

No. 657,537.

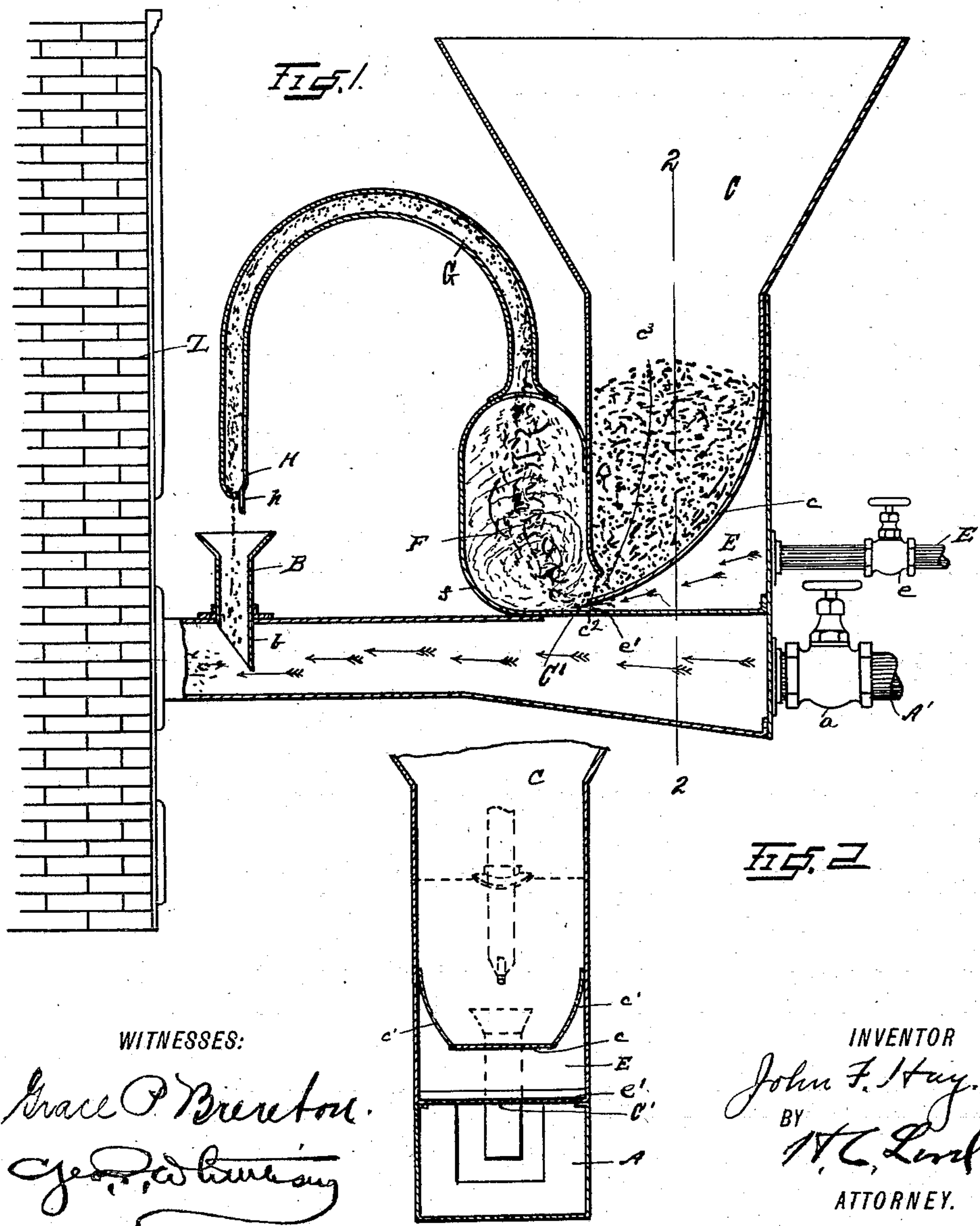
Patented Sept. 11, 1900.

