June 9, 1925. 1,541,087

W. H. WHITAKER

POWDERED FUEL AIR MIXER AND FEEDER

Filed Feb. 11, 1924 2 Sheets-Sheet 1

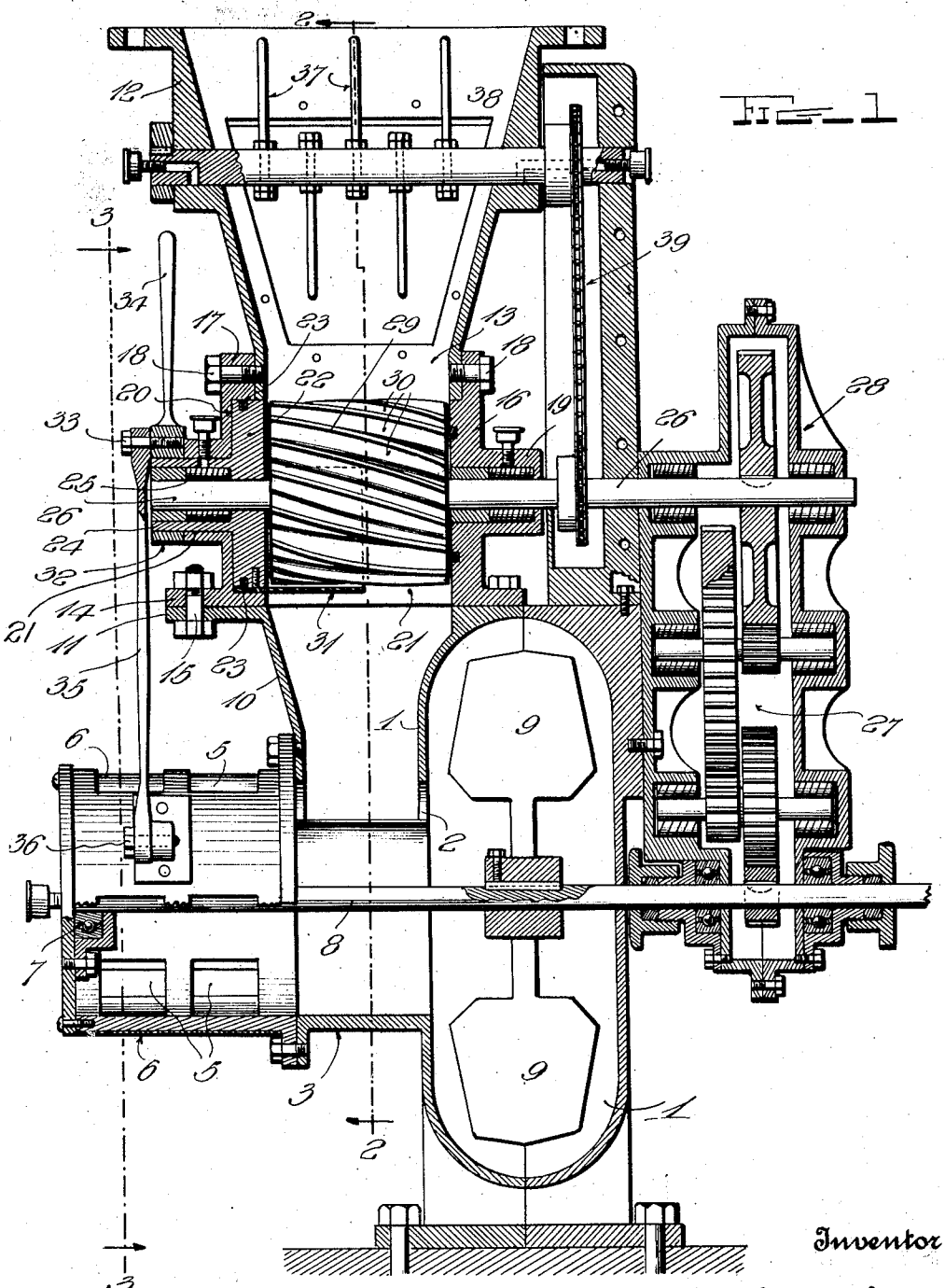


Fig. 1

Witness

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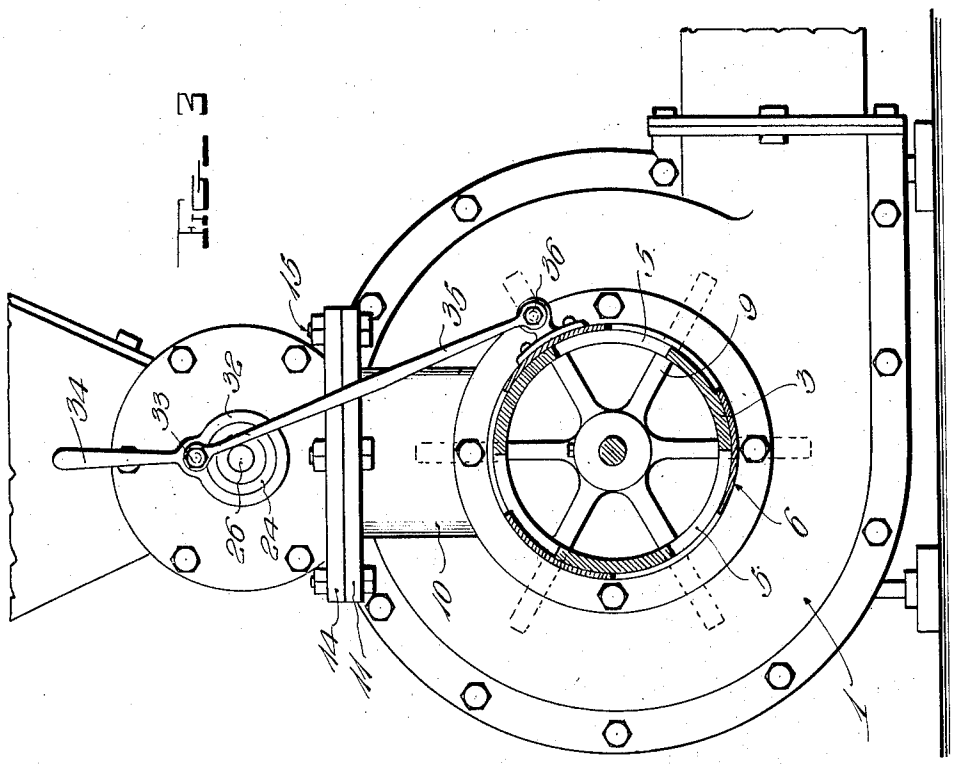
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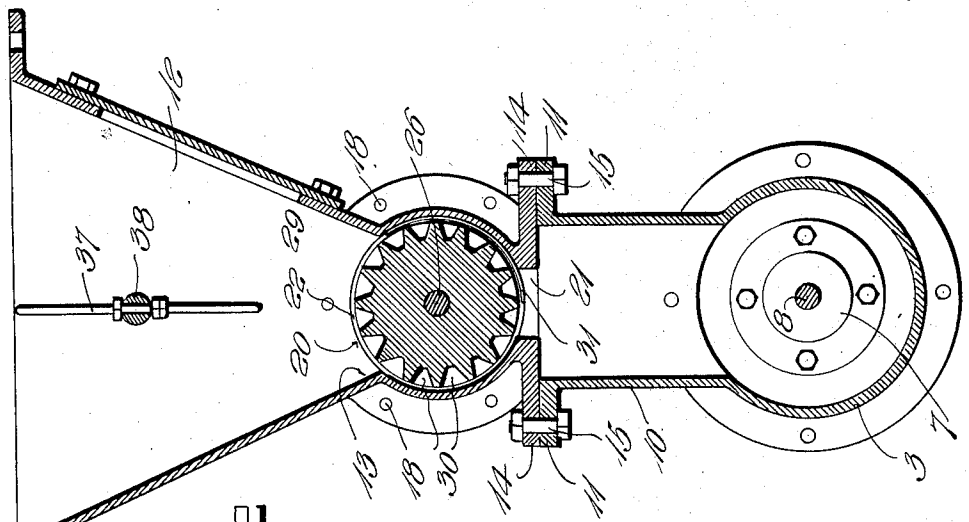
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UNITED STATES PATENT OFFICE.

WILLIAM H. WHITAKER, OF SHELBYVILLE, ILLINOIS.

POWDERED-FUEL AIR MIXER AND FEEDER.

Application filed February 11, 1924. Serial No. 692,065.

To all whom it may concern:

Be it known that I, WILLIAM H. WHITAKER, a citizen of the United States, residing at Shelbyville, in the county of Shelby and State of Illinois, have invented certain new and useful Improvements in Powdered-Fuel and Air Mixers and Feeders; and I do 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.

My invention relates to devices for supplying powdered or similar fuel, mixed with air, to the burner nozzles of furnaces, the principal object being to provide for effectively loosening the fuel, feeding measured quantities of such loosened fuel into a valve-controlled air inlet of a fan which discharges the mixed fuel and air into a nozzle, and accurately maintaining proper proportions of air and fuel at all times, whether operating at maximum or minimum capacity, or at any intermediate adjustment, the construction being such as to prevent packing, arching and sliding of the fuel, with their well known disadvantages.

