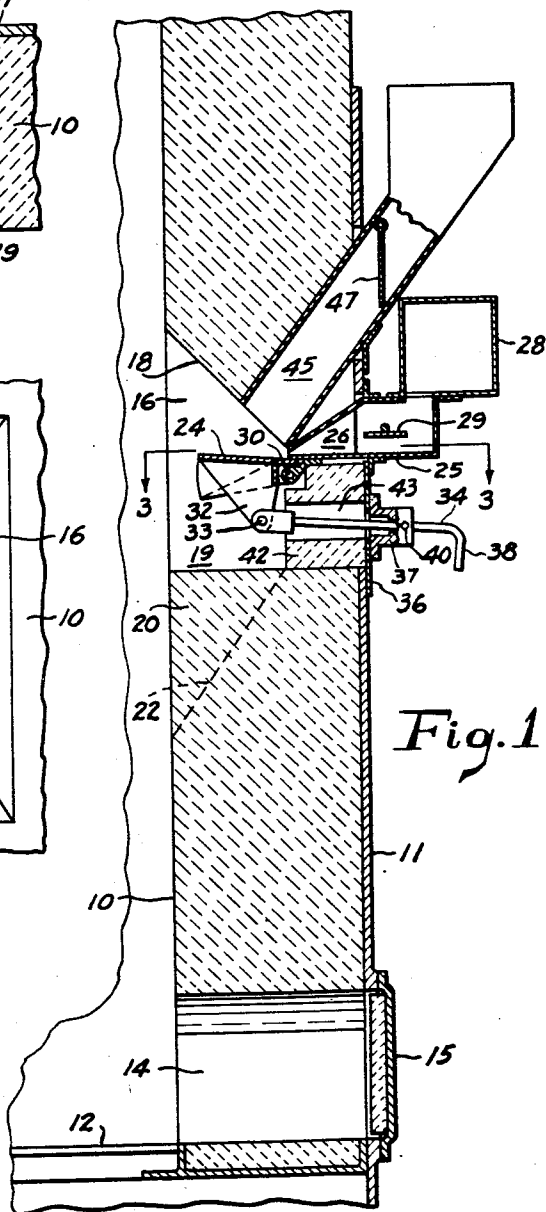
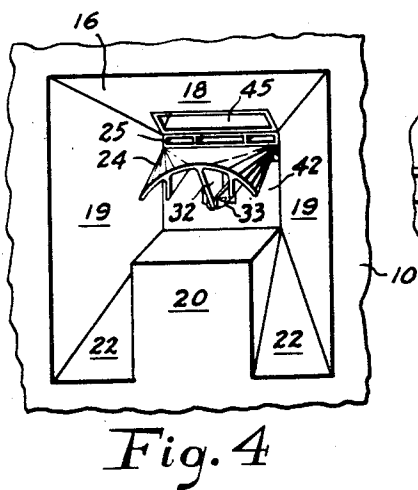
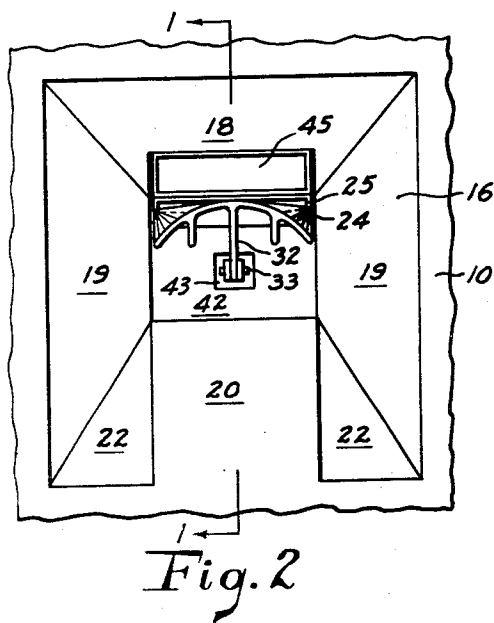
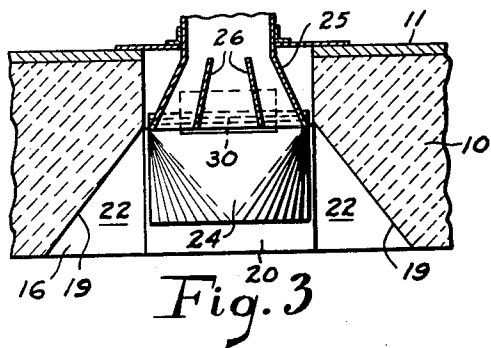


