—116)

The present invention relates to an air heater or recuperator.

Air heaters or recuperators are known which are provided with a heat exchanging nest of boiler tubes and have a burning or radiation chamber arranged therebelow. With such an arrangement the tube bottom carrying the lower ends of the tubes forms the upper closure of the combustion or radiation chamber. This tube bottom is, therefore, directly acted upon by the hot flue gases or the gasses of the burner or burner flame. As a result thereof, the tube bottom is subjected to a thermal overstress.

In addition thereto, with the heretofore known air heaters or recuperators, a considerable air resistance is encountered which will not permit a high flow velocity of the air and thus will not allow a good heat exchanger effect.

It is, therefore, an object of the present invention to provide an air heater or recuperator which will overcome the above mentioned drawbacks.

It is another object of this invention to provide an air heater or recuperator which will avoid any thermal overstress of the tube bottom and thus may be operated at higher heating temperatures than heretofore known air heaters or recuperators.

It is a further object of this invention to provide an air heater or recuperator as set forth in the preceding paragraphs, in which the flow conditions of the air will be such that a higher air velocity will be obtainable which in turn will bring about a better heat exchanger effect so that a higher degree of efficiency will be obtained.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 diagrammatically illustrates partially in section a fuel burning air heater according to the present invention.

FIG. 2 diagrammatically illustrates the present invention in connection with a recuperator.

The invention is based on an air heater or recuperator with a heat exchanging nest of tubes and a combustion or radiation chamber therebelow, said chamber being surrounded by an air conducting annular chamber. According to the present invention, the air conducting annular chamber is confined by the upper side of the combustion or radiation chamber, and a cap-like member, and said combustion chamber communicates through passages through said air conducting chamber with the nest of tubes. The hot flue or combustion gases will then enter a chamber in which the air to be heated is guided. In spaced relationship to the cap-like member there is provided the tube bottom, while both parts, namely the tube bottom and said air conducting chamber, are in communication with each other through a central tube section. The air to be heated is conveyed from the air chamber provided with the nest of tubes through said central tube section into said air conducting chamber around the combustion chamber.

Preferably, the upper side of the combustion or radiation chamber is arched. Thus, the cap-shaped member is similarly designed whereby favorable conditions from a flow standpoint are created which will allow a higher velocity of the air and thereby a better heat exchange.

Before referring to the drawing in detail, it may be said that while in connection with the drawing reference is made to a fuel burning heater, the invention also comprises the replacement of parts to form a recuperator. In the last mentioned instance, it is merely necessary instead of the combustion chamber with burner to provide a radiation chamber with the feeding of the corresponding gases.

Referring now to the drawing illustrating an air heater, according to the present invention, the air heater is provided with a housing 21 the lower portion of which has arranged therein a combustion chamber 28 which together with the adjacent portion of housing 21 and a cap-shaped member 29 confines a gap or intermediate chamber 27. Housing 21 has a flue gas outlet 2, and cold air inlet 4, and a hot air outlet 10. This member 29 is connected to the tube bottom 22 through the intervention of a tube section 30 so that the air to be heated will in the direction of the arrow 31 pass from chamber 32 of the nest of tubes through tube section 30 into intermediate chamber 27. In this way, the upper side 33 of the combustion chamber 28 will be acted upon by the air to be heated. The tube bottom 22 is arranged in spaced relationship to the upper side 33 and thus will not be subjected as with the heretofore known embodiments, to a high thermal stress by the burning gases.

Through chamber 27 extend passages 34 through which the combustion of flue gases can pass from the combustion chamber 28 into a chamber 35, which is confined by housing 21, bottom 22, a tube section 30, and cap member 29, and from said chamber 35 passes into tubes 36.

The upper side of the combustion chamber 28 is slightly arched so that as a result thereof the flow conditions will be more favorable. These improved flow conditions will allow a higher flow velocity of the air thereby increasing the heat exchanging effect.

