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A. A. WICKLAND
PULVERIZED FUEL MIXER

Filed Dec. 26, 1923

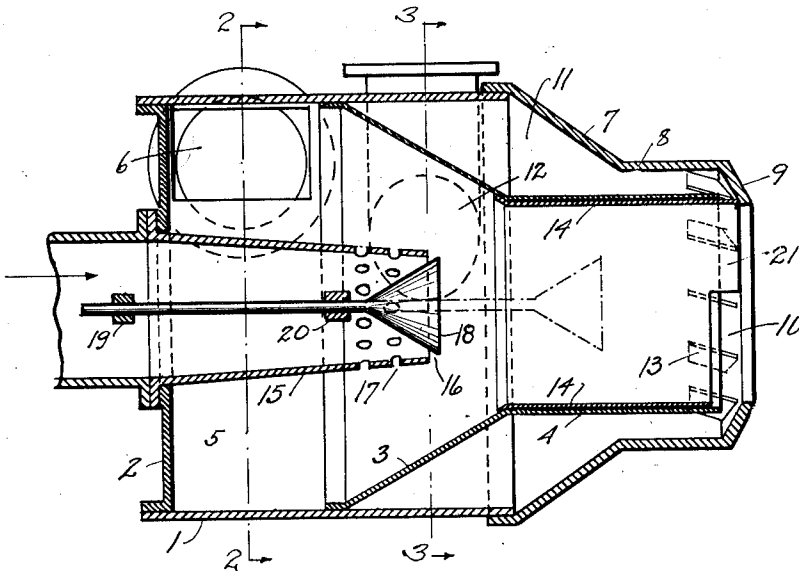


Fig. 1

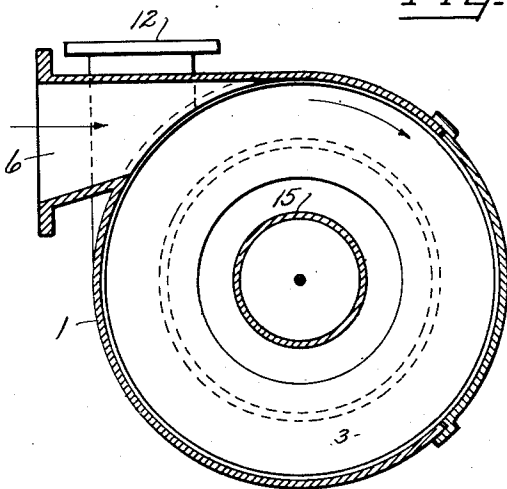


Fig. 2

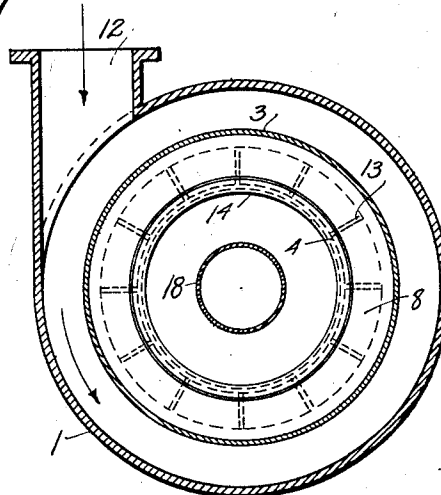


Fig. 3

INVENTOR.

Alph. A. Wickland

UNITED STATES PATENT OFFICE.

ALGOT A. WICKLAND, OF CHICAGO, ILLINOIS.

PULVERIZED-FUEL MIXER.

Application filed December 26, 1923. Serial No. 682,614.

My invention relates to improvements in pulverized fuel mixers wherein the pulverized fuel is mixed with air in the required proportion so as to secure a thorough and complete mixture of the two ingredients so as to burn most efficiently.

Another object of my invention is to provide means wherein all portions of the charge will be substantially evenly and uniformly mixed, and wherein the portion of the mixer most closely adjacent the furnace is protected from excessive heat.