J. F. HAY.

APPARATUS FOR FEEDING COMMINUTED FUEL TO FURNACES, &c.

(Application filed Dec. 27, 1899.)

(No Model.)





# UNITED STATES PATENT OFFICE.

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APPARATUS FOR FEEDING COMMINUTED FUEL TO FURNACES, &c.

SPECIFICATION forming part of Letters Patent No. 657,537, dated September 11, 1900.

Application filed December 27, 1899. Serial No. 741,713. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. HAY, a citizen of the United States; residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Feeding Comminuted Fuel to Furnaces and the Like; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus for feeding comminuted fuel to furnaces and the like; and it consists in certain improvements in the construction thereof, as will be hereinafter fully described, and pointed out in the claims. With apparatuses heretofore designed for this purpose great difficulty has been experienced in effecting a continuously-uniform feed which might be regulated as desired. For this reason in most places where a continuous and uniform heat is desired for a considerable period of time liquid and gaseous fuels have been resorted to; but these are much more expensive than comminuted fuel.

The object of this invention is to provide an apparatus with which comminuted material may be fed in readily-controlled quantities.

The invention is illustrated in the accompanying drawings as follows:

Figure 1 shows a vertical centrally-located section of the apparatus. Fig. 2 shows a section on the line 2 2 in Fig. 1.

Z marks the furnace, which may be of any desired type; A, the mixer-flue, leading to the furnace; A', a pipe for conveying a blast of air to the mixer-flue; *a*, a valve for controlling the air-blast to the mixer-flue.

Extending into the mixer-flue is the feed-tube B, having its lower end provided with a beveled edge *b*, the wall toward the blast being extended below that toward the furnace, so that the blast in passing by the end of the tube forms a suction, which facilitates the admission of the material into the mixer-flue.

Arranged preferably above the mixer-flue is a receiver C, in which a body of comminuted fuel is stored preparatory to being fed into the furnace. The bottom of the receiver

is provided with the hopper-plates *c c' c<sup>2</sup>*, the plate *c* extending across the bottom, so as to bring the discharge-opening *c<sup>3</sup>* toward the furnace side of the receiver. The plate *c<sup>2</sup>* is deflected slightly inwardly just above the opening *c<sup>3</sup>* and prevents an undue discharge of material from the receiver. Immediately below the opening *c<sup>3</sup>* is the plate C', which I term a "retaining-plate," and this checks the discharge of material through the action of gravity. By this arrangement the gravity discharge of the receiver is a relatively-small amount, which is deposited upon the plate C' when it is checked. Immediately to the rear of the plate *c* there is formed a feeding-blast chamber E, to which air is supplied by the pipe E'. This blast is regulated by the valve *e*. The outlet *e'* of the feeding-blast chamber E is immediately between the plate C' and plate *c* and directs the blast upon the plate C'. The opening *e'* is small and acting upon the material deposited upon the plate C' carries it forward into the fluffing-chamber F. The fluffing-chamber F is provided with the deflecting-surface *f* in front of the opening *e'*, which gives to the blast and to the material carried by it an upward and circular movement which strikes the upper plate *c* in its action, and this tends to work the fuel off the plate *c*. The result is that the comminuted material is fluffed in the chamber F—that is, the particles of which the material is composed are widely separated. Extending, preferably, from the upper end of the chamber F is a passage G, into which the material passes in the fluffed state. The material naturally follows the upper side of the passage, because of its curved nature. At the end of the passage there is a reducer H, by means of which the fluffed material is concentrated and delivered to the feeding-tube B in the form of a jet. Where a feed practically fills the reducer H with the fuel as it is discharged, the continuity of the discharge is facilitated by making an auxiliary opening *h* at the inner side of the passage through which the air may pass.

