May 30, 1933. D. L. BLATTER 1,911,488

FURNACE

Filed Aug. 11, 1928 2 Sheets-Sheet 1

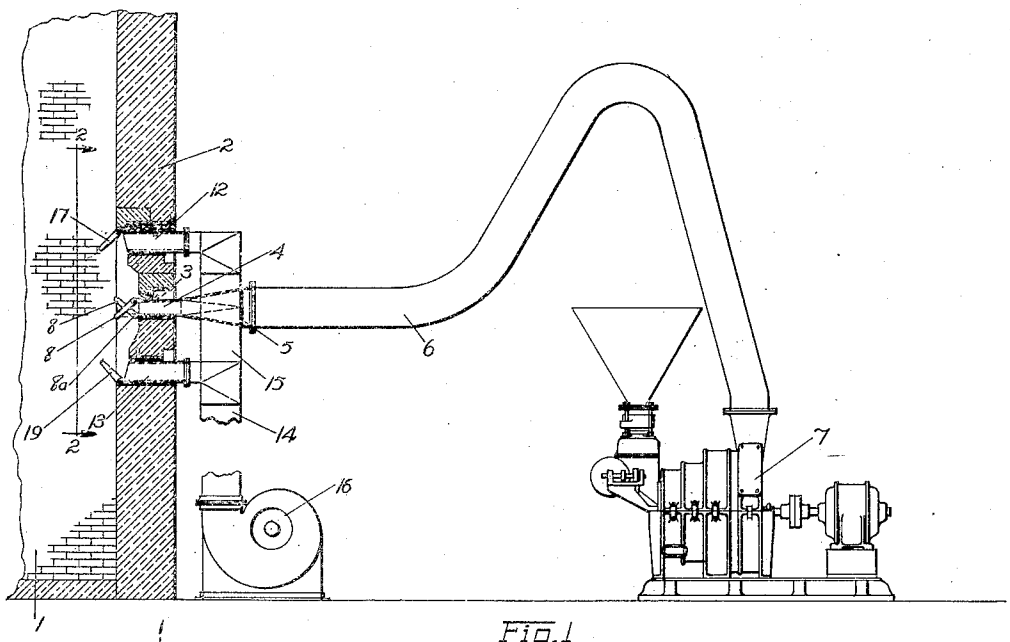


Fig. 1

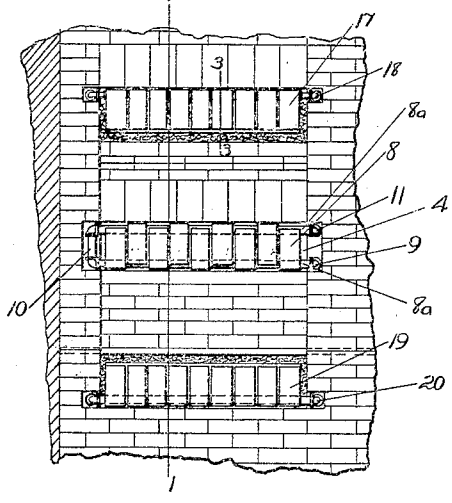


Fig. 2

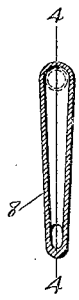


Fig. 3

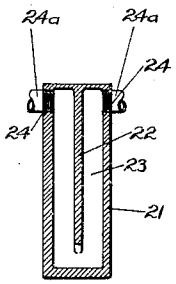


Fig. 4

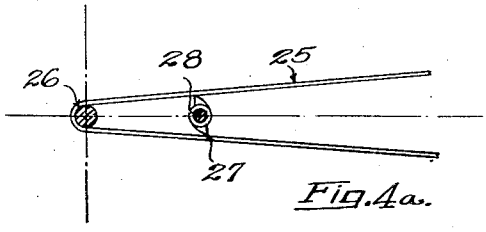


Fig. 4a.