Another object of my invention is to provide means for deflecting the flow of mixed fuel and air discharged from the mixer in the desired direction.

The invention has among its other objects the production of a device of the kind described which will be of simple, convenient, economical construction, reliable and satisfactory to use wherever found applicable.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art to which this invention appertains from the disclosures herein given.

To this end my invention consists of the novel construction, arrangement and combination of parts shown and described in the specification and more particularly pointed out in the claims.

In the drawings wherein like reference characters indicate like or corresponding parts.

Fig. 1 is a vertical sectional view taken through my device;

Fig. 2 is a transverse view taken substantially on a line 2—2 of Fig. 1; and

Fig. 3 is a transverse cross-section taken parallel to that shown in Fig. 2, and taken on the line 3—3 of Fig. 1.

In the drawings, wherein I have illustrated the preferred embodiment of my invention there is shown a mixer comprising an annular or cylindrical member 1 having an end closure plate 2 at one end thereof.

Intermediate the ends of the member 1 there is arranged a sleeve having a tapered portion 3 engaging the inner wall of the portion 1 at the large end and extending

outwardly axially of the member 1 as at 4, the outer end of the portion 4 being open and forming the discharge outlet for the pulverized fuel and air.

The chamber 5 within the shell 1 has an intake 6 arranged tangentially thereto and through which the pulverized fuel and air enter. The entering mixture is under pressure and travels at considerable velocity so that it travels within the chamber in a spiral path substantially as set forth in my co-pending application, Serial Number 655,404, and thence discharges through the outlet at the outer end of the portion 4.

An extension part is arranged at the outer end of the part 1, this extension having a tapered portion 7 merging into a longitudinally extending cylindrical portion 8 terminating substantially at the end of the portion 4 of the sleeve and thence extended obliquely inwardly to provide a flange 9 having a central opening or discharge outlet thereat substantially of the same size as the discharge opening through the sleeve 4 and slightly therebeyond.

The large end of the extension member is secured to the end of the part 1 as hereinbefore described and forms an annular chamber 11 with the outer surface of the sleeve member. An air intake 12 is arranged to enter the chamber 11 tangentially thereof as shown and spirals through the chamber toward its outlet, the direction of travel of the air through the chamber 11 being in reverse direction to the direction of spiral travel through the chamber 5, as indicated by the arrows in Figs. 2 and 3.

The inner edge of the flange 9 extends outwardly beyond the adjacent end 6 of the tubular part 4 and a plurality or series of ribs 13 are arranged in circumferentially spaced relation about the discharge end of the extension chamber, said ribs being preferably spiral and extending longitudinally inwardly from the flange 9 and of substantially the same height as the width of said flange and engaging and supporting the portion 4 of the sleeve.

It is apparent that any air admitted through the port 12 enters the chamber and

passes outwardly thereof through the channels formed between the adjacent ribs and the outer wall of the tubular part 4 with which they contact.

5 In order to supply additional air to the carbureted mixture admitted through the intake 6 a tapered pipe 15 extends axially through the end wall 2 as shown in Fig. 1, the inner end of said pipe being open to
10 form an outlet 16 and the side wall of said pipe having apertures or openings 17 circumferentially spaced adjacent the outlet end 16.

15 A valve 18 preferably in the shape of a cone is arranged to move axially through the chamber 5 and to seat against the discharge outlet 16 to control passage of air there- through.

20 Bearings 19 and 20 may be provided to support the valve stem, the bearing 20 also acting as a limiting stop to prevent excess movement of the valve. Should the valve be closed, the air passing through the pipe 15 will escape radially outwardly through
25 the perforations 17 substantially transversely to the mixture flowing through the chamber 5 and co-mingle therewith so as to efficiently mix the same.

30 The pulverized fuel enters through the intake 6 at the rear of the mixer and tangentially thereof. This fuel, entering at a rather high velocity is mixed with air so that as it swirls through the chamber the heavier particles, which in the present in-
35 stance is coal, will be thrown outwardly to cause a segregation of the coal particles, collecting at the periphery of the inside of the chamber and forming a film of powdered fuel, which will pass through the mixer in
40 the form of a spiral. If this segregating action is complete it is highly conceivable that the center of the chamber 5 is substantially free of coal particles since they are all thrown outwardly.

