D. J. IRISH.

APPARATUS FOR BURNING FINELY DIVIDED FUEL.

APPLICATION FILED APR. 1, 1913.

1,102,510.

Patented July 7, 1914.

2 SHEETS—SHEET 1.

Fig. 2.

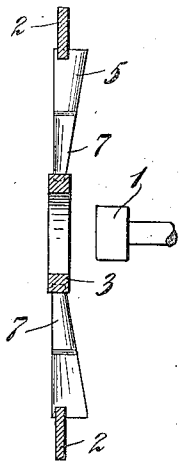


Fig. 1.

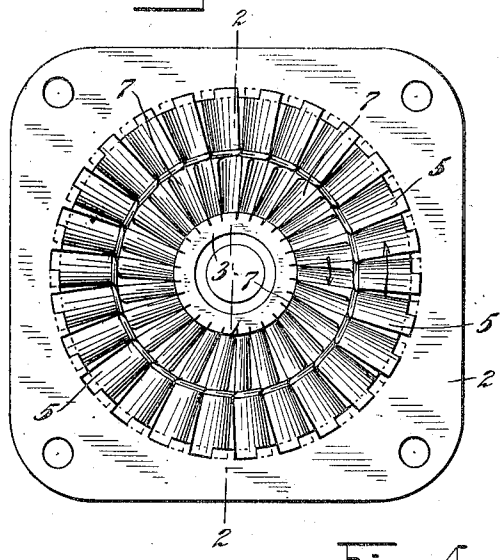


Fig. 3.

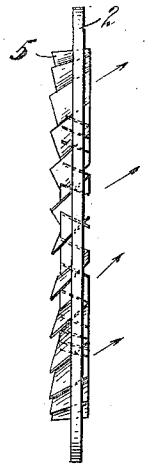


Fig. 4.

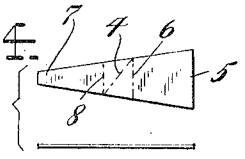


Fig. 8.

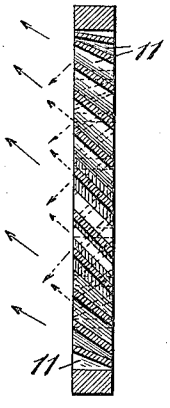


Fig. 7.

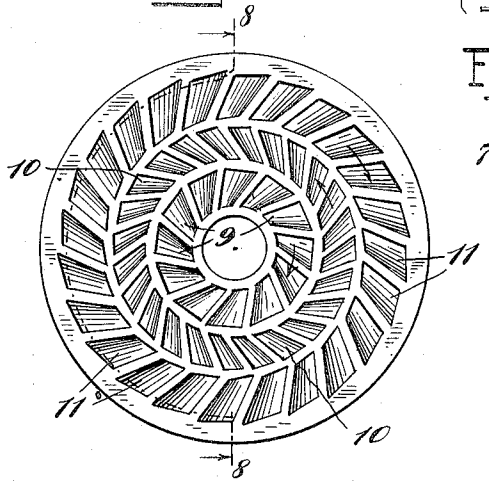


Fig. 5.

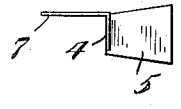
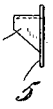


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 9.

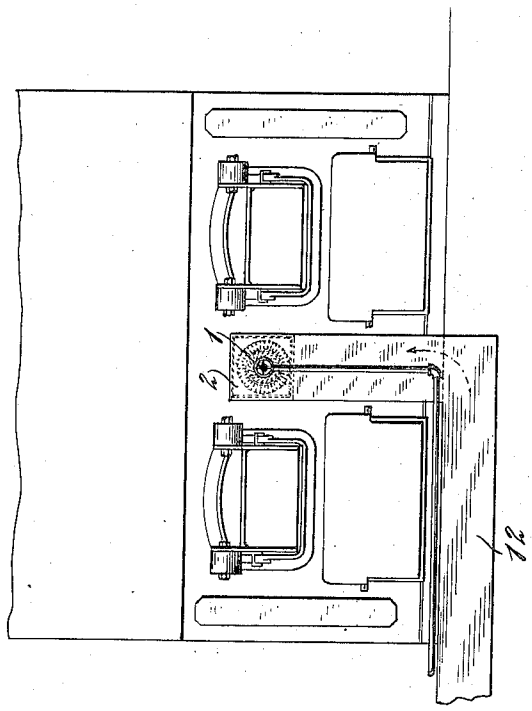
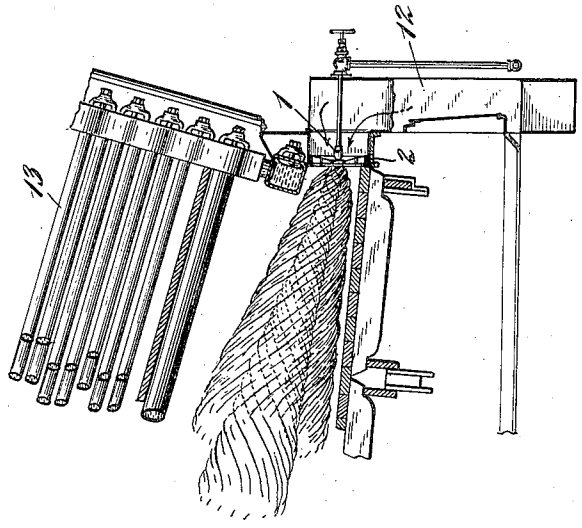


