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J. VAN BRUNT

1,707,335

ART OF BURNING PULVERIZED COAL

Filed Oct. 3, 1924

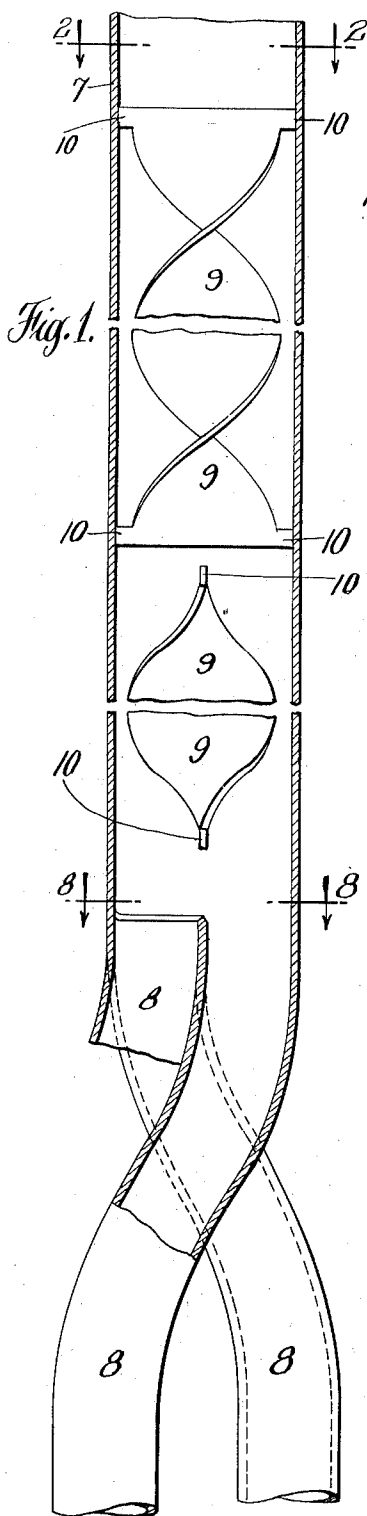


Fig. 2.

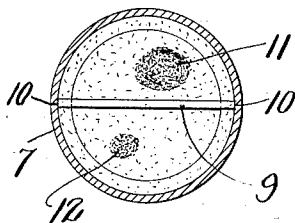


Fig. 3.

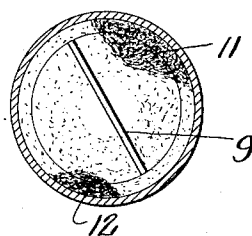


Fig. 4.

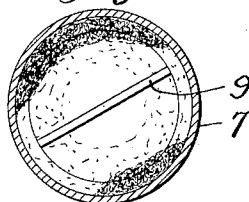


Fig. 5.

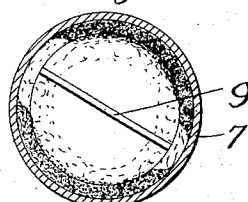


Fig. 6.

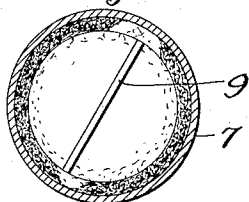


Fig. 7.

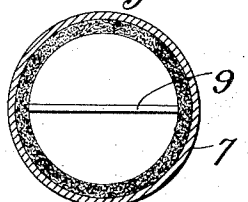


Fig. 8.

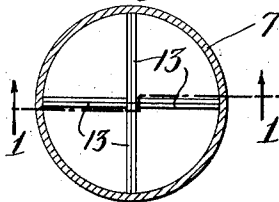


Fig. 9.

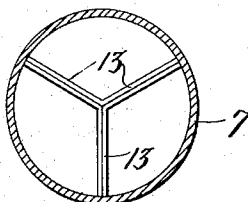
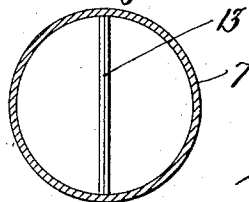


Fig. 10.



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ART OF BURNING PULVERIZED COAL.

Application filed October 3, 1924. Serial No. 741,361.

In the art of burning pulverized coal, it is a common practice to provide a storage bin or reservoir from which the fuel is fed by a feeder means to a pipe leading to the furnaces, the pipe subdividing into branches, each of which leads to one or more burners. It is also a practice in this art, in the so-called direct firing system, to lead a feed pipe from a pulverizer to the furnace or furnaces to be fed whereby, such pipe, where more than one burner is employed, dividing into branches each supplying one or more burners.

The fuel is carried along through the pipe by a blast of what is termed "carrying" air, the fuel particles being carried in suspension in such air.