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FURNACE

Filed Aug. 11, 1928 2 Sheets-Sheet 2

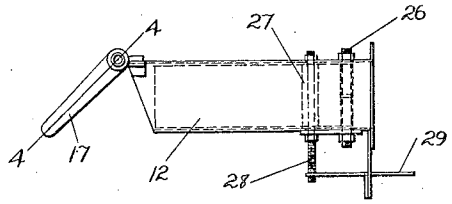


Fig. 5

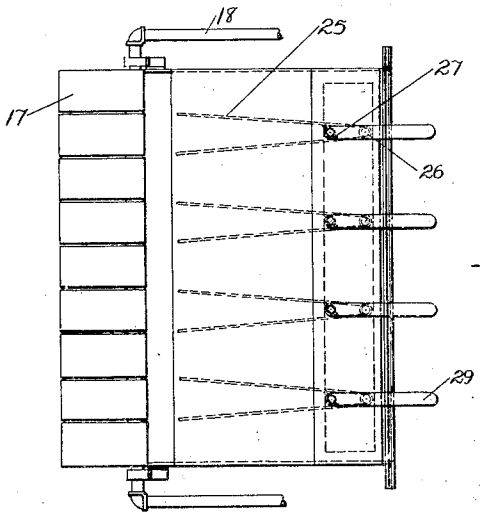


Fig. 6

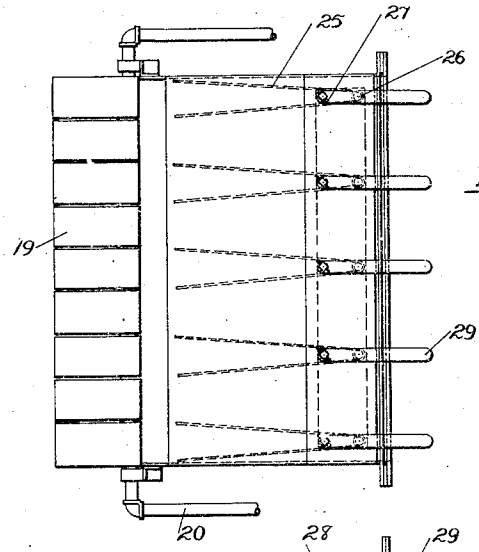


Fig. 7

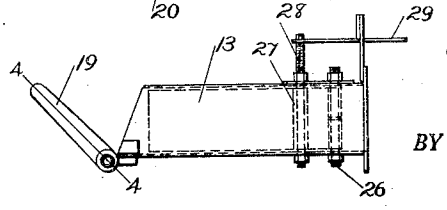


Fig. 8

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Patented May 30, 1933 1,911,488

UNITED STATES PATENT OFFICE

DONALD L. BLATTER, OF ERIE, PENNSYLVANIA, ASSIGNOR TO ERIE CITY IRON WORKS, OF ERIE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

FURNACE

Application filed August 11, 1928. Serial No. 299,083.

Furnaces for burning fuel, particularly fine fuel, are usually provided with a means supplying fuel with primary air and in addition to the primary air secondary air to complete combustion. In order that the combustion may be fully completed it is necessary to commingle the air and fuel so that all the fuel may properly burn with as little dilution by excess air as possible.

In a former application, filed by me, Sept. 12, 1927, Serial Number 219,046, I disclosed a means of deflecting into numerous streams the incoming fuel and primary air. In the present invention I preferably utilize this means of introduction of the fuel and primary air, supplementing the structure with air tuyères with deflectors capable of deflecting the air causing crossing and intermingling of the various streams and creating turbulence and intimate contact between the fuel and the air so that there may be rapid and complete combustion. Features and details of the invention will appear from the specification and claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings as follows:—

Fig. 1 shows a section of a furnace on the line 1—1 in Fig. 2, showing in elevation the fuel and air delivering devices.

Fig. 2 a sectional view on the line 2—2 in Fig. 1, showing the front wall in elevation.

Fig. 3 a section of one of the deflector plates on the line 3—3 in Fig. 2.

Fig. 4 a section on the line 4—4 in Fig. 5.