45 To obtain a more thorough mixture of the fuel and air in the chamber 5 the secondary air inlet is provided and terminates intermediate the ends of the chamber. The valve or deflector 18 causes the secondary air to
50 be deflected or thrown outwardly substantially transversely to the direction of travel of the air and coal particles swirling through the chamber and thus tends to effect a more thorough mixture of the same and break up
55 the film. Even when the valve is in its closed position as shown in full lines, the secondary air will escape radially outwardly through the apertures 17 and accomplish the same result although to a lesser degree.

60 The valve 18 may be arranged to deflect the mixture at any point intermediate the discharge ends of the parts 15 and 4, as shown in dotted lines.

65 The auxiliary air admitted through the intake 12 travels in the opposite direction

to the mixture admitted through the inlet 6, and when leaving the mixer tends to counteract the whirling motion of the mixture. The spirally arranged ribs which are in line with the spiral movement of the auxiliary
70 air increase the counteracting effect just described. This auxiliary air will act to form an exterior film about the core of carbureted mixture discharged through the sleeve and thus render the same more efficient for com-
75 bustion within the furnace adjacent thereto.

Another object of the addition of the auxiliary air is to cool the exterior of the mixer and prevent excessive heat radiated from the furnace from reaching the sleeve 4.
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In order to deflect the flow of mixture discharged through the nozzle or sleeve 4, a shield 14 may be arranged for closing a plu-
85 rality of adjacent spaces between the ribs 13 as shown, so that only the uncovered spaces will permit the auxiliary air to flow therethrough. This shield is preferably of arcuate radial cross-section and is of any suitable arcuate length, as for instance semi-
90 circular, as indicated at 21, and engages the longitudinally extending free edges of the ribs so as to bridge the portion of the extension member that extends beyond the dis-
95 charge outlet of the sleeve portion or nozzle 4.

Having thus described my invention it is obvious that various immaterial modifica-
100 tions may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construc-
105 tion, arrangement, and combination of parts herein shown and described, or uses mentioned, except as limited by the claims.

What I claim as new and desire to secure
by Letters Patent is:

1. In a pulverized fuel and air mixer, a tubular shell, a sleeve within said shell, said shell and sleeve forming a central mix-
110 ing chamber for fuel and air and an air chamber surrounding one end of said mixing chamber, an inlet conduit communicating tangentially with said mixing chamber, said mixing chamber having an outlet at
115 one end thereof, an air inlet communicating tangentially with said air chamber, said air chamber having an outlet adjacent to the said first mentioned outlet, a secondary air inlet tube extending into said mixing cham-
120 ber, and means for controlling and directing the secondary air within the said mixing chamber.