In the operation of the device the mixer-blast is turned into the pipe A' and the feeding-blast is turned into the chamber E. The blast from the chamber E takes up the portion of comminuted material deposited on the



plate C', fluffs it in the chamber F, and carries it in the fluffed state into the passage G. The material is concentrated by the reducer H and delivered through the feeding-tube B to the mixer-flue A, where it is taken up by the mixer-blast and conveyed to the furnace. The amount of fuel to be fed is regulated by the intensity or volume of air delivered to the chamber E, and this may be regulated by the valve *e*. As the feed is changed the mixer-blast of course must be regulated to accommodate the amount of fuel fed, and this may be regulated by the valve *a*. By this arrangement of feeding mechanism comminuted material may be fed through any period of time. The uniformity of the feed is facilitated by the introduction of the fluffing-chamber and the concentrator or reducer H in the discharge-passage. By thus fluffing the material the possibility of the material becoming sufficiently dense to form a piston, by means of which the material is subjected to direct pressure, is avoided, and the material is moved simply by impact, so that the feed is continuous and may be regulated as desired. This manner of feeding also does not draw the material from the receiver C except to replace material dislodged from the plate C' by the action of the blast. A break between the passage G and the feed-pipe is desirable, because it eliminates the influence of blast in the mixer-flue from the feed regulation.

I have used the term "air-blast" to describe the gaseous or similar medium by which the feeding action is accomplished; but of course it is to be understood that any gas or vapor may be substituted for air. I have also used the term "air-blast" to describe the movement of gases through the mixer-flue, and of course this will be also understood as including any gas or vapor capable of furnishing oxygen.

What I claim as new is--

1. In an apparatus for feeding comminuted fuel, the combination of a receiver, having a discharge-opening to which the fuel is delivered by gravity; a retarding-surface below said opening for checking the discharge by gravity; and an air-blast mechanism arranged to direct the blast from beneath the discharge-opening upon the fuel lodged upon said retaining-surface and to feed the fuel therefrom.
2. In an apparatus for feeding comminuted fuel, the combination of a receiver, having a discharge-opening, to which fuel is delivered by gravity; a protruding lip extending from said opening into a chamber upon which the fuel is delivered by gravity; said chamber; an air-blast mechanism directed into the chamber from beneath the projecting lip; and a deflector for deflecting the blast to operate upon the material upon the projecting lip.
3. In an apparatus for feeding comminuted fuel, the combination of a receiver, having a discharge-opening to which the fuel is de-

livered by gravity; a retarding-surface below said opening for checking the discharge by gravity; and an air-blast mechanism arranged to direct the blast from beneath the discharge-opening upon the fuel lodged upon said retarding-surface and to feed the fuel therefrom in proportion to the volume or intensity of the air-blast.

4. In an apparatus for feeding comminuted fuel, the combination of the receiver, C, having the bottom plate, *c*, and an opening *c*<sup>3</sup> therefrom to which the fuel is fed by gravity; surface, C', below the opening; the air-blast mechanism having the opening, *e*', in proximity to surface, C', described; and means for regulating the air-blast.

5. In an apparatus for feeding comminuted fuel, the combination of the receiver, C, having the opening, *c*<sup>3</sup>, therefrom, beneath which is the projecting lip formed by the extension on the plate, *c*, to which the fuel is fed by gravity, from the receiver, C; the air-blast mechanism, having the opening, *e*', immediately beneath the projecting lip; and means for regulating the air-blast and for deflecting the air-blast to operate upon the material upon the projecting lip.

6. In an apparatus for feeding comminuted fuel, the combination of the fluffing-chamber, F, having a curved surface, *f*, extending from the bottom thereof; means for feeding the fuel to said chamber opposite the curved surface, *f*; blast mechanism having the opening, *e*', in position to direct the blast against the material deposited in the bottom of the fluffing-chamber, in front of the curved surface, *f*; and a passage, G, leading from the upper part of said fluffing-chamber.

7. In an apparatus for feeding comminuted fuel, the combination of means for fluffing the fuel; a passage for conveying the fluffed fuel; an air-blast arranged to carry the fuel in the fluffed state into and through said passage; and a reducer at the discharge end arranged to concentrate the fluffed fuel at the exit.