It is well known in this art that a stream of pulverized coal and air in a pipe is not of uniform cross-sectional density, as is the case with a vapor or gas flowing through a pipe. With pulverized coal flowing through or down a pipe, there is a point of maximum density or maximum rate of flow, which point does not always remain constant but may move slowly over a portion of the cross-sectional area.

Hence, when the fuel stream and its carrying air are divided in the branches of the feed pipe or by partitions along the diameter of the pipe, the branches will not receive the same amount of coal, more coal going to one or more of the branches, depending upon the then particular location of the point of maximum density. Thus, the rate of feed of coal through the branches or compartments is not the same nor will the proportion remain the same, because of the variable factor incident to the shifting of the region of maximum density.

This difficulty might be overcome by providing a separate feeder for each pipe, but the impracticability of this will be apparent for example when it is considered that one furnace may have anywhere from one to half a dozen or more burners, all of which can be readily supplied from one feeder. The cost of providing individual feeders would be prohibitive.

It is quite important that there should be uniformity of feed and, therefore, it is the object of my invention to provide a simple means whereby this uniformity of feed can be obtained, without the great expense which would be involved in providing individual feeders.

How the foregoing, together with such other objects as may hereinafter appear, or are incident to my invention, may be obtained, is illustrated in the accompanying drawings wherein:

Fig. 1 is a vertical section, taken on the line 1—1 of Fig. 8, through a feed pipe which, for purposes of illustration, has a number of divisions each of which supply a burner, such pipe having my improvements applied thereto;

Fig. 2 is a section taken on the line 2—2 of Fig. 1, illustrating the general condition of the material in the pipe before it is reconditioned in accordance with my invention;

Figs. 3 to 7 inclusive are cross-sections through the pipe taken at successive points, illustrating the manner in which the conditioning is brought about;

Fig. 8 is a cross section on the line 8—8 of Fig. 1; and Figs. 9 and 10 illustrate modifications of the invention.

Referring now to Fig. 1, the reference numeral 7 designates the feed pipe (in this instance a vertical length of the feed pipe), terminating at its lower end in a plurality of (four) branch pipes 8 of smaller diameter. The reference numeral 9 designates a spiral or helical ribbon of sheet metal or the like, having feet 10 at its extremities for positioning of the helix in the pipe. The diameter of the helix or spiral is substantially less than the interior diameter of the pipe. There may be preferably two of such helixes.

Now referring to Fig. 2, this is a cross section through the pipe in advance of the helix or conditioning element. The dots indicate the pulverized fuel carried in suspension in the blast of air, the dark spots 11 and 12 indicating zones of greater density. The mixture of coal and air flows with considerable velocity and where it strikes or enters the helix, it is swirled about violently and deflected outward, or more properly speaking the mixture has imparted to it a whirling motion, bringing into play the action of centrifugal force which tends to drive the fuel particles to the periphery. The location of the zone or zones of greater density is thus shifted outward as shown in Fig. 3. As the mixture continues to flow along the helix, this action is continued with the result that the denser portions begin to flatten out along the inner periphery of the pipe, i. e. in the space between the helix and the pipe. Eventually

practically all of the coal particles are evenly distributed as indicated in Fig. 7, the path of the particles being in a spiral. Immediately after leaving the helix the fuel enters the four compartments formed by the dividing plates 13. By virtue of the spiral flow of the fuel, the same amount of fuel and also of air will enter each compartment. Air will enter in the compartments, both with the coal and from the "core" or central region of the pipe, and since the coal and air will strike the division plates and since these compartments vary in cross-section from a segment of a circle to a circle, the coal and air will be agitated and mingled in each branch pipe, so as to bring the particles into the desired state of suspension in the air.

In Figs. 9 and 10 I have respectively shown a pipe dividing into three branches and into two branches.

It will also be apparent that the conditioner may be useful in other applications, as for example where it is desired to convey pulverized coal over a substantial distance. In such cases it might be desirable to recondition the mixture at intervals so as to secure proper and effective delivery at the discharge end of the conveyor pipe.

Where two helixes are employed, I prefer to set the second at right angles to the setting of the first, as shown in the drawing, i. e., the first has a lead on the second. The twist of the two helixes is the same.

I claim:

1. Means for delivering finely divided fuel in suspension in a gas comprising a branched conduit having a helix therein in advance of the branches, the diameter of the helix being substantially less than the interior diameter of the conduit and means on said helix to position it coaxially with the conduit, whereby a uniform distribution of fuel to the branches is secured.

2. Means for delivering finely divided fuel in suspension in a gas comprising a branched conduit having a helix therein in advance of the branches, the diameter of the helix being substantially less than the interior diameter of the conduit and means positioning said helix coaxially with the conduit, whereby a uniform distribution of fuel to the branches is secured.

In testimony whereof, I have hereunto signed my name.

JOHN VAN BRUNT.