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E. C. MILLER ET AL
FUEL FEEDING APPARATUS

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INVENTORS
EARLE C. MILLER
WILLIAM B. HEWITT

BY *Albert G. Bledget*
ATTORNEY

UNITED STATES PATENT OFFICE

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FUEL FEEDING APPARATUS

Earle C. Miller, Worcester, and William B. Hewitt,
Cambridge, Mass., assignors to Riley Stoker
Corporation, Worcester, Mass., a corporation
of Massachusetts

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1

This invention relates to fuel feeding apparatus, and more particularly to apparatus for projecting fuel on to a grate at the bottom of a combustion chamber.

With certain fuels it is very difficult to obtain sufficiently uniform distribution of the fuel over the grate surface to ensure proper combustion conditions. This is particularly true with fuels of the cellulose type, such as hogged wood, wood shavings, wood sawdust, shredded bark, bagasse, and the like. Such materials tend to accumulate in a thick mass on the grate in a direct line with the point of fuel introduction, and this mass prevents the upward flow of air through the portion of the grate therebeneath and diverts the air flow to grate portions which have little or no fuel thereon. Efficient combustion under such conditions is impossible.

It is accordingly one object of the invention to provide a simple and comparatively inexpensive fuel feeding apparatus which will result in a greatly improved distribution of the fuel over a furnace grate.

It is a further object of the invention to provide a fuel feeding apparatus particularly suitable for handling fuels of the cellulose type, and adapted to spread the fuel laterally in a uniform manner over a considerable area.

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.

In accordance with the invention in its preferred form there is provided a plate having an upper surface over which a stream of gaseous fluid, such as air, is directed in a generally rearward direction. The air stream is preferably delivered by a nozzle having its discharge orifice located slightly above the front portion of the plate and shaped as a thin generally horizontal slit extending throughout substantially the entire width of the plate. While the upper surface of the plate close to the nozzle is generally flat and extends horizontally in a direction across the air stream, this surface curves laterally downward at each side to a gradually increasing degree as the rear or discharge edge of the plate is approached. Preferably the transverse contour of this plate surface changes smoothly and gradually from a substantially horizontal line adjacent the rear end of the nozzle to an upwardly convex circular arc adjacent the rear end of the plate, the arc extending for approximately ninety degrees. The plate is preferably

2

adjustable about a substantially horizontal axis adjacent its front edge. A chute or other means is provided above the nozzle to deliver the fuel particles to the air stream flowing rearwardly over the plate, for entrainment by the air stream. The contour of the plate surface as above described has the effect of spreading the stream laterally and at the same time causing the stream to turn downwardly, this downward travel being at a maximum in the extreme lateral portions of the stream and at a minimum in the central portion thereof. These parts are associated with a furnace wall located in front of a grate. The plate is mounted in an opening in this wall, the opening preferably flaring outwardly toward the furnace in all directions except directly beneath the plate, where a pier is provided to shield the plate from radiant heat. The construction as described is highly effective in distributing fuels of the cellulose type over the grate surface in a uniform manner.

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

Fig. 1 is a vertical section through a furnace wall and associated parts, the section being taken on the line 1-1 of Fig. 2;

Fig. 2 is an elevation of a portion of the wall, as viewed from the rear or furnace side thereof;

Fig. 3 is a section taken on the line 3-3 of Fig. 1; and

Fig. 4 is a perspective view of the apparatus shown in Fig. 2.

The embodiment illustrated comprises an upright furnace wall 10 of suitable refractory material having a metal plate 11 engaging its front or outer surface. A horizontal grate 12 is located behind the wall, and the wall is provided with an opening 14 and an associated door 15 immediately above the level of the grate. In the rear face of the wall and an appreciable distance above the grate there is provided a generally rectangular recess 16 having an upper surface 18 which slopes upwardly and rearwardly and two opposed side surfaces 19-19 which flare laterally and rearwardly. The upright front edges of the two side surfaces 19-19 are spaced apart horizontally. Within the lower portion of the recess 16 there is provided a pier 20 having its rear surface substantially flush with the rear surface of the wall 10 and its upper surface substantially horizontal and spaced downwardly from the upper surface 18 of the recess. The width of the pier 20 is substantially equal to the horizontal distance between the front edges of

the surfaces 19—19, and at each side of the pier the recess extends downwardly to a downwardly and rearwardly sloping bottom surface 22 of triangular shape.