Fig. 10.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR BURNING FINELY-DIVIDED FUEL.

1,102,510. Specification of Letters Patent. Patented July 7, 1914.

Original application filed July 15, 1911, Serial No. 638,687. Divided and this application filed April 1, 1913. Serial No. 758,088.

To all whom it may concern:

Be it known that I, DAVID J. IRISH, a citizen of the United States, residing at New York city, borough of Richmond, county of Richmond, and State of New York, have invented certain new and useful Improvements in Apparatus for Burning Finely-Divided Fuel, of which the following is a specification.

The present application is a division of my application Serial No. 638,687, filed July 15, 1911.

The invention herein described relates to a plate for deflecting the air entering a combustion chamber around an atomizer or so-called burner, and to the general arrangement and construction of apparatus and devices employed for atomizing and burning liquid fuel.

The invention will be understood by reference to the accompanying drawings in which—

Figure 1 is a front elevation of one form of an air deflecting plate embodying my invention; Fig. 2 a section on the plane of the line 2—2 of Fig. 1; Fig. 3 an edge view of Fig. 1; Fig. 4 the blank from which the blades of Fig. 1 are made; Fig. 5 an edge view of Fig. 4 after bending; Fig. 6 an end view of the same blade (Fig. 5) to show how the blade is twisted or bent to form two angles; Fig. 7 a front elevation of a modified form of deflecting plate; Fig. 8 a section on the plane of the line 8—8 of Fig. 7; Fig. 9 a front elevation of a furnace showing the application of the air deflecting plate and burner thereto; and Fig. 10 a longitudinal section of a portion of the furnace.

Similar reference numerals indicate similar parts in the several views.

The prime object of all methods of burning finely divided fuel is to obtain a continuous, intimate and thorough mixture of the fuel and an amount of air as nearly as possible equal to the theoretical quantity required to effect complete combustion. If the mixing process is not uniform and continuous, intermittent explosions take place resulting in severe vibrations in the furnace. If the mixture is not thoroughly effected a large excess of air is required with resultant loss in efficiency.

The object of the present invention is to secure a continuous, uniform and intimate mixture of the air and fuel so as to secure substantially uniform and complete combustion. This is accomplished by admitting the air for combustion around the burner and deflecting it from its normal direction of travel by a substantially flat plate comprising two or more concentrically arranged sets of blades inclined to the plane of the plate, the blades of one set being inclined in a direction opposite the direction of inclination of the adjacent set, thereby causing concentric whirling air currents to move in opposite directions to thoroughly mix with the fuel. The blades of each set are spaced apart so as to provide openings for the admission of the air to the fuel.

As the result of experience I have determined upon an angle of inclination of the blades of 45° to the plane of their supporting plate as giving the best results. This angle, however, can be varied according to the fuel or the character of the furnace to which the burner may be applied. The blades which cause the deflection of the air are susceptible of various modifications coming within the scope of my invention, as for example, they may be cast integral with a supporting plate, or may be secured thereto in fixed relation to one another and to the plate.

For the purpose of illustration, I have shown my invention as applied to a boiler furnace. Any suitable form of atomizer or so-called burner may be used, such for example, as that shown in United States Patent No. 1,007,793 dated November 7, 1911. The burner is connected to a supply pipe 1 and terminates in proximity to a central opening in the plate, and preferably in front of the plate, as shown in Fig. 2, so that the deflection of the air will begin after the air has passed the plane of the end of the burner. In the burners used by me the fuel, as it is projected into the combustion chamber, assumes a conical shape and to effect the desired intimate mixture therewith of the air necessary for complete combustion, I provide means comprising blades arranged as above stated to thereby cause concentric currents of air to be produced whirling in opposite directions. These blades which effect a change in the direction of the travel

of the air may be set in any suitable manner in an opening provided for the same in the furnace wall. I prefer, however, to mount them on a plate, either integral with the plate or secured thereto by any suitable means. By employing a plate to which the blades are secured they may be conveniently handled and mounted in the furnace wall.

