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BURNER FOR PULVERIZED FUEL

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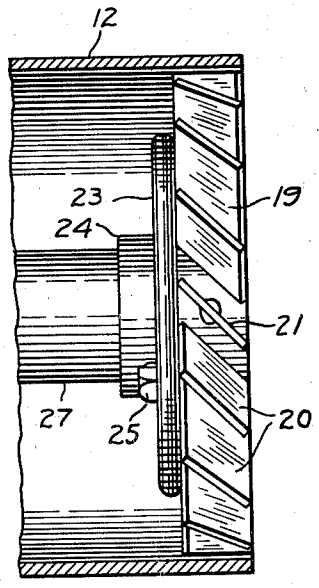


Fig. 4

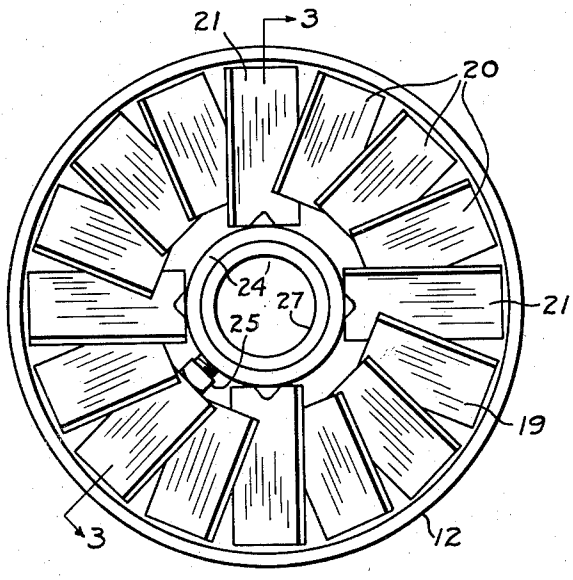


Fig. 2

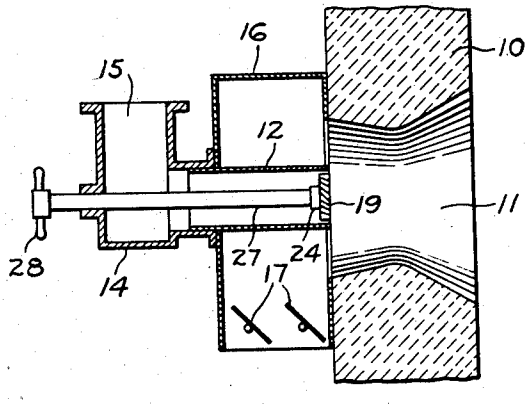


Fig. 1

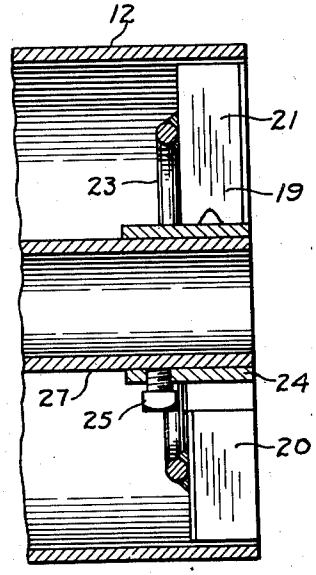


Fig. 3

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BURNER FOR PULVERIZED FUEL

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4 Claims. (Cl. 110—104)

This invention relates to burners for pulverized fuel, and more particularly to burners of the type having a nozzle arranged to discharge a stream of pulverized fuel and primary air, and means for delivering secondary air around the outside of the fuel stream.

It has been proposed heretofore to mount a fuel spreader comprising a series of substantially radial vanes at the discharge end of the fuel nozzle to whirl the fuel and deflect it outwardly into the secondary air stream. While burners so constructed operate with high efficiency under normal conditions, it is in some cases difficult to obtain a wide range of fuel burning rates and particularly to maintain ignition when operating at low capacities. Furthermore the prior fuel spreaders have been somewhat difficult and expensive to manufacture. It is accordingly one object of the present invention to provide a pulverized fuel burner which can be operated efficiently over a wide range of capacity.

It is a further object of the present invention to provide a pulverized fuel burner so constructed and arranged as to ensure proper ignition of the fuel even at low capacities.

It is a further object of the invention to provide a pulverized fuel burner which will be comparatively simple and inexpensive to manufacture.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention, and in which like reference numerals indicate like parts,

Fig. 1 is a somewhat diagrammatic longitudinal section through a pulverized fuel burner;

Fig. 2 is an end view of the fuel nozzle and the fuel spreader mounted therein;

Fig. 3 is a section on the line 3—3 of Fig. 2; and

Fig. 4 is a side elevation of the fuel spreader mounted in the nozzle, the latter being shown in longitudinal section.

