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1,889,299

PULVERIZED FUEL DISTRIBUTING SYSTEM

Filed May 6, 1929

2 Sheets-Sheet 1

Fig. 1

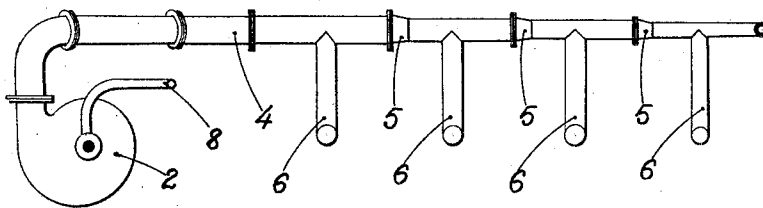


Fig. 2

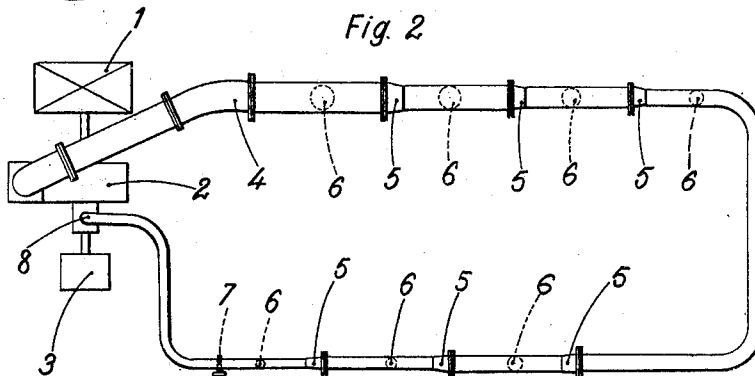
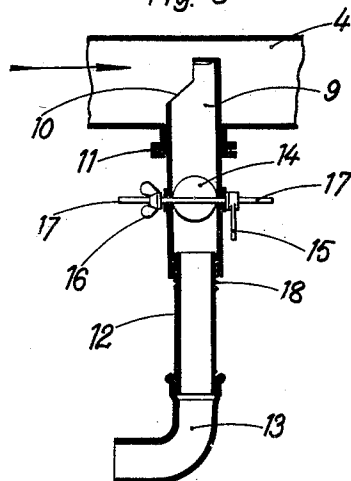