Referring to Figs. 1, 2 and 3 one form of plate is shown comprising a frame 2, to which the outer ends of the blades are secured, the inner ends of the blades being attached to a ring 3 forming a central opening for the burner, or through which the fuel may be projected. The blades are made from sheet metal, the blank being shown in Fig. 4. This blank is folded over flat on itself on the line 4 through 180°. The end 5 is then turned up 90° on the line 6 and the end 7 is turned down on the line 8 through 90°. The planes of the portions 5 and 7 of the blade are at right angles to each other so that when a blade so constructed is set into the plate with the section 5 thereof at an angle of 45° to the plane of the plate, the plane of the other section 7 will be at a like angle to the plane of the plate but inclined in an opposite direction. In this construction the air for combustion is divided into two currents traveling one within the other in opposite directions.

Instead of making the blades of sheet metal and securing them to the plate I may make them in the form of a casting divided into two or more concentric sections, the blades of contiguous sections being inclined in opposite directions. Thus in Figs. 7 and 8 I have shown a plate having three sections the innermost 9 having the blades inclined so as to cause a whirling of the air in a right-handed direction; the second or middle section 10 having the blades inclined to cause the air to whirl in a left-handed direction; and the blades of the outermost section 11 being inclined similar to the innermost. It is to be understood that the plate may have as many sections as may be desired, and that the blades may be inclined to the plane of the plate at any desired angle depending upon the character of the fuel, or the particular furnace with which the plate is used. The currents of air through the openings between the blades may be induced by the stack draft or by a forced draft.

In Figs. 9 and 10 I have shown an application of the invention with a forced draft, the air duct 12 leading from any suitable source of supply terminating at the furnace front to completely inclose the deflecting plate. The combustion chamber is shown as below a water tube boiler having a bank of inclined tubes 13. As the inner ends of the blades terminate in close proximity to the burner the whirling motion of the currents of air in opposite directions begins immediately after the current of air passes the substantially flat deflecting plate, so that the issuing stream of fuel is surrounded, intermingled with and thoroughly broken up by the whirling masses of air practically immediately after it is ejected from the burner.

As above stated the deflecting plate is substantially flat and, as shown in Figs. 1 and 2, the blades are wider at their outer than at their inner ends. The whirling columns of air surround the non-whirling column passing through ring 3 which in turn encompasses the spray of fuel at the start, after which the inner column is whirled by contact with the column of air deflected by blades 7. Also as shown in Fig. 1 the blades are set radially, the inner ends of the inner set terminating in the ring 3 which provides a central opening.

What I claim and desire to secure by Letters Patent of the United States is:—

1. The combination with a burner, of an air deflecting device consisting of a substantially flat plate having a central opening and comprising concentrically arranged sets of blades, the blades in the individual sets being substantially flat from their exterior to their interior edges and spaced apart to provide apertures for the admission of air and inclined to the plane of the plate, the blades of one set inclined in a direction opposite to the direction of inclination of the blades of the adjacent set, the inner ends of the inner set of blades terminating adjacent said central opening, and said burner terminating in proximity to said opening.

2. The combination with a burner, of an air deflecting device consisting of a substantially flat plate having a central opening and comprising concentrically arranged sets of blades, said blades being spaced apart to provide apertures for the admission of air and inclined to the plane of the plate, the blades of one set inclined in a direction opposite to the direction of inclination of the blades of the adjacent set, said blades being wider at their outer than at their inner ends and the inner ends of the inner set of blades terminating adjacent said central opening, and said burner terminating in proximity to said opening.

3. The combination with a burner, of an air deflecting device consisting of a substantially flat plate having a central opening and comprising concentrically arranged sets of blades, the blades in the individual sets being substantially flat from their exterior to their interior edges and spaced apart to provide apertures for the admission of air and inclined substantially 45° to the plane of the plate, the blades of one set inclined in a direction opposite to the direction of inclination of the blades of the adjacent set, the inner ends of the inner set of blades

terminating adjacent said central opening, and said burner terminating in proximity to said opening.

4. The combination with a burner, of an air deflecting device consisting of a plate having a central opening and a plurality of blades radially arranged and coaxial with said burner, said blades being divided into concentrically arranged sets and inclined to the plane of the plate and spaced apart to provide apertures for the admission of air, the blades in the individual sets being substantially flat from their exterior to their interior edges and the blades of one set inclined in a direction opposite to the direction of inclination of the blades of the adjacent set, the inner ends of the inner set of blades terminating adjacent said central opening, and said burner terminating in proximity to said opening.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

DAVID J. IRISH.

Witnesses:
M. E. McNINCH,
CHARLES S. JONES.