2. In a pulverized fuel and air mixer, a tubular shell, a sleeve arranged substantially co-axially within said shell, said shell and
125 sleeve forming a mixing chamber for fuel and air and an air chamber in co-axial relation to the said mixing chamber, a closure for one end of the said mixing chamber and an outlet at the opposite end thereof, a fuel
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- inlet conduit communicating tangentially with said mixing chamber, an air inlet conduit communicating tangentially with said air chamber, said air chamber having an outlet substantially co-axial with the outlet of said mixing chamber, a tube extending into said mixing chamber, and means for controlling the air passing through said tube into said mixing chamber.
3. In a pulverized fuel and air mixer, a tubular shell and a sleeve within said shell and therewith forming a fuel and air mixing chamber and a secondary air chamber in co-axial contiguous and cooperative relation to said first chamber, said chambers having substantially co-axial outlets and tangential inlets entering in opposite directions.
4. In a pulverized fuel and air mixer, a mixing chamber for fuel and air, a closure for one end of said chamber, said chamber having a frusto conical wall terminating in a tubular substantially co-axial discharge outlet, an inlet conduit communicating tangentially with said mixing chamber, an air chamber surrounding the discharge portion of the said mixing chamber, an air inlet conduit communicating tangentially with said air chamber but directed in the opposite direction to the inlet to the fuel and air mixing chamber, said air chamber having an outlet in substantially co-axial and cooperative relation with the outlet from the said mixing chamber.
5. In a pulverized fuel and air mixer, a fuel and air mixing chamber having a tangential inlet and a substantially co-axial outlet, an air chamber arranged substantially co-axially with the first mentioned chamber at the outlet end thereof and in cooperative relation thereto, said air chamber being provided with an outlet substantially co-axial with the outlet of the first mentioned chamber, and air inlets communicating with said chamber, respectively, substantially tangentially thereto but directed in opposite directions.
6. In a pulverized fuel and air mixer, a fuel and air mixing chamber having a funnel shaped extension and terminating in an outlet at one end thereof, said mixing chamber having a tangential inlet, a closure for one end of said mixing chamber, an air chamber surrounding the outlet portion of the said mixing chamber, an air inlet communicating tangentially with said air chamber, said air chamber being provided with an outlet substantially co-axial with the outlet of the said mixing chamber and in cooperative relation thereto, a tube extending into the said mixing chamber for supplying secondary air to the fuel mixture, said tube being provided with lateral openings, and means for deflecting the air passing through said tube into said mixing chamber.
7. In a pulverized fuel and air mixer, a tubular shell, a tapered sleeve within said shell and diverging therefrom, said sleeve forming a partition to divide the space within said shell into a central mixing chamber and an air receiving chamber and terminating in an outlet opening, inlet conduits, one communicating tangentially with each of said chambers, circumferentially spaced diagonal baffles extending inwardly from the outlet end of said tubular shell, and an adjustable shield controlling the passage of air between adjacent baffles.
8. In a pulverized fuel and air mixer, a tubular shell, a funnel-shaped sleeve within said shell, said sleeve and shell forming a mixing chamber for fuel and air and an air chamber, a fuel inlet conduit communicating with said mixing chamber, an outlet from said mixing chamber, an air inlet communicating tangentially with said air chamber, said air chamber having an outlet substantially co-axial with the outlet from the mixing chamber, a tube extending longitudinally within said shell for admitting secondary air to the mixing chamber, and an adjustable valve associated with said tube for controlling the flow of air passing through said tube toward the outlet of said mixing chamber.
9. In a pulverized fuel and air mixer, a tubular shell, a closure for one end of said shell, a funnel shaped sleeve arranged substantially co-axially within said shell separating the space within the shell into two chambers, inlet conduits, one communicating tangentially with each of said chambers, said chambers being provided with substantially co-axial contiguous outlets, a tube extending longitudinally within the said shell for admitting secondary air thereto, and a valve adjustably supported at the end of said tube to control the flow of air there-through and to deflect the air current outwardly and cause it to mix with the fuel mixture passing through the surrounding chamber.
10. In a pulverized fuel and air mixer, a tubular shell, a closure for one end of said shell, a sleeve arranged substantially co-axially within said shell and separating the space within said shell into a mixing chamber and a secondary air chamber, inlet conduits, one communicating tangentially with each of said chambers, said chambers having substantially co-axial contiguous outlets, a tube extending through the said closure, substantially longitudinally and axially within said shell for admitting secondary air, and a conical valve adjustably supported at the end of said tube adapted to control the flow of air passing into the surrounding chamber.
11. In a pulverized fuel and air mixer, a tubular shell, a sleeve arranged substantially

co-axially with said shell, said shell and sleeve forming a central fuel and air mixing chamber and an air chamber in substantially co-axial contiguous and co-operative relation to said mixing chamber, a fuel and air inlet communicating tangentially with said mixing chamber, and an air inlet communicating tangentially with said air chamber, said chambers having substantially co-axial outlets. 10

In testimony whereof, I have hereunto signed my name.

ALGOT A. WICKLAND.