In feeding the fuel to the air inlet of the fan, a peripherally-pocketed feed roll is used, whose pockets carry the fuel downwardly from a chamber in which it is loosened and dump it at the lower side of the roll, and a further object is to provide for throwing the pockets in a portion of the roll, more or less out of operation according to the quantity of fuel needed, provision being made for controlling the entrance of air into the fan according to the quantity of fuel discharged by the fuel roll.

Another aim is to provide an exceptionally simple and compact structure for obtaining excellent results.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, the description being supplemented by the accompanying drawings.

Figure 1 is a vertical longitudinal sectional view through a machine embodying my invention.

Figures 2 and 3 are vertical transverse sectional views as indicated by lines 2—2 and 3—3 of Fig. 1.

In the drawings above briefly described, the numeral 1 designates a vertically disposed fan casing adapted to be rigidly mounted on any suitable support. One side of this casing is formed with an air inlet eye 2, and a horizontal air inlet neck 3 leads to this eye, the inner end of this neck being preferably integral with the fan casing. The outer end of the neck 3 is formed with a plurality of air inlet openings 5 which are controlled by a sleeve valve 6, said end of the neck being provided also with a bearing 7 for a horizontal shaft 8 which passes through the neck and the fan casing and carries a fan 9. This shaft is preferably driven by an electric motor provided with a suitable rheostat, and forms the drive shaft of the entire machine.

Discharging into the upper side of the neck 3, and preferably formed integrally with said neck, is a fuel inlet neck 10, one of whose sides is preferably formed by one vertical side of the casing 1. The upper end of the neck 10 is preferably flush with the top of the casing 1, and may well be provided with an outstanding flange 11.

A fuel receiving chamber 12 is provided above the neck 10, being adapted for communication with a suitable hopper or the like (not shown), the lower end of said chamber being provided with a reduced outlet throat 13 whose lower end is formed with an outsanding flange 14 secured by screws or the like 15 to the flange 11, so that the throat 13 delivers into the neck 10. This throat is preferably provided with heavily constructed opposed sides 16 and 17 secured in place by screws or the like 18, the side member 16 being provided with a suitable shaft bearing 19. The inner side of the member 17 is provided with a recess 20 of circular outline and is also formed with an opening 21 co-axial with said recess and co-axial with the bearing 19. A flat head 22 is received rotatably in the recess 20 and is provided with a peripheral packing 23 engaging the recess wall to prevent sifting of fuel dust into the latter, said head being equipped with a central outwardly extending operating stub 24 which is preferably of tubular form and contains a bearing 25 alined with the bearing 19. A feed roll shaft 26 passes through the bearings 19 and 25 and has an extended end driven by a suitable train of gearing 27, from the shaft 8, said gearing being located in a suitable housing 28. Keyed

upon the shaft 26, within the throat 13, is a feed roll 29 which is provided with peripheral grooves 30 which are spirally directed and form pockets for receiving powdered fuel from the chamber 12 and dumping it into the neck 10.

To control the amount of fuel fed to the neck 10 by the roll 29, I provide a gate 31 which is preferably of arcuate form to extend partly around the periphery of the roll 29, at one end of the latter, said gate being carried by the head 22. It will be seen that by turning this head, the gate 31 may be positioned to cover the pockets at the lower side of substantially half of the feed roll, or only a desired number of such pockets. Thus, they are prevented from dumping and the quantity of fuel fed to the neck 10, by the feed roll, is reduced.

In the construction shown, the outer end of the stub 24 is provided with a collar 32 having a wrist pin 33 and a handle 34. By turning this handle, the valve or gate 31 may be set as desired. A connecting rod or link 35, depends from the wrist pin 33 to a similar pin 36 with which the sleeve valve 6 is provided. By this means, adjustments of the fuel valve 31 and the air valve 6 are synchronized, so that a proper proportion of fuel and air can be maintained, regardless of the capacity at which the machine is operating. It may here be further noted, that the rotations of the fan 7 and the feed roll 29, are synchronized also, so that there is no possibility of the fuel being supplied to the fan casing, any more rapidly than it can be blown from the latter with the air entering through the neck 3.

In order to thoroughly loosen the fuel in the chamber 12 and thus prevent it from packing, arching and later sliding, I have provided an appropriate agitator 37 whose shaft 38 is driven by a chain or other desired means 39, from the feed roll shaft 26.

