This invention relates to improvements in the art of burning pulverized coal, and is especially useful in connection with boilers of the radiant heat type, that is to say, boilers the tubes of which very largely define the combustion space and are subjected to radiant heat. In such boilers the tubes absorb heat at such a high rate as to tend to unduly lower furnace temperature, the result of which would be to introduce difficulties in combustion of the fuel.

In accordance with my invention I propose to overcome these difficulties by increasing the furnace temperature head, and by so mixing the coal with the air required for combustion as to produce violent and intense combustion.

How the foregoing, together with such other objects as may hereinafter appear, is obtained is illustrated in the accompanying drawings in the preferred form.

In the drawings:

Fig. 1 is a vertical section through a boiler-furnace installation embodying my improvements, and

Figure 2 is a diagrammatic sectional view taken on the line 2—2 of Figure 1 looking in the direction of the arrows and illustrating the relation of certain fin tubes to the burner and air admission means, other parts being omitted.

The boiler is of the general type illustrated in my copending application, Serial No. 3,932, filed January 20, 1925, and it will suffice for the purposes of the present specification to point out that the boiler tubes are so arranged as to provide two narrow flame ways a and b communicating with one another at the bottom so as to form a substantial U. The amount of evaporating surface with respect to the fuel burned in regular operation is such that the waste gases leave at a very high temperature—much higher than usual. The heat of these gases is utilized to preheat air which is blown through the air preheater 7 by means of a fan 17, the preheated air being used for combustion purposes. In the drawings the direction of flow of the air is indicated by dotted arrows and the direction of flow of the flue-gas by full line arrows.

A portion of the preheated air is delivered by means of duct 16 into the channels 8 and 9 formed by various of the tubes of the boiler, to which end such tubes are provided with longitudinally extending fins 19 on each of two opposite sides thereof, whereby the tubes and fins cooperate to provide a practically continuous metallic wall. The finned tubes adjacent the zone of combustion are spaced slightly apart, so as to provide air inlet slits 11 from the channels 8 and 9.

The remaining portion of the air is delivered from the preheater to the manifold 65 by means of pipe 18, fan 19 and pipe 20. Air delivery members 13 lead from this manifold 12, and are adapted to discharge downwardly through the arch 14 of the flue way a, these air delivery members being preferably rectangular and alternating with the burners 15. The air delivery members 13 are somewhat flattened, and have the longer dimensions of their outlets extending at right angles to the front wall 16 of the installation. The burners 15 are also flattened, but they have the longer dimensions of their outlets parallel to the front wall.

The burners are, therefore, adapted to deliver relatively thin and spaced sheets of coal (the coal being preferably delivered by a blast of carrying air), and the air delivery members 13 are adapted to deliver bodies of very hot air in between these sheets of coal. The relative velocities of the coal and air are such that violent admixing of the hot air and the coal takes place, with the result that intense combustion is set up. The intensity of the combustion is furthered by the jet-like bodies of air that are forced from the channels 8 and 9 through the inlet slits 11.

In consequence of the foregoing, the fuel and flame stream is relatively narrow, and violent eddying and combustion occur. By virtue of the relative narrowness of the flame stream, the most efficient heat transmission is assured. By virtue of the violent agitation and turbulent combustion and the increase in furnace temperature head resulting from the introduction of highly preheated air, the chilling effect of the tubes is overcome, and substantially perfect and complete combustion is obtained.

What I claim is:

1. In a pulverized coal burning furnace a row of alternating flattened burners and flattened air delivery members so arranged that the longer dimensions of the outlets of
the air delivery members are disposed at
right angles to longer dimensions of the outlets of the burners, said members discharging in substantially the same direction.

2. In combination, a combustion chamber having a narrow flameway substantially defined by water walls, and a row of alternately flattened burners and flattened air delivery members discharging into and along said flameway in substantially the same direction and so arranged that the longer dimensions of the outlets of the air delivery members are disposed at right angles to the longer dimensions of the outlets of the burners and other air inlets disposed along the flameway delivering hot air thereinto.

3. In combination, a combustion chamber having a narrow flameway substantially defined by water walls, and a row of alternately flattened burners and flattened air delivery members discharging into and along said flameway in substantially the same direction and so arranged that the longer dimensions of the outlets of the air delivery members are disposed at right angles to the longer dimensions of the outlets of the burners and other air inlets disposed along the flameway delivering hot air thereinto under pressure.

In testimony whereof I have hereunto signed my name.

EDWIN LUNDGREN.