8. In an apparatus for feeding comminuted fuel, the combination of means for fluffing the material; a passage having an upwardly-extended portion connecting with a downwardly-extended portion, at the end of which is a reduced discharge-opening for concentrating the fluffed material; and an air-blast mechanism for forcing the material through the passage.

9. In an apparatus for feeding comminuted fuel, the combination of a means for delivering fuel in the fluffed state; a passage for conveying the fuel in the fluffed state; an air-blast for carrying the fuel through said passage; a reducer for concentrating the fuel at the discharge end; and an auxiliary opening, *h*, adjacent to the reducer for allowing the escape of air.

10. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue having a feed-opening therein; a blast apparatus



therefor; a passage for conveying comminuted fuel to the feed-opening, said opening in passage being arranged with a break in the continuity of the passage, whereby the influence of the blast in the mixer-flue on the feeding of material through the passage, is eliminated; an air-blast mechanism for effecting a feeding action through said passage and a separate blast mechanism for directing a blast to the mixer-flue.

11. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a blast device therefor; a receiver for storing the fuel to be used; a separate air-blast mechanism arranged to produce the discharge of the fuel from the receiver; and means for conveying the discharged fuel to the mixer-flue.

12. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a blast device therefor; a receiver for storing the fuel to be used; an air-blast mechanism arranged to produce the discharge of the fuel from the receiver; means for conveying the discharged fuel to the mixer-flue; and means for regulating one of the air-blasts relatively to the other.

13. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed; an air-blast mechanism arranged to produce the discharge action from the receiver and to convey the material discharged to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

14. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed; an air-blast mechanism arranged to produce the discharge action from the receiver and to convey the material discharged to the mixer-flue; a separate blast mechanism for producing a blast in the mixer-flue; and means for regulating one of the blasts relatively to the other.

15. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing fuel to be fed; an air-blast mechanism arranged to produce a discharge action from the receiver; means arranged to regulate the amount discharged from the receiver, in proportion to the volume or intensity of the air-blast; means for conveying the discharged fuel to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

16. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing fuel to be fed; an air-blast mechanism arranged to produce a discharge action from the receiver; means arranged to regulate the amount discharged from the receiver in proportion to the volume or intensity of the air-blast; means for conveying the discharged fuel to the mixer-flue; a separate blast mechanism for producing a blast in the mixer-flue; and means for regulating one of the blasts relatively to the other.

17. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed, arranged to deliver the fuel to a discharge-opening; an air-blast mechanism arranged to operate upon the fuel at the discharge-opening, and to regulate the amount discharged; means for conveying the fuel discharged to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

18. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing fuel to be fed and arranged to deliver the fuel to the discharge-opening; an air-blast arranged to operate upon the fuel at the discharge-opening and to regulate the amount discharged; means for conveying the fuel discharged to the mixer-flue; a separate blast mechanism for producing a blast in the mixer-flue; and means for regulating one of the blasts relatively to the other.

19. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed arranged to deliver the fuel to a discharge-opening; an air-blast mechanism arranged to operate upon the fuel at the discharge-opening, to regulate the amount discharged and to convey the fuel discharged to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

20. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed, arranged to deliver the fuel to a discharge-opening; an air-blast mechanism arranged to operate upon the fuel at the discharge-opening to regulate the amount discharged and to convey the fuel discharged to the mixer-flue; a separate blast mechanism for producing a blast in the mixer-flue; and means for regulating one of the blasts relatively to the other.

21. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed, said receiver having a discharge-opening to which fuel is delivered by gravity; a retaining-surface below said opening for checking the discharge by gravity; an air-blast mechanism arranged to conduct a blast upon the fuel lodged upon said retaining-surface and to feed the fuel therefrom; means for conveying the fuel so fed to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

22. In an apparatus for feeding comminuted fuel, the combination of a mixer-flue; a receiver for storing the fuel to be fed; said receiver having a discharge-opening, to which fuel is delivered by gravity; a retaining-surface below said opening for checking the discharge by gravity; an air-blast mechanism arranged to conduct a blast upon the fuel lodged upon said retaining-surface and to feed the fuel therefrom; means for conveying the fuel so fed to the mixer-flue; a separate air-blast mechanism for producing a blast in the



mixer-flue; and means for regulating one of said blasts relatively to the other.

23. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber; a receiver for storing the fuel to be fed, said receiver being provided with an opening entering into said fluffing-chamber, and also being arranged to deliver the material to said opening by gravity; an air-blast mechanism arranged to direct a blast from beneath the opening from the receiver into the fluffing-chamber and to produce a feeding action from the receiver into the fluffing-chamber and to direct a blast against the fuel in the fluffing-chamber at the discharge-opening; means for deflecting a blast to fluff the fuel acted upon in said chamber; and a passage for conveying the fluffed fuel from the chamber.

24. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber, a receiver having an opening leading to said chamber for storing the material to be fed; an air-blast mechanism arranged to produce a feeding action of the fuel from the receiver into the fluffing-chamber; means arranged to regulate the amount discharged from the receiver in proportion to the volume or intensity of the air-blast; means for deflecting the air-blast in the fluffing-chamber to fluff the fuel acted upon in said chamber; and a passage for conveying the fluffed fuel from the chamber.

25. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber; a receiver for storing the fuel to be fed; an air-blast mechanism arranged to produce a feeding action from the receiver into the fluffing-chamber and to direct a blast against the fuel in the fluffing-chamber; means for deflecting the blast to fluff the fuel acted upon in said chamber; a mixer-flue; a passage leading from the fluffing-chamber and arranged to convey the fuel from the fluffing-chamber to the mixer-flue and a blast mechanism for producing a blast in the mixer-flue.

26. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber; a receiver for storing the material to be fed; an air-blast mechanism arranged to produce a feeding action of the fuel from the receiver into the fluffing-chamber; means arranged to regulate the amount discharged from the receiver in proportion to the volume or intensity of the air-blast; means for deflecting the

air-blast, in the fluffing-chamber to fluff the fuel acted upon in said chamber; and a mixer-flue; a passage leading from the chamber and arranged to convey the fuel from the fluffing-chamber to the mixer-flue and a separate blast mechanism for producing a blast in the mixer-flue.

27. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber; a receiver for storing the fuel to be fed; an air-blast mechanism arranged to produce a feeding action from the receiver into the fluffing-chamber and to direct a blast against the fuel in the fluffing-chamber; means for deflecting the blast to fluff the fuel acted upon in said chamber; a passage for conveying said material in a fluffed state; and a reducer at the discharge end of the passage for concentrating said material.

28. In an apparatus for feeding comminuted fuel, the combination of a fluffing-chamber; a receiver for storing the fuel to be fed; an air-blast mechanism arranged to produce a feeding action from the receiver into the fluffing-chamber and to direct a blast against the fuel in the fluffing-chamber; means for deflecting the blast to fluff the fuel acted upon in said chamber; a mixer-flue; a passage extending from the chamber and arranged to carry the material therefrom in a fluffed state, and to deliver the same to the mixer-flue; a reducer at the end of the passage for concentrating the fluffed fuel, and a separate blast mechanism for producing a blast in the mixer-flue.

29. In an apparatus for feeding comminuted fuel, the combination of the mixer-flue, A; a blast-pipe, A', leading thereto and having the regulating-valve, a, therein; the feeding-tube, B, extending into the mixer-flue; the receiver, C, having the hopper-bottom and forwardly-projecting plate, c; the blast-chamber, E, extending through the opening, e', and under the opening, c'; a blast-pipe, E', having a regulating-valve, e, therein; a fluffing-chamber, F, having the deflecting-surface, f; the passage, G, leading therefrom to the feed-tube, B, the reducer, H; and the auxiliary passage, h.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN F. HAY.

Witnesses:

BERT COHN,

JOHN S. RILLING.