When the machine is operating, the agitator 37 effectively loosens the fuel in the chamber 12, the pockets 30 of the feed roll 29 are gradually filled with the loosened fuel, as said roll rotates, and these pockets dump the fuel in measured quantities, into the neck 10. There is no possibility of the fuel sliding by the feed roll 29 and as the movements of the feed roll and fan are synchronized, an over supply of fuel cannot be obtained, having a tendency to choke the fan outlet or produce a flickering flame. The fan draws air inwardly through the neck 3 and the fuel dumped from the feed roll pockets, is picked up by this air and carried in suspension thereby, into the fan casing. In this casing, an intimate mixture of air and fuel takes place and the mixture is blown from the fan outlet into the burner nozzles (not shown), producing a steady flame which may be regulated at will, by speeding or retarding the fan and the feed roll, and by operating the handle 34 to simultaneously control the gate 31 and the sleeve valve 6, so as to supply the required amount of fuel and the proper amount of air therewith.

Excellent results are obtainable from the details disclosed and they are therefore preferably followed, but within the scope of the invention as claimed, numerous minor changes may be made.

I claim:

1. Powdered fuel and air feeding and mixing means comprising a fan casing having a horizontal air inlet neck whose upper side is formed with a fuel inlet opening, a powdered fuel hopper above said neck, a substantially straight vertical fuel passage from the lower end of said hopper to said fuel inlet opening of the neck, said passage having a fixed internal size, means in said hopper for loosening the fuel and preventing arching thereof over said passage, a cylindrical feed roll disposed horizontally in said passage and at all times alone acting to prevent direct gravitation of fuel from the hopper into said air inlet neck, said roll having longitudinal circumferentially spaced ribs extending uninterruptedly from one end to the other and defining pockets to receive the loose fuel from the hopper and carry such fuel bodily to the lower side of the roll for discharge into the aforesaid air inlet neck of the fan casing, an arcuate gate at the periphery of said feed roll and of less length than said roll, said gate being pivotally mounted co-axially with said feed roll and being effective for controlling the handling of fuel by the portions of the pockets at one end of said roll, an air controlling valve for the aforesaid air inlet neck, operating connections between said valve and the aforesaid gate, a rotary fan in the fan casing for discharging the air and fuel therefrom, and driving connections between said fan and said feed roll.

2. Powdered fuel and air mixing and feeding means comprising a substantially horizontal air passage, a substantially straight vertical fuel inlet passage of fixed internal size opening through the top of said air passage, a feed roll across said fuel passage and at all times alone acting to prevent direct gravitation of fuel therethrough, said roll having longitudinally disposed circumferentially spaced ribs from end to end defining pockets which are adapted to receive fuel from the fuel passage and carry it bodily downward for discharge into said air passage, an arcuate gate at the periphery of said feed roll and of less length than said roll, said gate being movable across the portions of said pockets at one end of said feed roll to prevent functioning thereof, a

valve for said air passage, and operating connections between said valve and the aforesaid gate.

3. Powdered fuel and air mixing and feeding means comprising an air passage, a fuel inlet opening into said air passage, a peripherally-pocketed feed roll whose pockets discharge fuel into said passage through said fuel inlet, a gate movable across a portion of said feed roll to prevent fuel feeding by said portion of the roll, said gate having an operating stub extended outwardly through the wall of said fuel inlet, a controlling valve for the aforesaid air passage, and means connecting said stub and valve for adjustment in unison.

4. A structure as specified in claim 3; said stub and valve being rotatable and having wrist pins, and a link connecting said wrist pins, constituting said connecting means.

5. A feeder for powdered material comprising a passage of fixed internal size, a feed roll across said passage at all times alone preventing direct gravitation of fuel therethrough, said roll having uninterrupted pockets from end to end for carrying the material from one side of said roll to the other and dumping it, and an arcuate gate at the periphery of said feed roll and of less length than said roll, said gate being movable across the portions of said pockets at one end of said feed roll to prevent functioning thereof, said gate being rotatable concentrically with the feed roll and having a tubular operating stub extending outwardly through the wall of said passage, said roll being provided with a driving shaft, one end of which is rotatable within said tubular stub.

6. A feed device comprising a passage whose wall is formed with an internal recess of circular outline and with an opening co-axial with said recess, a feed roll extending across said passage in axial alinement with said recess and having pockets from one end to the other, a head rotatably received in said recess and having an arcuate gate at the periphery of said feed roll and of less length than said roll for controlling functioning of the portions of the feed roll pockets in one end of the roll, and an operating stub extending from said head through the aforesaid opening.

In testimony whereof I have hereunto affixed my signature.

WILLIAM H. WHITAKER.