Sept. 30, 1941 G. A. KOHOUT 2,257,693

FURNACE

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Fig. 1

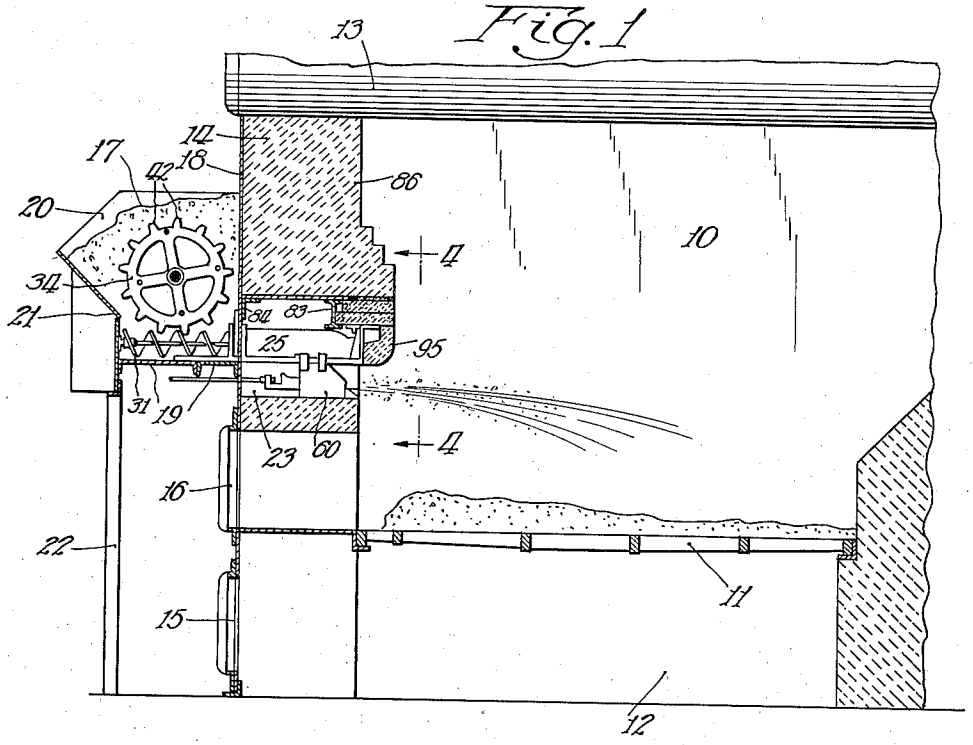
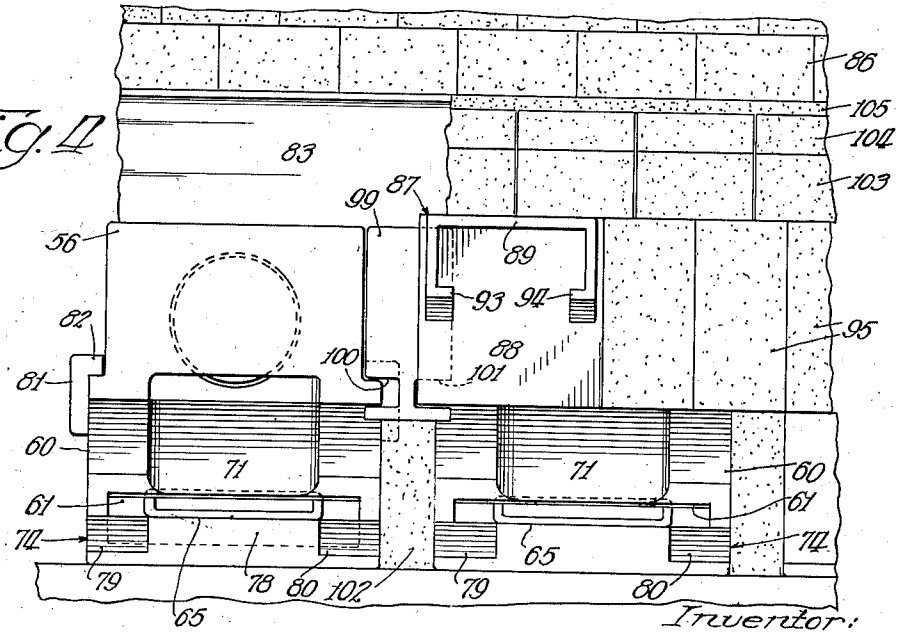