It will be appreciated that instead of the illustrated direction of flow of the air, the air may also be guided in an inverse manner from the bottom to the top, for instance when the burner 39 is operated with heavy oil the flue gases of which would destroy the flue gas tubes when the temperature would drop below the point of condensation of the sulphuric acid.

As mentioned above, the invention is also applicable in connection with a recuperator. This is illustrated in FIG. 2 in which the same reference numerals apply to the same parts as described in connection with FIG. 1. It will be appreciated that in this connection the only difference of FIG. 2 over FIG. 1 consists in that instead of the combustion chamber with burner a radiation chamber with the feeding of the corresponding gases has been provided.

It is, of course, to be understood that the present invention is, by no means, limited to the particular construction shown in the drawing but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. An air heater and recuperator system, which comprises in combination a housing having an air inlet opening for admitting air to be heated and having a discharge opening for discharging heated air, said housing also having discharge means for discharging heating gases, first wall means arranged within the lower portion of said housing and confining a combustion chamber with a bottom wall portion and a side wall portion and a top wall portion, said side wall portion being spaced from the adjacent portion of the housing wall and confining therewith an annular passage communicating with one of said openings, means extending into said heating cham-

ber for producing heating gases therein, second wall means arranged above and in spaced relationship to said top wall portion of said heating chamber and confining therewith a first heat exchanging chamber communicating with said annular passage, a nest of heat exchanging tubes arranged in the upper portion of said housing with both ends of said tubes open, third wall means arranged above and in spaced relationship to said second wall means and having its marginal portion connected to said housing and supporting one end of said tubes, fourth wall means arranged in spaced relationship to said third wall means and having its marginal portions connected to said housing and supporting the other end of said tubes, said third and fourth wall means with the housing wall portion therebetween confining a second heat exchanging chamber, first conduit means establishing communication between said first and second heat exchanging chambers, the wall of said first conduit means together with said second and third wall means and the adjacent housing portion confining an annular heating gas receiving chamber communicating with the interior of said tubes, and second conduit means for conveying heating gases from said combustion chamber into said heating gas receiving chamber.

2. An air heater and recuperator system, which comprises in combination a housing having an air inlet opening for admitting air to be heated and having an outlet opening for discharging heated air, said housing also having discharge means for discharging heating gases, first wall means arranged within the lower portion of said housing and confining a combustion chamber with a bottom wall portion and a side wall portion and a dome-shaped top wall portion, said side wall portion being spaced from the adjacent portion of the housing wall and confining therewith an annular passage communicating with said outlet opening, means extending into said heating chamber for producing heating gases therein, second wall means shaped similar to and spaced from and arranged above said top wall portion and having its marginal portions connected to adjacent housing wall portions and confining with said top wall portion a first

heat exchanging chamber communicating with said annular passage, a nest of heat exchanging tubes arranged in the upper portion of said housing with both ends of said tubes open, substantially flat third wall means arranged above and in spaced relationship to said second wall means and having its marginal portion connected to said housing and supporting one end of said tubes, fourth wall means arranged in spaced relationship to said third wall means and having its marginal portions connected to said housing and supporting the other end of said tubes, said third and fourth wall means with the housing wall portion therebetween confining a second heat exchanging chamber, first conduit means leading substantially into the central portion of said second wall means and establishing communication between said first and second heat exchanging chambers, the wall of said first conduit means together with said second and third wall means and the adjacent housing portion confining an annular heating gas receiving chamber communicating with the interior of said tubes, and second conduit means having a diameter considerably smaller than said first conduit means and leading from said combustion chamber through said first heat exchanging chamber into said heating gas receiving chamber.

3. An arrangement according to claim 1, in which said second and first conduit means include tube means, and in which the diameter of the tube means of said second conduit means is considerably smaller than the diameter of the tube means of said first conduit means, the tube means of said second conduit means extending through said first heat exchanging chamber.

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