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BURNER

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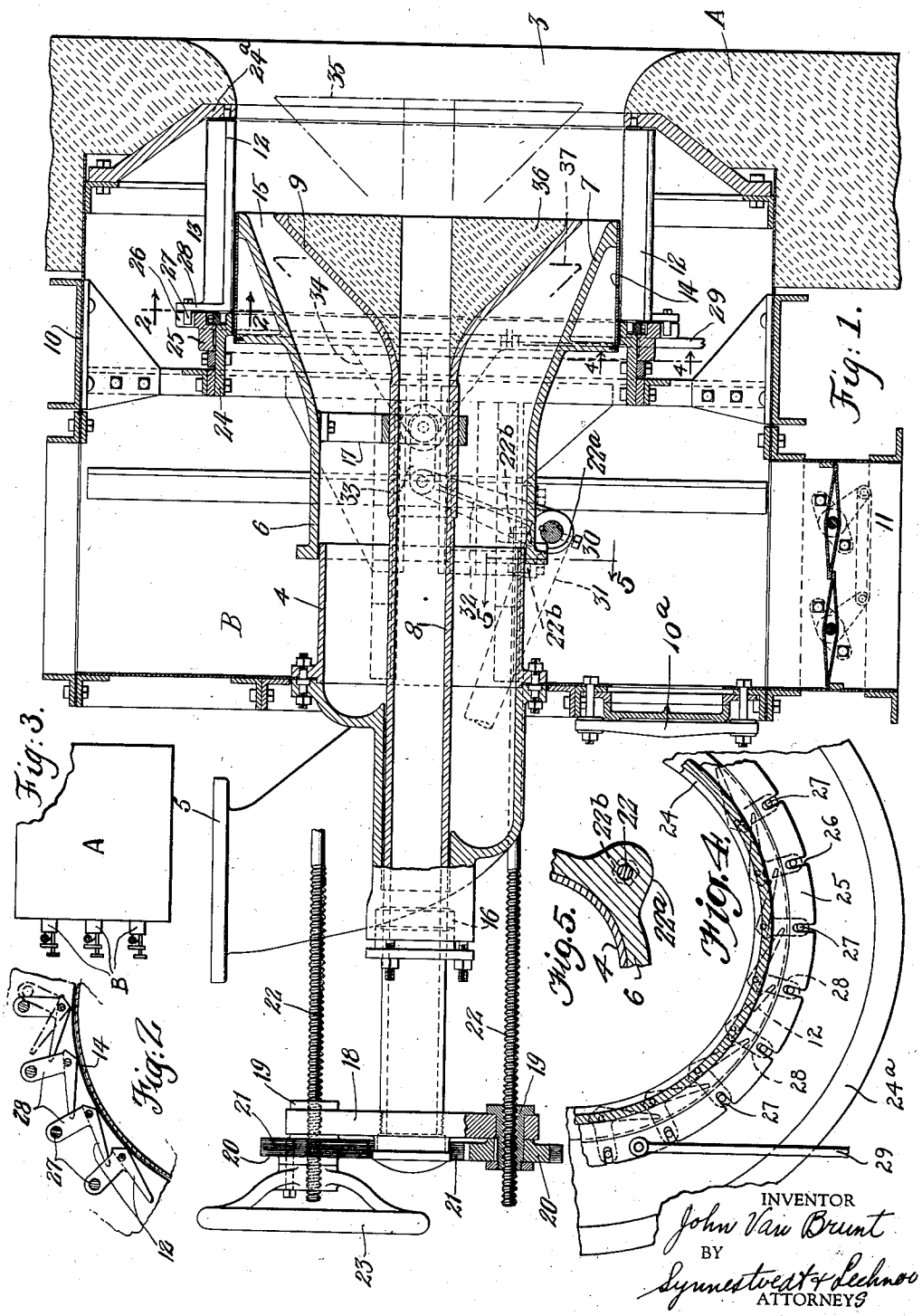

Fig. 1.

Fig. 3.

Fig. 2.

Fig. 5.

Fig. 4.

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BURNER

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This invention relates to burners and more particularly to improved burners for pulverized fuel burning furnaces.

One of the primary objects of my invention is the provision of a burner by means of which the fuel may be admitted and burned in flames varying from a flat mushroom-like flame to an elongated flame, so that the burner may be adapted to a variety of operating conditions and also to a variety of physically different installations.