Fig. 2



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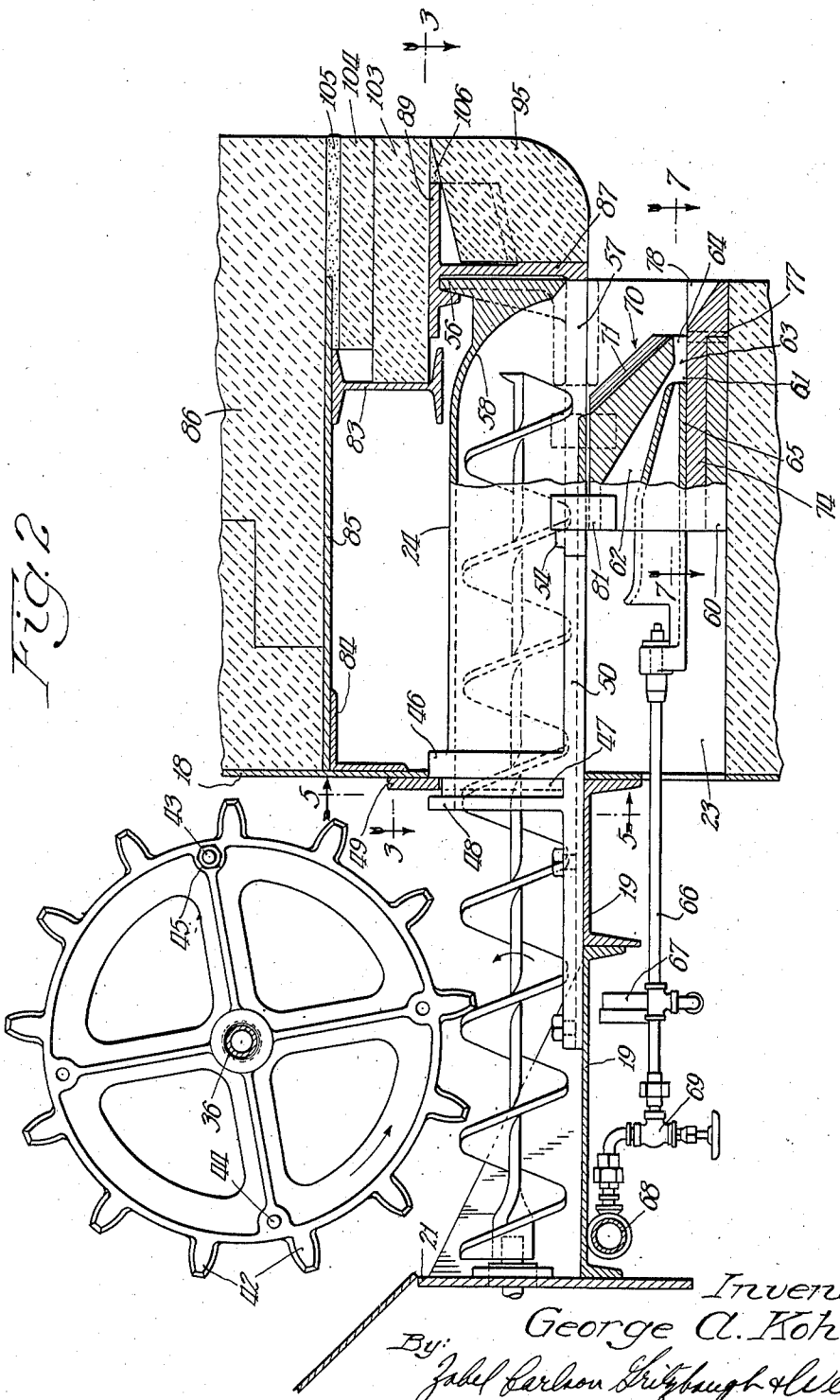


