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C. SCHWARTZ

FUEL CONDITIONING SYSTEM

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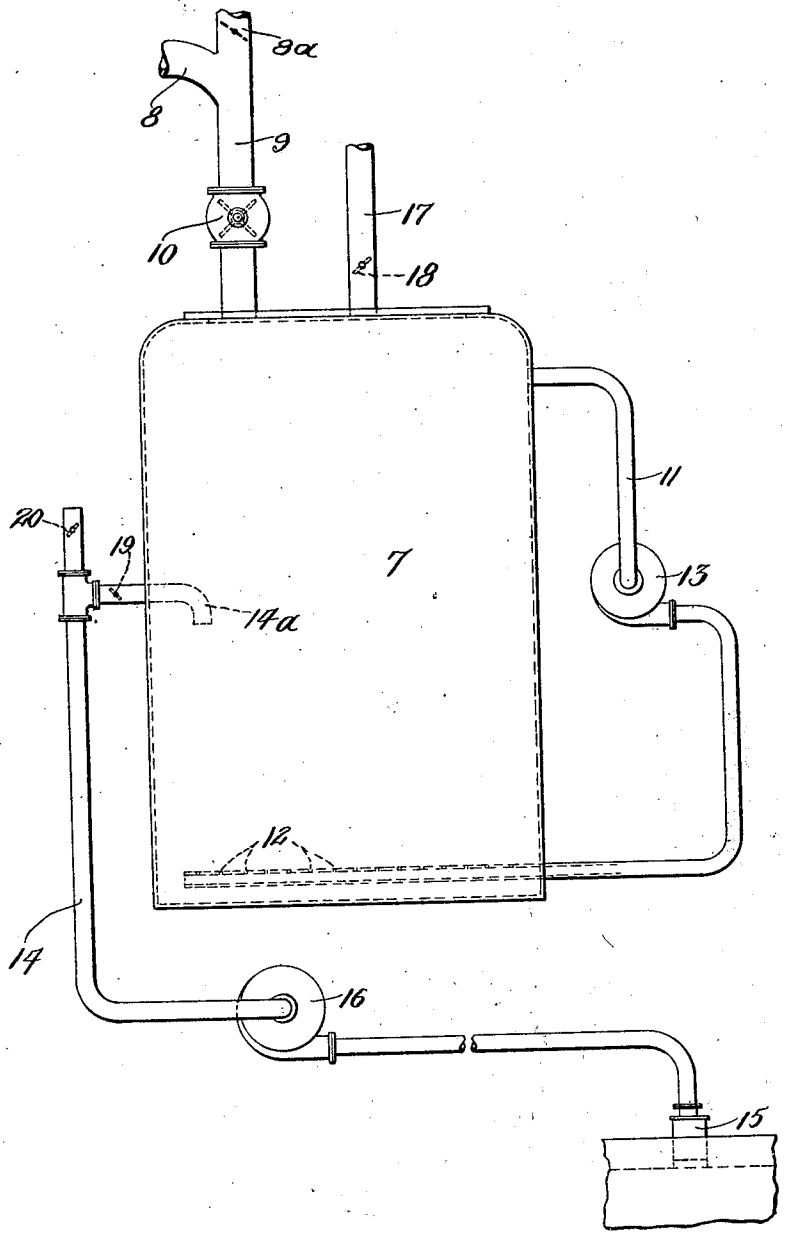


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# UNITED STATES PATENT OFFICE.

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## FUEL-CONDITIONING SYSTEM.

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This invention relates to a conditioning system and it is especially useful in connection with pulverized coal burning installations, particularly those of the direct fired type in which the coal is led from the pulverizer to the furnace.

In such direct fired arrangements the coal mixed with air is conveyed to the burners from the pulverizer and the operation of the pulverizer is impaired by virtue of the relatively large volume of air which is passed therethrough and, in addition, the passage of this air through the pulverizer represents work more or less uselessly performed, involving increased power costs and larger and more expensive motors and apparatus. The mixture, also, is not uniform, which is an item of considerable importance. Deficiencies in mixture cannot be wholly and effectively compensated for by air admission at the furnace.

I aim to overcome these difficulties and to make direct firing more practical and effective. I contemplate the proper conditioning of the fuel intermediate the pulverizer or other source of supply and the point of use, so that on the one hand, I may decrease power costs and the size of the pulverizer equipment and increase the effectiveness of the pulverizer and on the other hand burn the fuel more effectively and with less complication as to air supply and regulation.