More specifically stated it is an object of my invention to provide a burner in which the above characteristics are obtained by a novel combination of an adjustable fuel nozzle and adjustable air admission means.

Other objects reside in the provision of a burner mechanism having means adapted to be moved to protect the burner parts from radiant heat, for example, when the furnace is being fired by other means, and a burner which may be advantageously employed for admitting air when the furnace is being fired by other means.

Other objects and advantages will occur to those skilled in the art from the following description considered in connection with the accompanying drawings which illustrate a preferred embodiment of the invention.

Fig. 1 of the drawings is substantially a longitudinal sectional view of a burner embodying my improvements.

Fig. 2 is a fragmentary section taken on the line 2—2 of Fig. 1 and illustrates certain air vanes which I employ.

Fig. 3 is a diagrammatic plan view of a furnace equipped with the burner means of the present invention.

Fig. 4 is a fragmentary sectional view taken substantially as indicated by the line 4—4 of Fig. 1, and

Fig. 5 is a detailed sectional view taken as indicated by the line 5—5 of Fig. 1.

Referring to the drawings, a portion of a furnace wall is indicated by the reference letter A, which wall is provided with an opening 3 for a burner, which burner is indicated as a whole by the reference letter B.

The burner B comprises, in general, a cylindrical chamber 4 having a fuel inlet 5; a movable member 6 constituting an extension of the chamber 4 and having a belled end 7; a movable member 8 arranged coaxially with the chamber 4 and member 6 and having a coned end 9; an air casing 10 arranged around the outlet end of the burner parts referred to, said casing having a damper controlled air inlet 11; and a plurality of spaced movable louvres or vanes 12 so disposed with relation to the belled end 7 of the member 6 as to constitute a cylindrical cage 13 surrounding it. In addition, the casing 10 may be provided with an inspection opening closed by means of a cover plate 10^a. The outer periphery of the belled end 7 is cylindrical as indicated at 14, and serves as a means for blanking off a portion of the air slots provided by the spaced vanes.

Before going into the particular advantages to be gained through the practice of my invention, and before describing in detail how such may be accomplished, I will first describe the general operation of the burner which is as follows:

The fuel to be burned, together with some air, is delivered to the chamber 4 under pressure and discharges therefrom into the furnace through the annular opening 15 between the bell 7 and the deflecting cone 9. The fuel stream leaving the opening 15 encounters a swirling body of air which is set up by the introduction of air under pressure from the air casing 10 through the cage 13, and in consequence thereof complete and thorough admixture of the fuel and air results. The arrangement of the movable vanes or louvres 12, in order to produce the swirling motion referred to, is clearly illustrated in Figure 2 of the drawing.

Depending upon such factors as the physical construction and dimensions of the furnaces and upon operating conditions, it is desirable to have a burner which may be adapted to burn the fuel with flames not only differing in intensity, but also in shape. For example, to obtain the best results, it might be desirable to have a mushroom-shape flame, or a relatively long and narrow flame, or a flame of intermediate character. I am enabled to

produce flames of such character from the same burner in the following manner.

Assuming now that it is desired to fire with a flat or mushroom-like flame, the deflecting cone 9 is moved into such relation with the bell portion 7 of the member 6 that the annular opening 15 is of relatively small size, as illustrated in full lines in Fig. 1, and the air vanes 12 are moved toward their closed positions to a position in which the air passages therebetween are relatively small, as compared to their maximum size with the vanes in their wide open positions. Thus, a maximum amount of fuel discharges through the opening 15 and the swirl of air, due to its velocity, retards the movement of the fuel into the furnace and produces a mushroom-like flame.

In order to accomplish such adjustment I have provided means for moving the member 8 with its cone 9 longitudinal of its axis and means for opening and closing the vanes 12. The member 8 extends through the end of the fuel chamber 4 and is provided with a packed bearing 16 in the chamber 4 and a bearing 17 in the member 6. At its outer end the member 8 is provided with a yoke member 18 rigidly secured thereto, which member has rotatably mounted therein a pair of internally threaded collars 19. Each of the collares 19 has keyed thereto a sprocket wheel 20 and a chain 21 connects the sprockets. The collars 19 have threaded thereinto the threaded rods 22, which rods extend from and are secured to the lugs 22^a of the movable member 6 by means of the nuts 22^b (see Fig. 5). A hand wheel 23 is fixed to one of the sprocket wheels and it will be seen that when this wheel is rotated the collars 19 are rotated and act as nuts on the rods 22 and cause the yoke 18 and the member 8 to move axially in one direction or the other, according to the direction of rotation of the hand wheel. Thus adjustment of the cone 9 with respect to the bell 7 may be accomplished.