Fig. 2

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FURNACE

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Fig. 3

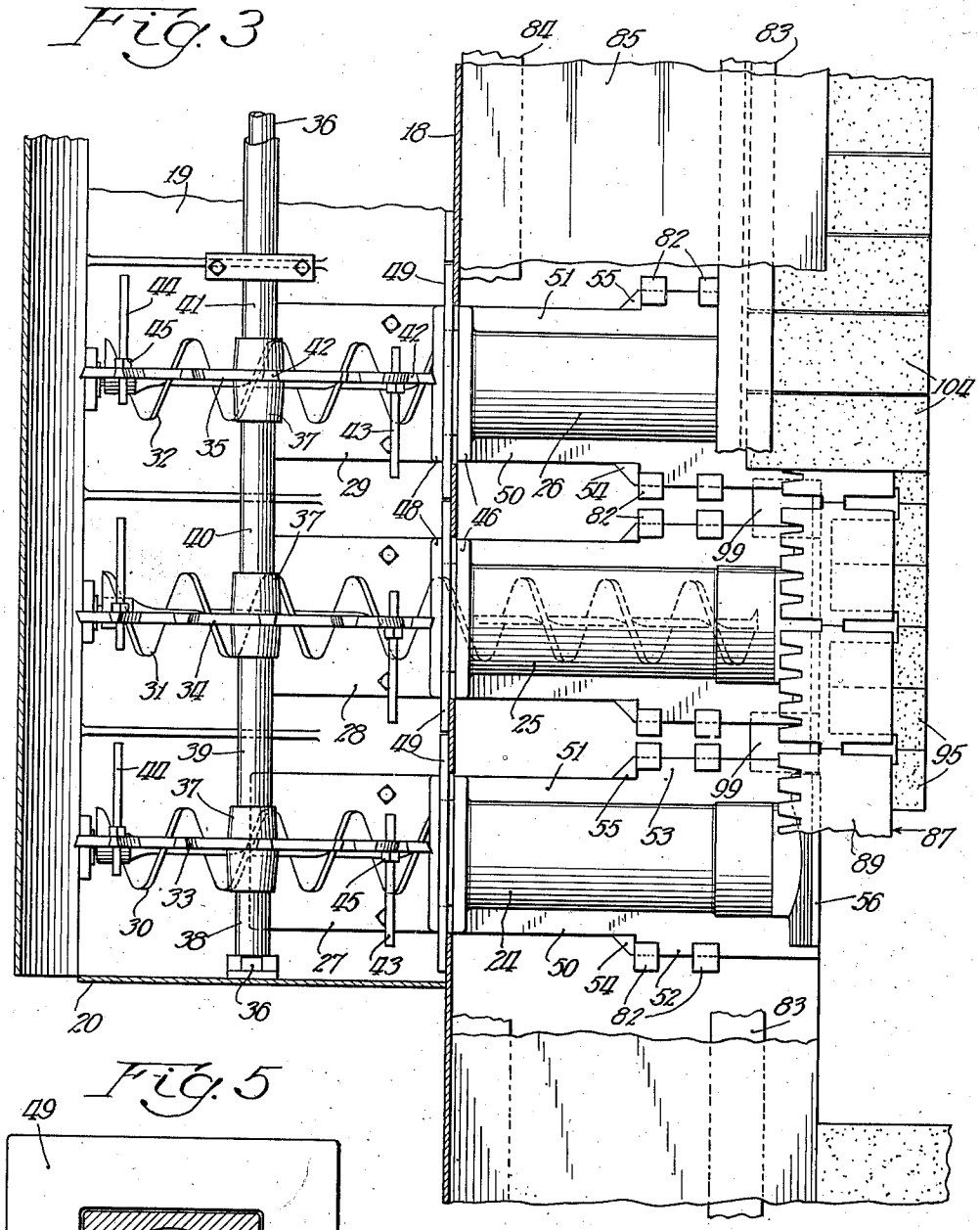
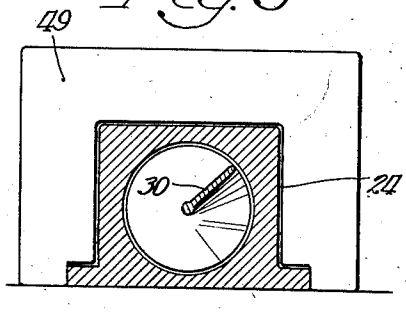