Fig. 4*a* an enlarged plan view of an air controlling vane.

Fig. 5 a side elevation of a tuyère and deflector plate.

Fig. 6 a plan view of the upper set of secondary air tuyères.

Fig. 7 a similar view of the bottom tuyère.

Fig. 8 a side elevation of the bottom tuyère.

1 marks the furnace chamber and 2 the front wall of the chamber. This is provided with a fuel and air opening 3. A nozzle 4 is arranged in the opening. A connection 5 extends from the nozzle to a conduit 6. The conduit 6 extends to the discharge of a pulverizer 7. Deflectors 8 are arranged at the discharge of the nozzle 4 and preferably project therefrom. They are carried on hollow hinges 8*a* and supplied with water through pipe 9, this pipe delivering water to one group of the plates and the other section being connected with the first section by a U-bend 10 to which the water passes so that all sections of these deflectors receive water. The water discharges through the pipe 11.

Secondary air tuyères 12 and 13 extend through the furnace wall, the tuyère 13 receiving its air from a duct 14 and the tuyère 12 being connected with the duct 14 by a duct 15. The duct 14 receives its air from a fan 16 and this air may receive any pre-treatment that may be desired. Deflector plates 17 are mounted at the outlet of the tuyère 12 preferably projecting inwardly therefrom. They are water-cooled receiving their water from a pipe 18. The lower tuyère 13 is supplied with similar deflectors 19 receiving water from a pipe 20.

All the deflector plates are hollow having outer walls 21 and a central wall 22, the wall 22 forming a U-shaped passage 23 through the deflector plate. Nipple openings 24 are supplied at the hinge ends of the plates and nipples 24*a* connect the different plates so that there is a continuous passage of water through these plates. These nipples with their pipe connections make it possible to adjust the deflectors as a whole, or the individual deflector may be adjusted. Ordinarily the deflectors 8 are alternated up and down. While the deflectors of the secondary air tuyère are more or less in line so as to cross the streams of fuel and primary air the inclination of the deflectors for the secondary air may be varied to better adjust them to the air streams. Arranged within the tuyères are vanes 25, these are U-shaped, the loop extending around and being secured by bolts 26. Spreaders 27 are arranged between the arms of the vanes 25 and these spreaders are carried by pins 28 to which levers 29 are attached. By throwing the levers the arms of vanes 25 may be separated, or closed, thus varying the amount and velocity of air delivered. The vanes 25, it will be noted, cut

off every other deflector plate from the reception of air and those cut off correspond with the air streams controlled by the deflectors 8, that is to say, where the deflector 8 is inclined downwardly the corresponding vanes 25 cut out the deflector plate 17 directly above it, but where the deflector plate 8 is inclined upwardly the corresponding vanes 25 leave an opening to the directly opposed deflector plate above it so that the deflector system shall so direct the air streams as to make them cross. In some instances it may be better to have the vanes so arranged and the deflectors adjusted so that the streams of secondary air and primary air are staggered relatively to each other. The sectional arrangement and adjustability of the deflectors make it possible to so relate the different streams as to get the greatest turbulence and intermingling of the elements of combustion.

What I claim as new is:—

1. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace; and secondary air delivering mechanism comprising a secondary air tuyère at each side of said means, and deflectors at the outlets of said tuyères deflecting the secondary air into commingling relation with the primary air stream from said means.

2. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace; and secondary air delivering mechanism comprising a secondary air tuyère at each side of said means, and deflectors at the outlets of said tuyères deflecting the secondary air into commingling relation with the primary air stream from said means, said deflectors being adjustable.

3. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace; and secondary air delivering mechanism comprising a secondary air tuyère at each side of said means, and a plurality of deflectors at the outlets of said tuyères deflecting the secondary air into commingling relation with the primary air stream from said means, said means and tuyères being elongated crosswise and in the same direction and said deflectors extending along each tuyère.

4. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace; and secondary air delivering mechanism comprising a secondary air tuyère at each side of said means, and deflectors at the outlets of said tuyères deflecting the secondary air into commingling relation with the primary air stream from said means, said means and tuyères being elongated crosswise and in the same direction and the deflectors extending along the tuyères and being sectional and adjustable.

5. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace, said means comprising a nozzle elongated crosswise and a plurality of deflectors at the outlet of the nozzle; and secondary air delivering mechanism comprising a tuyère elongated crosswise and in the same direction as the nozzle and a plurality of deflectors at the outlet of the tuyère the deflectors on the nozzle and tuyère deflecting the fine fuel and primary air and secondary air into commingling relation.

6. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace, said means comprising a nozzle elongated crosswise and a plurality of deflectors at the outlet of the nozzle; and secondary air delivering mechanism comprising a tuyère elongated crosswise and in the same direction as the nozzle and a plurality of deflectors at the outlet of the tuyère, said deflectors being individually adjustable to deflect the fine fuel and primary air and secondary air into commingling relation.

7. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace, said means comprising a nozzle elongated crosswise and a plurality of deflectors at the outlet of the nozzle; and secondary air delivering mechanism comprising a tuyère elongated crosswise and in the same direction as the nozzle and a plurality of deflectors at the outlet of the tuyère, said deflectors being individually adjustable to adapt the deflectors to adjustment to stagger the air streams into commingling relation.

8. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the furnace comprising a nozzle elongated crosswise and oppositely inclined deflectors at the outlet of the nozzle; and secondary air delivering mechanism comprising tuyères at opposite sides of the nozzle and deflectors on the tuyères adapted to deflect the secondary air stream into intermingling relation with the streams of primary air and fuel.

9. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the chamber comprising a nozzle elongated crosswise, and staggered and oppositely inclined deflectors at the outlet of the nozzle; and mechanism delivering secondary air to the chamber comprising tuyères elongated crosswise and in the same direction as the nozzle at opposite sides of the nozzle having deflectors at their outlet adapted to deflect the secondary air stream into commingling relation with the primary air and fuel streams.

10. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the chamber comprising a noz-

zle elongated crosswise, and staggered and oppositely inclined deflectors at the outlet of the nozzle; and mechanism delivering secondary air to the chamber comprising tuyères elongated crosswise and in the same direction as the nozzle at opposite sides of the nozzle each having deflectors at their outlet, said deflectors being individually adjustable and adapted to deflect the secondary air stream into commingling relation with the primary air streams.

11. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the chamber; and secondary air delivering mechanism comprising a secondary air tuyère elongated in cross section, a plurality of deflectors at the outlet of the tuyère, and vanes in the tuyère varying the flow from the tuyère with relation to different deflectors and the means.

12. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the chamber; and secondary air delivering mechanism comprising a secondary air tuyère elongated in cross section, a plurality of deflectors at the outlet of the tuyère, and vanes in the tuyère varying the delivery from the tuyère with relation to different deflectors to divide the air into streams and into commingling relation with the fine fuel and primary air.

13. In a furnace, the combination of a furnace chamber; means supplying fine fuel with primary air to the chamber; and secondary air delivering mechanism comprising a secondary air tuyère elongated in cross section, a plurality of deflectors at the outlet of the tuyère, and vanes in the tuyère varying the delivery from the tuyère with relation to the deflectors and adapted to divide the air into streams corresponding to alternate deflectors.

14. In a furnace, the combination of a furnace chamber; means delivering primary air and fuel to the chamber comprising a nozzle elongated crosswise and oppositely inclined deflectors arranged in staggered relation at the outlet of the nozzle; and mechanism delivering secondary air to the chamber comprising tuyères elongated crosswise and in the direction of the nozzle, said tuyères being arranged at opposite sides of the nozzle, a plurality of deflectors at the outlet of each tuyère, and vanes in the tuyères directing the air to alternate deflectors on the tuyères, said deflectors on the nozzle and tuyères being adapted to deflect the streams from the nozzle and tuyères into intermingling relation.

In testimony whereof I have hereunto set my hand.

DONALD L. BLATTER.