The vanes 12 are pivotally mounted in the fixed rings 24 and 24^a and may be swung on their pivots by means of an oscillatable ring 25 which has engagement with the vanes by means of slots 26, pins 27 and arms 28 (see Fig. 4). Any suitable means may be provided for rotating the ring 25 as, for example, a readily accessible arm 29. Thus the amount of opening between the vanes may be adjusted by movement of the ring 25.

Assuming now that it is desired to fire with an elongated flame, the deflecting cone 9 is moved to the left, by rotating the hand wheel 23, to the position indicated in dot and dash lines at 37 in Fig. 1, and the vanes 12 are moved by means of the ring 25 to the position indicated in dot and dash lines in Fig. 2. Thus the opening 15 is reduced in size and the vane openings increased, in consequence of which an elongated flame results for reason that the velocity of the fuel stream is increased and that of the air reduced. It will be understood that any number of different kinds of flames may be produced by adjusting the deflecting cone and vanes to positions intermediate those described.

It is to be noted that while I have shown the belled end 7 of the member 6 in a position half way in the cylindrical cage 13 so that the air slots are blanked off for one half of their length, I am enabled to move the member 6 to the left by means of lever and link mechanism 30 comprising an operating lever 31, a lever 32, and a link 33 connected to the member 6 by means of the lug 34. On operation of the lever mechanism 30 the cone 9 with its operating mechanism moves with the belled member 6. Movement of this lever mechanism admits more or less air as the case may be, and alters the position of the fuel outlet in the burner opening 3. Thus the intensity of the flame may be controlled.

It is to be observed that the adjustment or movement of the cone 9 is not limited to the range above described, but that the cone may be moved inwardly toward the combustion chamber from the position shown in full lines to the position shown in dot and dash lines at 35. This is very advantageous for the reason that with the cone in such position, the burner parts may be protected from radiant heat, as, for example, when a burner of a series of burners, as illustrated in Fig. 3, is out of use, or when the burner is being used in a furnace fired with more than one kind of fuel, in which case, under certain conditions, it might be desirable to shut down the burner B. The cone 9 is preferably lined with refractory material as indicated at 36.

It is also pointed out that when the burner B is out of use, I may still employ it as a means for introducing combustion air into the combustion chamber to support combustion of the fuel employed. This, however, is not always to be desired, and by my invention I am enabled to protect a burner not in use without admitting air which has heretofore been done in an attempt to keep such burner cool. In many instances this previous practice has been objectionable from a combustion and efficiency standpoint.

In connection with the adjustment of the annular discharge opening 15 it is to be understood that the adjustment may be accomplished by moving the member 7 axially and that any particular adjustment of the opening may be maintained throughout the entire range of travel of the member 6 longitudinally thereof.

I claim:—

1. A fuel burner including a fuel nozzle having an annular discharge opening, and means for setting up a swirling current of air into which the fuel discharges, said discharge opening and said means being adjustable to

control the flame produced by the burner, together with means for moving the fuel nozzle in a direction to blank off a portion of the aforesaid means.

2. A pulverized fuel burner comprising, in combination, a fuel nozzle having an axially movable belled discharge end and an axially movable deflector cone associated with the belled discharge end in such manner as to form an annular fuel discharge opening between the two, means for moving the cone to adjust the size of the discharge opening, a source of air, a set of vanes around the said discharge end of the nozzle for admitting air from said source, and means for moving said belled discharge end together with the cone in its adjusted position in a direction to blank off a portion of the vanes.

3. A pulverized fuel burner comprising, in combination, a fuel nozzle having an axially movable belled discharge end and an axially movable deflector cone associated with the belled discharge end in such manner as to form an annular fuel discharge opening between the two, means for moving the cone to adjust the size of the discharge opening, a source of air, a set of vanes around the said discharge end of the nozzle for admitting air from said source, and means for moving said belled discharge end together with the cone in its adjusted position in a direction to blank off a portion of the vanes, together with means for adjusting said vanes.

In testimony whereof I have hereunto signed my name.

JOHN VAN BRUNT.