Sept. 4, 1928. 1,683,577

R. C. HOPKINS

RECUPERATOR

Filed Nov. 21, 1925 2 Sheets-Sheet 1

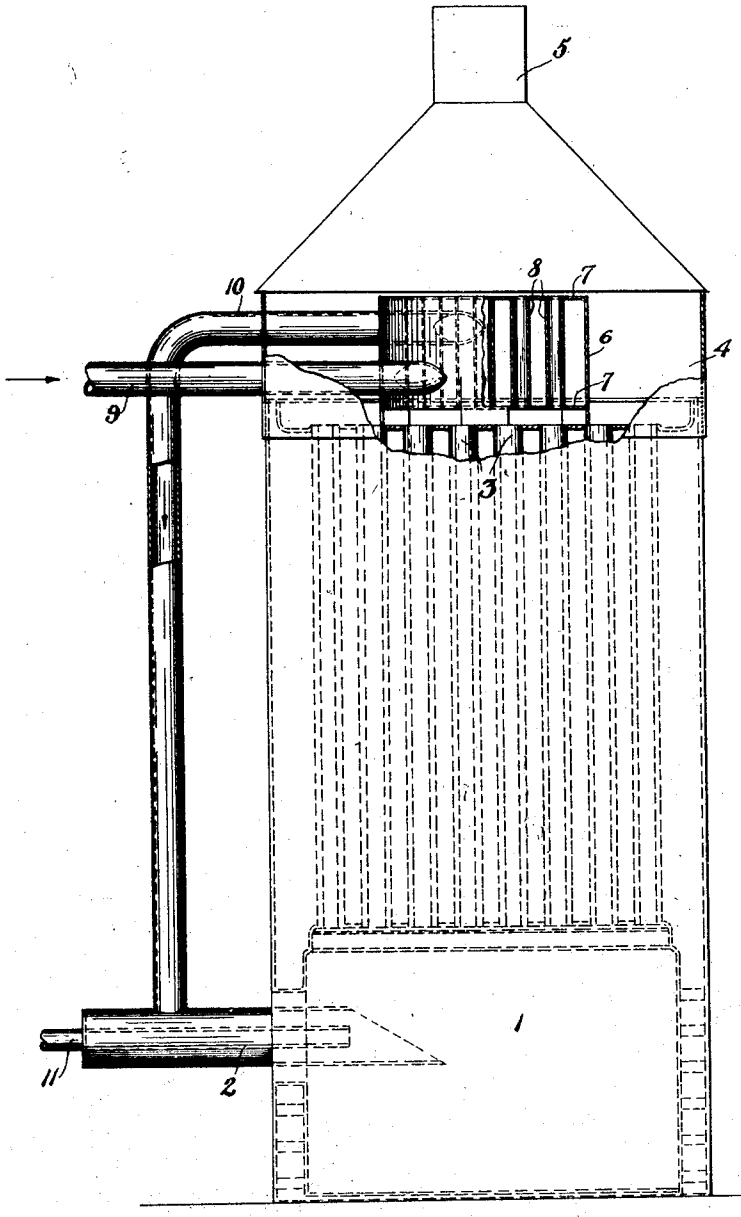

Fig. 1

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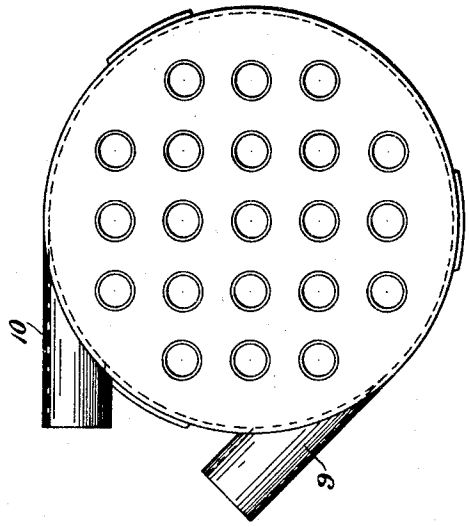

Fig. 3

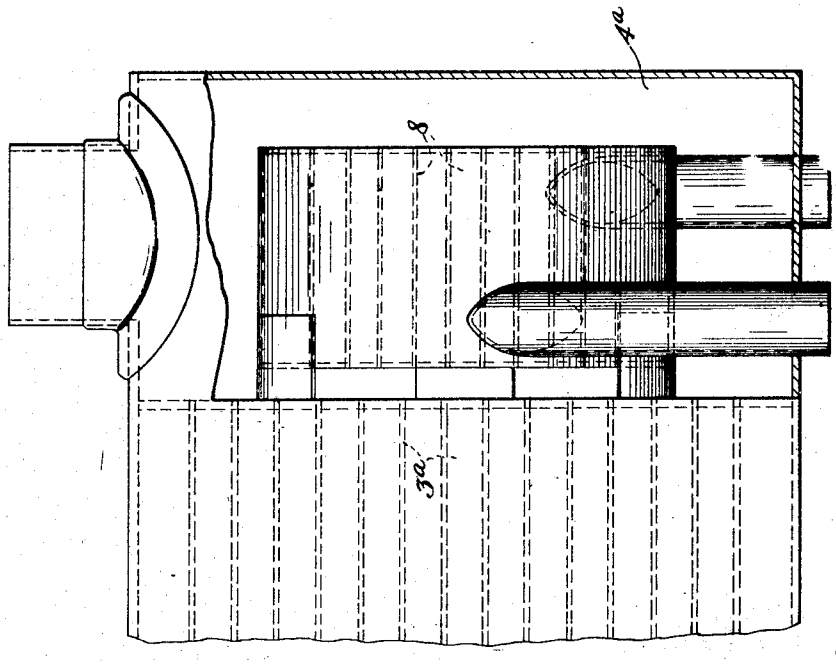

Fig. 2

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UNITED STATES PATENT OFFICE.