Fig. 3



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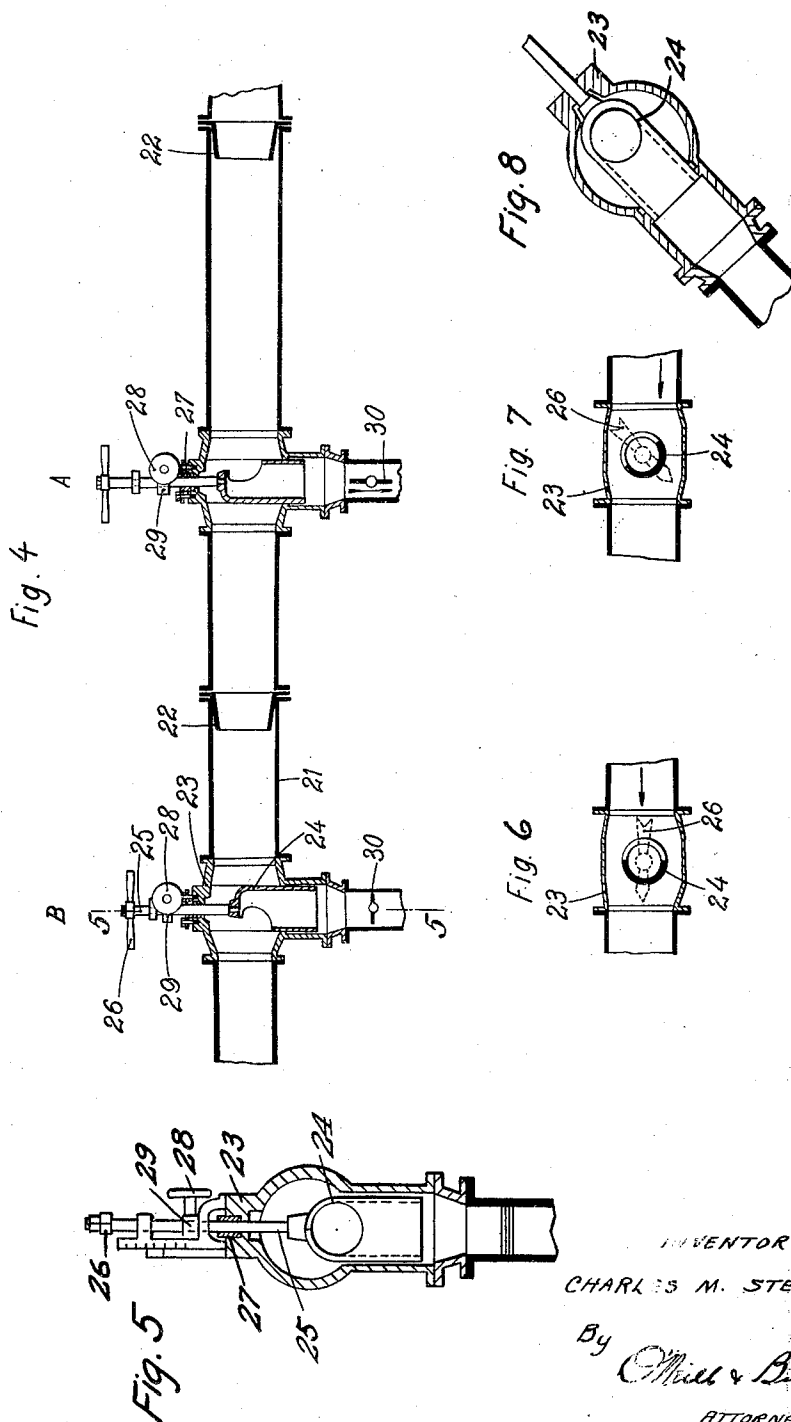
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UNITED STATES PATENT OFFICE

CHARLES M. STEIN, OF PARIS, FRANCE, ASSIGNOR TO SOCIETE ANONYME DES APPAREILS DE MANUTENTION ET FOURS STEIN, OF PARIS, FRANCE, A CORPORATION OF FRANCE

PULVERIZED FUEL DISTRIBUTING SYSTEM

Application filed May 6, 1929, Serial No. 360,970, and in France October 26, 1928.

The present invention has for its object the supply of powdered fuel to several burners mounted in a common furnace, or in several distinct furnaces, by the use of an apparatus requiring no stock or reverse supply of such powdered fuel.

At the present time, all plants of this class require a central station in which the fuel is pulverized and is then stored up in a silo of large size, but such a stock of powdered fuel is not without danger. In such plants it is necessary to dispose at each working point, that is, near each burner, a hopper which is supplied with fuel from a central hopper, usually through an air piping, and in certain cases by a mixture of fuel and air, or by the known conveyors. From the said hoppers, the fuel is fed by screws turning at variable speed, and it drops into a conduit whence it is taken up by a current of air and is thus supplied to the burner in each case.

The apparatus according to the said invention is adapted to supply the burners in a very simple manner as compared with the known devices. It comprises a pulverizer and means for feeding the powdered fuel to different points according to needs, in a variable and adjustable manner.

The said process and apparatus offer the following principal features.

A.—No stock of powdered fuel is provided, and the said fuel is consumed as fast as produced.

B.—Each burner is separately adjustable, and one or more burners can be stopped without affecting the operation of the others.

C.—The fuel which has not been consumed at the end of the circuit is again delivered to the pulverizer and is thus returned to the circuit, thus obviating all loss of fuel.

The following arrangements are adopted in order to provide for a more approved functioning of the plant:

A.—The apparatus comprises additional centering cones in each section of the main piping.

B.—A spoon-shaped fuel offtake device is provided which can be adjusted vertically, and also by turning on its axis, thus affording a rotary adjustment in the main conduit.