More specifically, it is an object of my invention to provide a simple, effective conditioning apparatus, inexpensive to operate and maintain.

How the foregoing, together with such other objects as may hereinafter appear, or are incident to my invention, are obtained, I have disclosed in the following description and illustrated in preferred form in the drawing which is a diagrammatic illustration of my invention.

With reference to the drawing, the conditioner comprises a vessel or tank 7 and a means for maintaining the fuel in suspension in air therein and in circulation. The pulverized fuel is led directly to the tank from the pulverizer (not shown) with practically only carrying air through the branch pipe 8 and the pipe 9, which latter is provided with a feeder 10 of any preferred design such as the star wheel type shown; or from a storage tank through the damper controlled branch 8a. This feeder is preferably operated at speeds such as will replace fuel as fast as drawn form the conditioning tank to the furnace.

Leading form the tank, preferably the upper part thereof, is a pipe 11 which enters another part, preferably the bottom, and extends well within the tank where it is provided with a plurality of upwardly directed nozzle or jet openings 12. Located in this pipe is a suction fan 13. The operation of this fan, in starting, by way of illustration, is to draw air from the upper part of the tank and discharge it upwardly in the bottom of the tank, putting the pulverized coal in suspension in air. As the operation continues, the fan draws a mixture of coal and air from the top and discharges it into the bottom, keeping the fuel in suspension and in circulation. The fan may be small and uses little power as the operation is at atmospheric pressure, i. e. neither plus nor minus.

A stream of the mixture may be drawn off at will through an outlet conduit or pipe 14, of which there may be one for each burner 15. This outlet preferably leads from an intermediate or middle portion of the tank, the intake end 14a being turned downwardly to more effectively carry off the mixture. Any preferred arrangement may be employed to induce a flow through the pipe 14 and, in this instance, I have shown a fan 16, although other means may be well substituted.

As the stream is being drawn off, make up air is admitted through the inlet 17, which may well be merely open to the atmosphere, as the action will be substantially automatic for the reason that the feeder supplies fuel at the rate that the fuel is drawn out; and hence air enters 17 at the rate that it is drawn out. Stated another way the feeder and pipe 17 together supply coal and air at the rate coal and air are drawn off. A damper 18 is provided for control if needed.

By this arrangement, during operation, the fuel is kept in suspension and in circulation with a uniform mixture or degree of mixture, and the mixture will be properly maintained notwithstanding variations in demand, in which connection it may be necessary to coordinate the two fans and the feeder, for which purposes all three are preferably operated by variable driving devices, such as variable speed motors. The degree of mixture is determined by the initial de-

sign of the parts. With a uniform mixture and a uniform feed, which also results, the burning of the fuel may be more effectively accomplished, and the regulation of additional air admitted to the furnace for combustion simplified.

In shutting down, the damper 19 is closed and the damper 20 opened, whereby air is admitted to the pipe 14 and all fuel drawn out therewith, leaving the pipe clean for starting up.

I claim:

1. In a pulverized fuel conditioning system, the combination of a source of fuel supply, a point of use, an interposed conditioning vessel having a fuel and air circulator adapted to maintain a mixture of the fuel with the air in the vessel, and a separate air inlet leading from the atmosphere to the conditioning vessel independent of the circulator.

2. In a pulverized fuel conditioning system, the combination of a source of fuel supply, a point of use, an interposed conditioning apparatus with connections from the supply means and to the point of use, and means whereby one of the connections may be exhausted of its contents.

3. In a pulverized fuel conditioning system, a source of supply, a point of use, and an interposed conditioner having a conduit leading therefrom to the point of use, said conduit having a discharger therein and a shut off and an air inlet between the conditioner and the discharger.

4. A pulverized fuel conditioning system comprising, in combination, a conditioning chamber; fuel and air inlet means therefor in an upper region thereof; a fuel and air mixer including a conduit with fuel and air circulating means therein, one end of said conduit being connected into the chamber for the withdrawal of air and fuel therefrom, and the other end extending into the lower part of said chamber and having a plurality of upwardly directed discharge openings; and an outlet from the chamber for the mixed fuel and air.

In testimony whereof, I have hereunto signed my name.

CARL SCHWARTZ.