Fig. 5



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Fig. 8

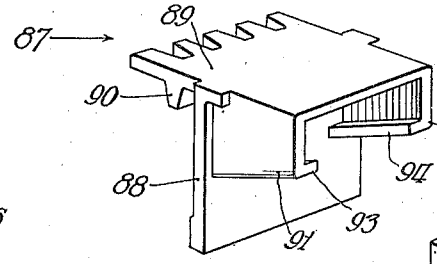
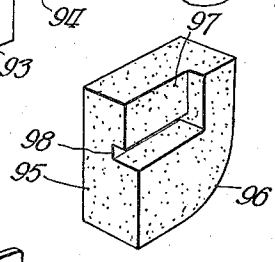


Fig. 9



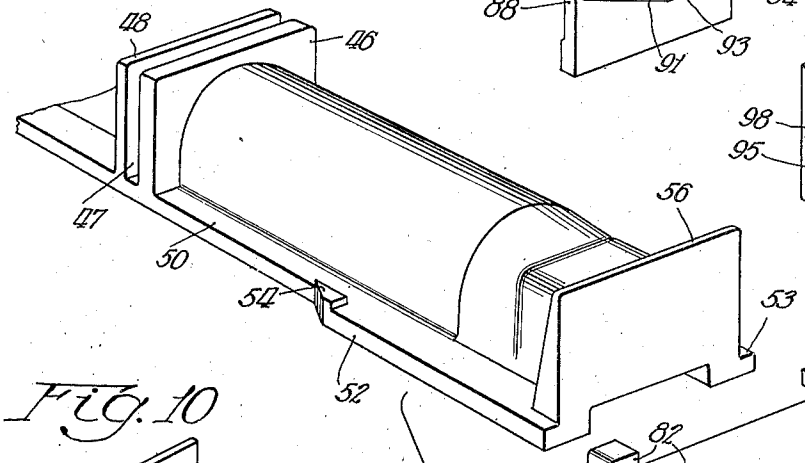


Fig. 10

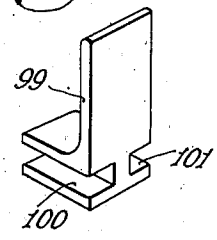


Fig. 6

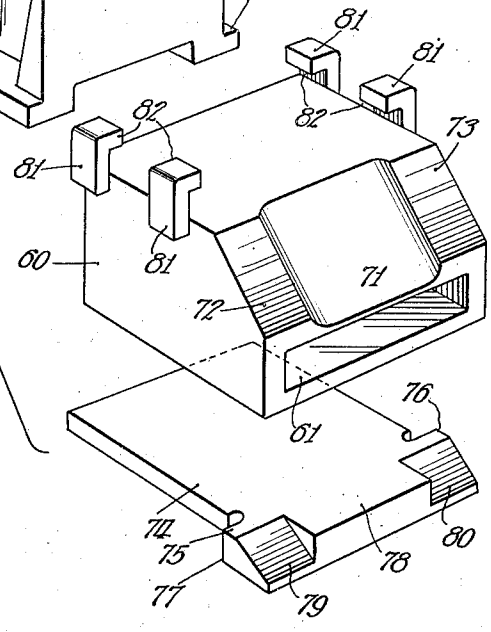
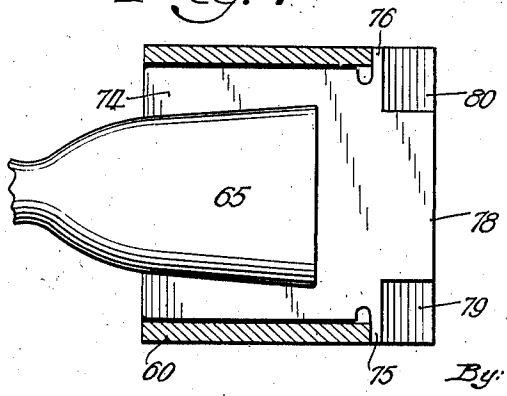


Fig. 7



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Patented Sept. 30, 1941

2,257,693

UNITED STATES PATENT OFFICE

2,257,693

FURNACE

George A. Kohout, Chicago, Ill.