Figs. 1, 2 and 3 show by way of example a plant according to the invention adapted for the supply of seven burners which are situated in a common furnace or in different furnaces.

Fig. 1 is a diagrammatic view representing the fuel circuit.

Fig. 2 is the corresponding plan view.

Fig. 3 is a section showing one form of unit offtake for the powdered fuel in the main conduit for conducting the fuel to a burner in use.

Fig. 4 is a lengthwise section of a portion of the main fuel supply conduit and showing another form of the fuel offtakes, two such successive offtakes being shown each supplying separate burners designated by A and B.

Fig. 5 is a cross section of one of the offtakes shown in Fig. 4, the section being taken on line 5—5 of Fig. 4 looking from the right.

Fig. 6 is a horizontal section on the axis of the main fuel conduit, adjacent one of the said offtakes.

Fig. 7 is a like horizontal section, but showing the offtake collecting element turned into another position, as will be further specified.

Fig. 8 is a fragmentary cross section similar to Fig. 5, showing the said offtake device which has been turned by a certain angle with reference to the longitudinal axis of the main conduit.

In Figures 1, 2 and 3, 1 is a fuel pulverizer; 2 is a main blower or fan which withdraws the powdered fuel from the said pulverizing apparatus and delivers it, in suspension in the air, into the main piping; 3 is an electric motor driving the pulverizer and blower set; 4 is the main feed pipe. By way of example, the said pipe is shown as supplying seven burners, which may be employed in one furnace or in several furnaces; 5 is a cylindrical coupling for reducing the cross section of the piping beyond each burner, so that the rate of circulation of the fuel powder and its conveying air can be maintained practically constant in the said piping, also offering the advantage, by restricting the flow section at a certain point, of rendering the mixture more homogeneous; 6—6 are unit branches feeding the powdered fuel to

the respective burners. Seven such branches are shown by way of example, but the apparatus will obviously comprise the number required for a furnace or furnaces in use. 7 is the throttle valve mounted in the main pipe beyond the branch for the last burner. 8 is a suction orifice connected with blower 2, connecting the main pipe 4 beyond said valve 7. 9 is a tube for the flow of the fuel and air mixture from the main pipe to one of the branches. At 10, the end of said tube 9 is cut out so that the tube is directed towards the admission of the fuel mixture. 11 is a packing device in which the tube 9 may turn without leakage.

The mixture of the conveying air and powdered fuel enters through the end 10 into the tube 9 and it circulates to the burner through the tubes 12 and 13.

The amount of fuel supplied to each burner is regulated by means of a butterfly valve 14 on a shaft 17 whose position is adjusted by a handle 15, the valve being set by means of a nut 16.

When the said valve 14 is partly closed, this reduces the flow section of the fuel current and sets up a counter-pressure which is manifested at the open end 10 of the tube, thus reducing the fuel feed. The burner is entirely shut off by closing the said valve 14, but at this time the part of the tube 9 between the valve 14 and the open end 10 might become rapidly stopped up, and it would thus be difficult to start the burner. In this case, before closing the valve 14, the tube 9 is turned through an angle of 180° so as to direct the opening in the end 10 of the tube 9 in pipe main 4 away from the flow of fuel mixture by means of the handle, which movement is permitted by screw threads 18 forming the connection between tubes 9 and 12. This thread 18 also serves to adjust the height of the end of the tube, and this end may thus be disposed either above or below the centre of the pipe 4, according to the particular shape of the said pipe, in order to find the stream having the greatest density and homogeneity, and the point at which the fuel feed is the most constant.

When all the burners are in use, any variation of the feed of the powdered fuel will be shown by a corresponding variation of the amount of such fuel supplied to each burner, and all excess of fuel will return to the blower. If one or more burners is turned down or extinguished, the valve 7 can be opened to allow all excess of fuel to return to the blower by which it will be again supplied to the feeding circuit.

Fig. 3 shows one practical form of construction of a unit offtake for powdered fuel, mounted on the main piping. This device is given solely by way of example, and other mechanical constructions will afford the same result.

In Figures 4 to 8, the arrows show the circulation of the fuel mixture.