An approximately horizontal fuel-distributing plate 24 is mounted within the recess 16, midway between the side surfaces 19—19 thereof and above the pier 20, and a stream of air is blown over the upper surface of this plate in a generally rearward direction. For this purpose there is provided a nozzle 25 having its discharge orifice located slightly above the front portion of the plate 24. This orifice is shaped as a thin generally horizontal slit which extends throughout substantially the entire width of the plate. As best shown in Fig. 3, the rear portion of the nozzle 25 flares laterally toward both sides, and inclined baffles 26 are mounted within the nozzle to aid in spreading the air stream. The lower wall of the nozzle is substantially horizontal (Fig. 1), whereas its upper wall slopes downwardly and rearwardly to the discharge opening. Air at a suitable pressure is supplied to the nozzle by an air duct 28 located in front of the wall 10, and the rate of air flow is controlled by an adjustable damper 29 within the nozzle. The front portion of the plate 24 is pivotally connected to the rear portion of the nozzle by a horizontal hinge pin 30, so that the plate can be swung upwardly or downwardly as desired. In order to hold the plate in a fixed position of adjustment, an arm 32 extends downwardly from the plate, and the lower end of this arm is connected by a pin 33 to the rear end of a rod 34. This rod extends through an upright plate 36 and a flanged boss 37 secured to this plate, the front end of the rod being bent at 38 to form a handle. The boss 37 is provided with a set screw 40 which serves to clamp the rod in a desired position of adjustment. The plate 36 is releasably secured to the main front plate 11. The recess 19 is closed at the front by refractory material 42 (preferably in the form of loose bricks) located beneath the nozzle 25 and behind the plate 36. The material 42 has an opening 43 therethrough for the rod 34.

The fuel to be burned in the furnace is suitably supplied to the air stream flowing rearwardly over the upper surface of the plate 24. For this purpose there is provided a chute 45 of generally rectangular cross-section which slopes downwardly and rearwardly at a steep angle to discharge the fuel by gravity through the front portion of the upper surface 18 of the recess 16. The discharge end of this chute is located directly above the plate 24, and the width of the chute is substantially the same as that of the said plate. Fuel may be supplied to the upper end of the chute 45 by a suitable and regulatable feeding mechanism. A comparatively light plate 47 is freely suspended within the chute to prevent the fuel above the plate from becoming ignited, this plate affording only a very slight resistance to the downward travel of the fuel.

The contour of the upper surface of the plate 24 is of very great importance, since it has a decided effect upon the distribution of the fuel over the grate 12. As best shown in Fig. 4, the front portion of this surface is substantially flat and extends horizontally in a transverse direction adjacent the discharge end of the nozzle 25, whereas the remainder of this surface curves downwardly at each side to a gradually increasing degree as the rear edge of the plate is approached. As illustrated, the transverse con-

tour of this plate surface changes smoothly and gradually from a horizontal line adjacent the nozzle to an upwardly convex circular arc of approximately ninety degrees in extent at the rear edge of the plate. Thus the central portion of the plate surface is flat over an area shaped substantially as an isosceles triangle with its base adjacent the front edge of the plate and its apex adjacent the center of the rear edge thereof, and the surface portions at opposite sides of the flat triangular area are shaped as fragments of conical surfaces with their apices located adjacent the respective front corners of the plate. The triangular flat surface is tangent to the two conical surfaces. Preferably the plate is of substantially uniform width throughout its length.

It will now be apparent that in the operation of the invention the damper 29 will be open so that air under pressure may flow from the duct 28 to the nozzle 25 and thence rearwardly across the plate 24. A suitable fuel, such as shredded bark, is supplied to the chute 45 by a regulatable feeding mechanism (not shown) and descends through the chute by gravity to the plate 24, where it enters the air stream and is carried along therewith. While the very finest particles of fuel will burn in suspension, a large part of the fuel will descend by gravity to the grate 12 to provide a fuel bed. Air will flow upwardly through the grate and the fuel bed in the usual way to maintain combustion.