Application May 6, 1938, Serial No. 206,337

3 Claims. (Cl. 110—105.5)

The present invention relates to furnaces, and more particularly to means for feeding fuel from a hopper into a furnace and spreading the same within the furnace. It is the principal purpose of the present invention to provide a fuel feeding system wherein the parts are combined and cooperate with each other in such a way that fuel may be fed evenly and in measured quantities at all times, even though the coal at times may be wet and at other times dry.

The present invention contemplates the provision of a fuel feeding device comprising a hopper from which individual feed screws advance fuel into the furnace where the fuel is caused to fall and to be spread as it falls by an air blast. The air blast itself supplies a portion of the air for combustion purposes, in addition to performing the spreading operation.

The present invention also contemplates the provision of novel means for insuring delivery of coal in the hopper to the feed screws so that they will be able to uniformly supply the coal to the furnace.

The present invention also contemplates a novel arrangement of the feed screw housing and the protecting refractory wall within the furnace by which the feed screw and its housing is protected from the intense heat within the combustion chamber.

Other features and advantages of the invention will appear more fully as the description proceeds, reference being had to the accompanying drawings wherein a preferred form of the invention is shown. It is to be understood, however, that the description and drawings are illustrative only, and are not to be considered as limiting the invention except insofar as it is limited by the claims.

In the drawings, Fig. 1 is a section taken longitudinally through a furnace to which my invention has been applied;

Fig. 2 is an enlarged sectional view taken longitudinally through one of the fuel feeding units;

Fig. 3 is a fragmentary plan sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary view in elevation taken on the line 4—4 of Fig. 1, certain parts being removed to illustrate the interior construction;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is an exploded perspective view showing the screw housing, the blast block and the blast plate;

Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 2;

Fig. 8 is a perspective view of the nose tile supporting casting; and

Fig. 9 is a perspective view of one of the nose tiles, and

Fig. 10 is a perspective view of a spacing element that cooperates with the nose tile supports shown in Fig. 8.

Referring now in detail the drawings, the invention is shown in Fig. 1 as applied to a furnace having a combustion chamber 10 and a grate 11, there being an ash pit 12 beneath the grate 11. A boiler is indicated at 13, and the front wall of the furnace is indicated at 14. This front wall is provided with a lower door 15 and an over-fire door 16.

The present invention concerns itself with a means for feeding fuel from a hopper 17 that is provided at the front of the furnace on the outside of the wall 14. The front wall 14 of the furnace is made up of refractory material with an outer metal facing 18, and the hopper 17 has a bottom wall made up of channel irons 19 which extend outwardly from the facing 18.

The hopper, of course, is provided with suitable end walls, one of which is shown at 20 in Fig. 1, and a front wall 21. The hopper may be supported with suitable legs 22, as will be readily understood.

The front masonry wall of the furnace is provided with an opening 23 which extends transversely of the wall and provides an entry space for receiving a plurality of housings 24, 25 and 26. The housings have shelf portions 27, 28 and 29, respectively, which shelf portions extend through the facing 18 over the channel irons 19. The facing 18 is, of course, apertured to receive the housings 24, 25 and 26. A plurality of feed screws 30, 31 and 32 extend across the bottom of the hopper 17 and into the housings 24, 25 and 26. These feed screws may be driven by any suitable means, not shown, for advancing fuel from the hopper through the housings.