The main conduit 21 is successively reduced in diameter, and each insertion of a branch for a burner is followed by a correspondingly reduced diameter of the main conduit.

On the approach to each offtake branch is disposed a tapered element 22 coaxial within the conduit, which forms a homogeneous fuel and air mixture at the offtake point. Otherwise it might happen that by centrifugal action of the solid particles at the angles in the conduit, or by gravity in the long parts of the conduit, the distribution of the fuel in its conveying air will not be uniform in the cross section of the conduit, and hence an offtake to a burner, inserted at point lacking in homogeneity, would take off a mixture differing more or less from the standard composition in circulation. If the burners are closely spaced, the said tapered elements of the conduit, which are situated immediately forward of each offtake and are due to the necessary reduction in diameter, will be sufficient to supply a practically homogeneous mixture to the succeeding offtake. This is the case shown in Figures 1, 2 and 3; but if the burners are widely spaced apart, it may be necessary to use a tapered centering device as shown at 22 in Figure 4.

Figs. 4 and 5 show a form of construction of the offtake from the main conduit, for use with a burner.

The main body or casing of the offtake device is connected on either side with the main pipes. In the said casing is suspended a member 24 forming a collecting shell, which is open at the top; its lower part is inserted into the conduit leading to the burner. Since the said shell is secured to the rod 25 and the handle 26, it is observed that the said handle 26 can be operated to secure the following results.

1.—The said shell is placed on the axis 5—5, so that its inlet opening is situated in a mean position such that the said opening corresponds to the axis of the main conduit (which is shown at A), or is so situated that its said opening corresponds to the upper part of the conduit (see C) or to the lower part of the conduit (see D). The different intermediate parts of the said opening, between the positions C and D, may obviously be used.

2.—The operator may turn the said inlet opening on its axis 5—5, so that the opening may be exactly in line with the direction of flow (as shown in Fig. 6) or it may be turned to any other angle with reference to the said direction (as shown in Fig. 7). The opening may even be turned through 180° and is thus against the direction of flow (see B). Figs. 6 and 7 show in dotted lines the position

of the handle 26 corresponding to the opening in member 24.

As an accessory feature, the control rod 25 traversing the main casing 23 (through stuffing-boxes 27) may be held in all positions above specified, by the hand wheel 28 controlling the pressing collar 29, or by like means. Thus the vertical and the angular position of the said opening can be made permanent.

On the other hand, the devices A, B, C, D for the fuel offtake can be turned in all desired directions about the center line of the said main conduit. It is simply necessary to release the flanges of the casing 23 from the conduits on either side, in order (Fig. 8) to turn the whole device on the said center line into any position with respect to conduit 21.

Due to these different arrangements, the said opening can be placed at any point on the cross section of the said main conduit, and it can be chiefly situated in the region in which the fuel is the most homogeneous.

Furthermore, the said opening can be rotated on the center line in such manner as to afford a simple regulating of the amount of fuel supplied to each burner. The amount is obviously a maximum when the opening is exactly in line with the fuel current, then diminishing, as the said opening is rotated, and reaching the zero point when the side of the said open end of the tube is in line. When the said open end is turned clear around to the 180° position, the fuel supply to the burner is practically cut off (see B).

The combination of the closing of the individual valve 30 mounted on the burner conduit, with the 180° rotation of the said open end of the tube, will entirely cut off the fuel in the corresponding branch line of the burner.

I claim:

In a system for supplying powdered fuel in suspension to burners, a fuel supply main, an offtake conduit leading from the supply main to a burner, a tubular member extending into the offtake conduit and into the fuel supply main being open on one side only in the supply main, means for rotating said tubular member from a position where the open side thereof will intercept the flow of fuel in the supply main to a position opposite thereto and to intermediate points therebetween for regulating the amount of fuel supplied through the offtake conduit to the burner without effecting the passageway in the offtake conduit, and means for moving said tubular member crosswise of the supply main for adjusting the position at which the opening in the side of the tubular member will intercept the flow of fuel in the fuel supply main.

In testimony whereof he has signed this specification.

CHARLES M. STEIN.