ROBERT C. HOPKINS, OF ALLIANCE, OHIO.

RECUPERATOR.

Application filed November 21, 1925. Serial No. 70,546.

The invention relates to oil or gas fired steam boilers and more particularly to means for heating an air blast for the oil or gas burner by waste heat from the boiler.

The object of the invention is to provide a recuperator drum within the smoke box of a boiler having tubes therethrough permitting the waste heat from the boiler to pass through the tubes and around the outside of the drum, air under pressure being forced through the drum, around the heated tubes and then to the burner.

An embodiment of the invention is illustrated in the accompanying drawings, in which

Figure 1 is an elevation partly in section of a vertical steam boiler showing the improved recuperator mounted therein;

Fig. 2, a sectional view of a portion of a horizontal steam boiler showing the recuperator therein, and

Fig. 3, a plan view of the recuperator.

Similar numerals of reference indicate corresponding parts throughout the drawings.

The improved recuperator may be applied to either vertical or horizontal boilers and, as illustrated in the drawings, the boilers are of the fire tube type, although the recuperator is equally adapted for use upon other types of boilers.

In Figure 1 is illustrated a conventional form of vertical boiler having the fire box 1 into which is extended a burner 2 which may be of any desired construction.

The flame and products of combustion pass upward through the fire tubes 3 in the usual manner and into the smoke box 4 which is provided with the usual stack 5.

The recuperator to which the invention pertains is in the form of a hollow metal drum having the cylindrical side wall 6 and the upper and lower heads 7, a plurality of tubes 8, open at both ends, being located through the drum and connected in any suitable manner to the heads thereof.

An inlet pipe 9 communicates with the interior of the recuperator drum, being preferably located tangentially to the drum and communicating with the lower portion thereof, this pipe being connected with a fan or other suitable apparatus for producing an air blast.

An outlet pipe 10 communicates with the upper portion of the recuperator drum, preferably at a tangent thereto and upon the opposite side of the drum from the inlet pipe, this outlet pipe leading to the burner 2, to which oil or similar fuel is conducted as by the supply pipe 11.

Although it is preferable to provide the tubes 8, or other means for furnishing extra heating surface within the drum, these tubes may, if desired, be dispensed with, the drum being heated entirely from its exterior by the waste heat passing upward through the smoke box, from the fire tubes, and around the drum.

By locating the recuperator drum within the smoke box and close to the boiler tubes the maximum waste heat from the boiler will be utilized in heating the drum, as it passes around the same and through the tubes.

The air blast which is continuously passing through the drum will be quickly heated by contact with the interior of the shell of the drum and the exterior of the tubes, thus furnishing a continuous blast of hot air to the burner which will materially assist in the vaporizing and burning of the fuel.

In Fig. 2 the same form of recuperator drum is shown applied to a horizontal boiler, being located within the smoke box 4^a thereof and in close proximity to the tubes 3^a.

In this case, as well as in the vertical boiler, the tubes 8 of the recuperator are preferably located substantially in alignment with the fire tubes of the boiler, thus permitting the hot gases to travel in substantially a straight line through the boiler flues and the tubes of the recuperator, and since the recuperator is of considerably less diameter than the boiler or smoke box, a flow of hot gases is also provided entirely around the drum, heating the shell thereof as well as the tubes.

I claim:

1. In combination with a boiler having tubes, a fire box at one end of the tubes and a smoke box at the other end of the tubes, a burner in the fire box, a recuperator drum in the smoke box in proximity with the tubes, said drum having tubes in alignment with the boiler tubes, and means including inlet and outlet pipes tangentially connected with the recuperator drum for passing an air blast through the recuperator drum to the burner.

2. In combination with a boiler having fire tubes, a fire box at one end of the tubes and a smoke box at the other end of the tubes, a burner in the fire box, a recuperator drum in the smoke box, tubes through the recuperator drum in alignment with the fire tubes, and means including inlet and outlet pipes tan-

gentially connected with the recuperator drum for passing an air blast through the recuperator to the burner.

3. In combination with a boiler having tubes, a fire box at one end of the tubes and a smoke box at the other end of the tubes, a burner in the fire box, a recuperator drum in the smoke box, tubes in the drum aligned with the boiler tubes, inlet and outlet pipes tangentially connected with the recuperator drum, the outlet pipe communicating with the burner, and means for passing an air blast into the inlet pipe.

4. In combination with a boiler having tubes, a fire box at one end of the tubes and a smoke box at the other end of the tubes, a burner in the fire box, a recuperator drum in the smoke box, means including inlet and outlet pipes tangentially connected with the recuperator drum for passing an air blast through the recuperator to the burner, and heating surfaces within the drum aligned with the boiler tubes.

In testimony that I claim the above, I have hereunto subscribed my name.

ROBT. C. HOPKINS.