Cooperating with the feed screws 30, 31 and 32 are a plurality of agitators 33, 34 and 35. The agitators are mounted upon a common tubular supporting shaft 36 which extends from one end wall to the other of the hopper 17. The agitators have hubs 37 on the shaft 36. The hubs 37 are spaced by sleeves 38, 39, 40 and 41 so as to be held in proper position over their respective screw members. Each of the agitators 33, 34 and 35 comprises a sprocket wheel having a multiplicity of teeth 42 which extend down into the path of the adjacent screw so as to be engaged thereby. The teeth 42 are so spaced that rotation

of the screw to advance fuel into the furnace intermittently rotates the sprocket wheel. The sprocket wheel acts to agitate the coal in the hopper and cause it to work down into the screw. The sprocket wheels are each provided with one or more agitator bars 43 and 44. These bars are threaded into openings provided near the periphery of the sprocket wheel and held in place by a lock nut 45. The bar 43, as shown, extends from one side of the sprocket wheel, while the bar 44 extends from the other side. The length of the bars is such that the bars on adjacent sprocket wheels reach almost half way from one sprocket wheel to the other. This insures agitation of the coal so as to work it down around the screws.

Each of the housings 24, 25 and 26 has its lip portion bolted down to the channels 19. Also each housing is provided with a flange 46 which has a contour adapted to fit the corresponding opening cut in the furnace facing 18. On the hopper side of the flange 46, there is a groove 47 and a second flange 48. A tie plate 49 is shaped to fit in the groove 47 and form a lapped joint with the facing 18 and the flange 46. Each housing, such as 24, has a flat bottom surface and has side flanges 50 and 51, which are widened as shown at 52 and 53, adjacent the combustion chamber end thereof. At the junction of the narrow and wide portions of the flanges 50 and 51, there are stops 54 and 55. Also, at the furnace ends of the housings, each housing has an upwardly and laterally directed flange 56. Each housing is provided with a downwardly directed outlet opening 57 at its furnace end, the housing being rounded opposite the outlet opening, as shown at 58, in order to provide a smooth discharge passage for the coal fed by the feed screws. A blast block 60 has an aperture 61 therethrough, this aperture comprising an inwardly tapered air inlet portion 62 which terminates in a restricted throat 63 and an air discharge passage 64 leading from the throat 63 and expanding somewhat in depth toward the furnace. An air blast nozzle 65 is located in the aperture 61 so as to discharge directly into the throat 63 and entrain air from the larger portion 62 of the opening. This air blast nozzle may be supplied with air or steam under pressure through a supply pipe 66 having a gauge 67 therein. The supply pipe 66 is tapped from the main supply header 68. A control valve 69 is provided for controlling the pressure of the jet supplied through the pipe 66. The blast block 60 is preferably constructed of cast iron. It is rectangular in cross section and has a tapered front face 70 which slopes downwardly toward the furnace. This tapered front face is divided into a central depressed section 71 adapted to receive coal from the discharge outlet 57 of the screw housing, and two side portions 72 and 73 which are raised above the coal receiving portion 71.

The aperture 61 in the blast block 60 is of such a size as to receive a blast plate 74. This blast plate has the front end thereof widened to provide abutting shoulders 75 and 76 to engage the front end of the blast block 60, and is extended downwardly so as to overlap the front end of the blast block with a portion 77. The front end of the blast plate 74 is provided with a shelf portion 78 extending horizontally so as to provide a flat surface directly beneath the stream of air being discharged through the expanding portion 64 of the aperture in the block 60. At the opposite side edges, however, the blast plate 74 has its front face sloped downwardly as indicated at 79 and 80. The flat surface 78 is directly in line with the coal receiving face 71 of the blast block. However, the sloping faces 79 and 80, being at opposite sides, prevent the accumulation of any coal in front of the corners of the blast block and thus enable the surface 78 to be swept clean at all times by the air blast. The blast block 60 is connected with the housing 24 by means of a series of lugs 81, there being two on each side of the blast block, the lugs being extended upwardly from the top surface of the blast block and having end flanges 82 adapted to rest upon the flanges 52 and 53 of the housing. The blast block is moved back until the rear lugs 81 strike the stops 54 and 55, and this positions the blast block with respect to the housing.