In the drawing I have shown a vertical furnace wall 10 of refractory material provided with a burner opening 11. A horizontal cylindrical pipe or nozzle 12 is mounted in front of the opening 11, the front end of this nozzle being supported in a hollow receiving head 14 having an inlet passage 15. Pulverized fuel and primary air are delivered to the passage 15 from a suitable source, and the stream is discharged from the nozzle 12 rearwardly through the opening 11. A casing 16 surrounds the nozzle 12, and secondary air under pressure is delivered to this casing from a suitable source and escapes therefrom through the opening 11 in surrounding relation to the fuel stream. The admission of air to the casing 16 may be controlled by dampers 17.

In order to ensure thorough and rapid mixing of the fuel with the secondary air and thus obtain a short and turbulent flame, a fuel spreader 19 is mounted at the discharge end of the nozzle 12, this spreader being arranged to whirl the fuel and throw it outwardly into the surrounding secondary air stream. In the embodiment illustrated the spreader 19 comprises a series of deflecting vanes 20 and 21 mounted in substantially radial positions and each arranged at an angle to the general direction of the stream flow. These vanes are comparatively thin and of uniform width throughout their lengths, and they can be readily cut from commercially available strips of flat steel without bending. The outer ends of the vanes are arranged in a circle having a diameter slightly less than the inside of the nozzle 12, and they are held in assembled relationship by means of a ring 23 concentric with the nozzle and welded to the front edges of the vanes intermediate their lengths. This ring can be formed by a steel rod of circular cross-section bent into the desired shape.

It will be noted that the vanes 21 are somewhat longer than the vanes 20. Furthermore the longer vanes 21 are few in number as compared with the shorter vanes. The inner ends of the shorter vanes 20 are arranged in a circle, and the longer vanes 21 extend beyond the shorter vanes and into this circle. With this construction, the resistance to flow at the central part of the spreader is greatly reduced as compared with prior constructions, and yet the desired whirl is imparted to the entire fuel stream.

Provision is preferably made for adjusting the fuel spreader 19 longitudinally of the nozzle 12. For this purpose the inner ends of the longer vanes 21 are welded to a cylindrical sleeve or hub 24, and this sleeve is fastened by means of a set screw 25 to the rear end of a tube 27 coaxial with the nozzle 12. This tube 27 is slidably supported in the head 14, and a handle 28 is secured to the front end of the tube to facilitate its longitudinal adjustment.

The operation of the invention will now be apparent from the above disclosure. The stream of pulverized fuel and primary air flows through the receiving head 14 and the nozzle 12 and is discharged rearwardly through the opening 11.

Secondary air is delivered from the casing 16 to the opening 11 in surrounding relation to the fuel stream. The vanes 20 and 21 whirl the fuel and throw it outwardly into the secondary air, ensuring a short and turbulent flame. The annular space between the sleeve 24 and the inner ends of the shorter vanes 20 is comparatively unobstructed, so that considerable fuel will flow therethrough even when the burner is operating at low capacities. This provides a central core for the flame which is comparatively rich in fuel and as a result ignition can be readily maintained, this being facilitated by the action of the inner portions of the longer vanes 21 which tend to concentrate the fuel in localized streams.

The improved fuel spreader is comparatively simple and inexpensive to manufacture and effective for its intended purpose.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A pulverized fuel burner comprising a nozzle arranged to discharge a stream of pulverized fuel and air, a series of deflecting vanes mounted in the path of the fuel at the discharge end of the nozzle and shaped to whirl the fuel, and a central hub, the vanes being arranged in substantially radial positions with the inner ends of some of the vanes secured to the hub, the inner ends of the other vanes being spaced outwardly from the hub to provide a plurality of openings through which a substantial flow of fuel may take place during the burner operation.

2. A pulverized fuel burner comprising a nozzle arranged to discharge a stream of pulverized fuel and air, a series of deflecting vanes mounted in substantially radial positions in the path of the fuel at the discharge end of the nozzle and shaped to whirl the fuel, some of the vanes being longer than the others, and a central hub secured to the inner ends of the longer vanes, the inner ends of the shorter vanes being spaced outwardly from the hub to provide a plurality of openings through which a substantial flow of fuel may take place during the burner operation.

3. A pulverized fuel burner comprising a cylindrical nozzle arranged to discharge a stream of pulverized fuel and air, a series of deflecting vanes mounted in substantially radial positions in the path of the fuel at the discharge end of the nozzle and shaped to whirl the fuel, the outer ends of the vanes being arranged in a circle and some of the vanes being longer than the others, and a central hub secured to the inner ends of the longer vanes, the inner ends of the shorter vanes being spaced outwardly from the hub to provide a plurality of openings through which a substantial flow of fuel may take place during the burner operation.

4. A pulverized fuel burner comprising a cylindrical nozzle arranged to discharge a stream of pulverized fuel and air, a series of deflecting vanes mounted in substantially radial positions in the path of the fuel at the discharge end of the nozzle and shaped to whirl the fuel, the outer ends of the vanes being arranged in a circle and some of the vanes being longer than the others, a ring secured to the vanes intermediate their lengths, a central hub secured to the inner ends of the longer vanes, and a support for said hub, the inner ends of the shorter vanes being spaced outwardly from the hub to provide a plurality of openings through which a substantial flow of fuel may take place during the burner operation.

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