Because of the novel shape and arrangement of the plate 24 and the associated parts, the fuel will be distributed over the grate far more uniformly than with prior apparatus. The fuel which travels along the center line of the plate will be deposited on the portion of grate extending directly behind the plate. Since the plate provides a flat area of generally triangular shape which tapers substantially to a point at the center of the rear edge of the plate, fuel which travels along either lateral portion of the plate will be diverted to one side or the other. In the case of fuel traveling only slightly to one side of the plate center line, the amount of lateral diversion will be small, whereas fuel which travels adjacent either side edge of the plate will be discharged at a considerable angle to that side. The fuel distribution is greatly improved by the provision of the conical surfaces at opposite sides of the central flat triangular surface. As the air stream flows over these conical surfaces it is not only spread laterally but it tends to follow these surfaces and thus be drawn downwardly at an angle, this effect being most pronounced in the side portions of the air stream. Since the fuel particles are entrained by the air stream they are likewise drawn downwardly and projected on to the grate at opposite sides of the plate 24 and close to the front wall 10. These lateral portions of the fuel stream travel downwardly at opposite sides of the central pier 20 and above the downwardly inclined surfaces 22. If any of the fuel particles fall on these surfaces 22 they will slide downwardly therefrom to the grate. The pier 20 serves to shield the plate 24 to a considerable extent from the heat of the fuel bed. The distribution of the fuel over the grate can be controlled to some extent by adjusting the plate 24 upwardly or downwardly about the hinge pin 30 (by means of the rod 34), or by adjusting the damper 29 to vary the velocity of the air stream discharged by the nozzle 25. The construction is relatively simple and inex-

5

pensive to manufacture, and highly effective for the purpose intended.

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

1. Apparatus for feeding fuel to a furnace grate comprising a plate which provides an upper surface with a generally flat central portion and downwardly curved portions at opposite sides of the central portion, the width of the flat central portion decreasing from front to rear, and the width of the curved portions increasing from front to rear, means to direct a stream of gaseous fluid rearwardly over the upper surface of the plate, and means to supply particles of solid fuel to the said stream.

2. Apparatus for feeding fuel to a furnace grate comprising a plate having a front edge and a rear edge connected by an upper surface, the transverse contour of the said surface changing smoothly and gradually from a substantially horizontal line extending throughout substantially the entire width of the plate adjacent the front edge thereof, to an upwardly convex arc adjacent the rear edge, means to direct a stream of gaseous fluid rearwardly over the upper surface of the plate, and means to supply particles of solid fuel to the said stream.

3. Apparatus for feeding fuel to a furnace grate comprising a plate which provides an upper surface with a generally flat central portion shaped as an isosceles triangle with its base adjacent the front edge of the plate and two downwardly curved lateral portions shaped generally as fragments of conical surfaces with their apices located adjacent the respective front corners of the plate, the flat surface being tangent to the two conical surfaces, means to direct a stream of gaseous fluid rearwardly over the upper surface of the plate, and means to supply particles of solid fuel to the said stream.

4. Apparatus for feeding fuel to a furnace grate comprising an upright wall in front of the grate and having in its rear face a generally rec-

6

tangular recess which is spaced an appreciable distance above the grate, a plate mounted within the recess and having an upper surface with a generally flat central portion and downwardly curved portions at opposite sides of the central portion, the width of the flat central portion decreasing from front to rear and the width of the curved portions increasing from front to rear, the recess having two opposed side surfaces which flare laterally and rearwardly away from the adjacent lateral edges of the plate, a nozzle located in front of the plate in position to discharge a stream of gaseous fluid rearwardly over the upper surface of the plate, means to supply particles of solid fuel to the said stream, and a pier in the lower portion of the recess directly beneath the plate in position to protect the plate from heat radiated upwardly from the front portion of a fuel bed on the grate, the recess extending downwardly at each side of the pier to a bottom surface which slopes steeply downwardly and rearwardly so that channels are provided on opposite sides of the pier for the downward travel of fuel particles discharged from the side edges of the plate.

5. Apparatus as set forth in claim 4, in which the recess has an upwardly and rearwardly sloping upper surface, a downwardly and rearwardly sloping chute being provided to supply particles of solid fuel through the said upper surface to the said stream.

EARLE C. MILLER.

WILLIAM B. HEWITT.

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