Means are provided to protect the front end of the housings 24, 25 and 26 from the heat from the combustion chamber. The upper portion of the furnace wall 14 above the housings is supported by means of an I-beam 83 and an angle iron 84 extending across the front of the furnace and supported by the side walls thereof. Over these supports, there is laid a metal plate 85, upon which the brickwork 86, constituting the upper portion of the front wall of the furnace, may be laid. On the flange 56 of each housing, there is hung a tile supporting casting 87. This casting is shown in detail in Fig. 8 and comprises a vertically extending face 88, a horizontally extending shelf portion 89, a depending lug 90 adapted to hook over the flange 56 and two side flanges 91 and 92 which extend down and have inturned lips 93 and 94. The side flanges 91 and 92, and the shelf portion 89, extend forwardly from the vertically running portion 88, so as to provide means for mounting a plurality of nose tile 95. The nose tile 95 are rounded on their heat receiving faces, as shown at 96. They are also cut away at 97 and 98 to provide a recess and a slot for the side flanges 91 and 92, and the inturned lips 93 and 94. The tile 95 are provided in pairs, so that two tile fill the space between the flanges 91 and 92.

The adjacent housings 24, 25 and 26 are linked together at the front end by spacer castings 99, which are provided with oppositely directed grooves 100 and 101, adapted to receive the flanges 52 or 53 of adjacent housings. These spacer castings are adapted to be aligned with the front face of the flange 56 and to fit between the vertical portion 88 and the depending lug 90 of the tile supporting casting 87. The blast blocks 60, associated with each of the housings, are separated by firebrick, shown at 102 in Fig. 4. Also, the space in front of the I-beam 83 is filled with two removable refractory tile or firebrick 103 and 104. The space between the brickwork 86 and the tile 104 may be filled with any suitable packing 105 which is capable of allowing expansion and contraction of the adjacent refractory materials. Also, the packing 106, of a similar character, may be used between the nose tile 95 and the tile 103. If at any time a nose tile fails or becomes burned so as to not properly protect the adjacent housing, it can be readily replaced by removing it into the furnace and substituting a new tile. In fact, the entire nose construction can be exposed readily by lifting off the tile 103 and 104, then removing the nose tile supporting casting 87 with

its nose tile, to permit ready access to the last block of the housing and the associated parts.

From the above description, it is believed that the construction of the various parts of the furnace will be readily apparent to those skilled in this art. It is also believed to be evident that I have provided a simple, compact and convenient structure whereby coal may be fed from a hopper by a series of individual screws and distributed in a furnace by means of a blast of air, or mixed air and steam. The blast block and blast plate construction are particularly advantageous in delivering the coal into the furnace and spreading it so as to not only separate the coal according to size, but to burn particles of the coal, which are very fine, in suspension, and to supply combustion air to aid in complete burning of the coal and gases in the combustion chamber.

It will be noted that the construction of the throat **63**, and the outlet **64** therefrom, is such as to provide a Venturi nozzle which is quite effective. Furthermore, the blast plate construction at the front end prevents the accumulation of any small bodies of coal on the blast plate where they would tend to coke and obstruct the distribution of the coal.

Cooperation between the housing, the feed screw, and the agitating sprocket wheel, is such that it is possible to handle coal, either wet or dry, with equal facility.

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

1. In a furnace, a feed screw housing, said housing having a downwardly directed discharge opening and an upwardly projecting flange at one end thereof, a tile supporting casting, cooperating elements removably mounting said casting on said upwardly projecting flange, and nose tile supported by said casting over the end of the housing, whereby to protect said end from combustion heat.

2. In a furnace of the character described a feed screw housing having a horizontally extending shelf at one end thereof, said housing having a downwardly directed outlet at the other end thereof, side flanges on said housing at the opposite sides of said downwardly directed opening and a blast block having lugs thereon adapted to rest upon the side flanges of the housing, said blast block having a horizontally extending channel therethrough, said blast block having a sloping face for directing fuel from the outlet opening of the housing over one end of the channel.

3. In a furnace of the character described, the combination of a feed screw housing having a downwardly directed outlet aperture, side flanges on said housing, a blast block having lugs thereon engaging said side flanges whereby to position the blast block beneath said outlet opening, said blast block having a sloping facing directly beneath said opening, said sloping facing having a depressed central portion and a blast plate within said block having a flat shelf projected forwardly from the blast block below said depressed portion.

GEORGE A. KOHOUT.