No. 804,160. PATENTED NOV. 7, 1905.

E. J. NEVILLE.

DEVICE FOR FEEDING PULVERIZED FUEL.

APPLICATION FILED MAR. 14, 1904.

2 SHEETS—SHEET 1.

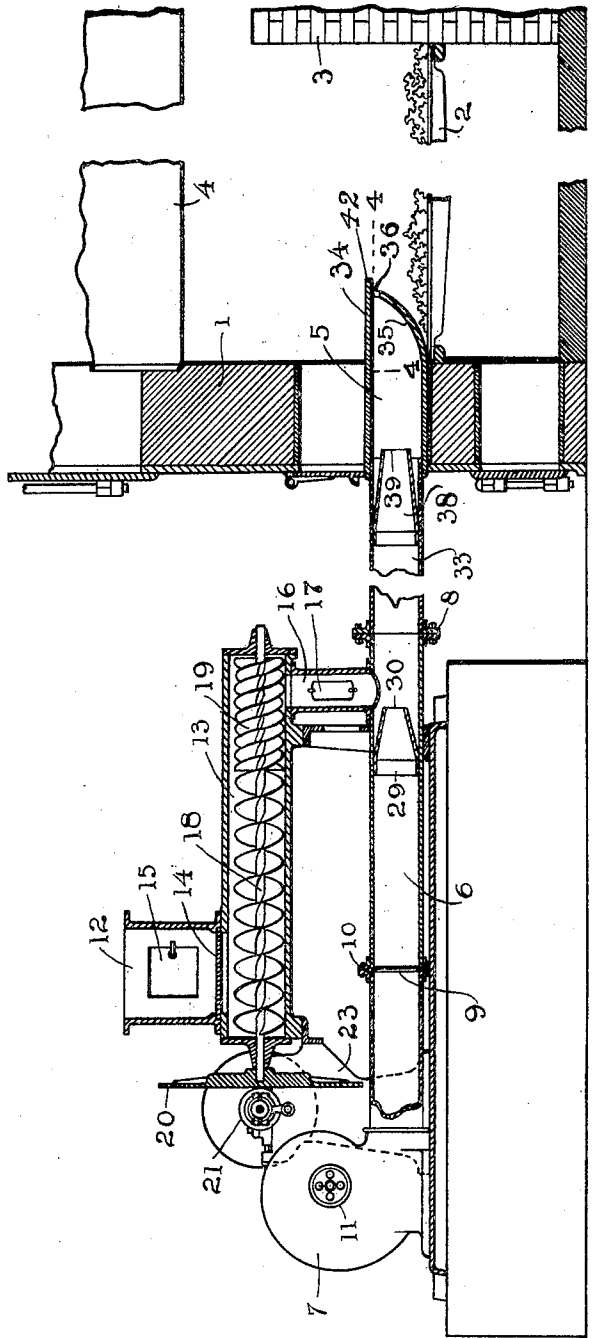


Fig. 1

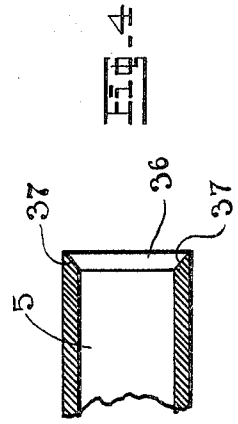


Fig. 4

WITNESSES:

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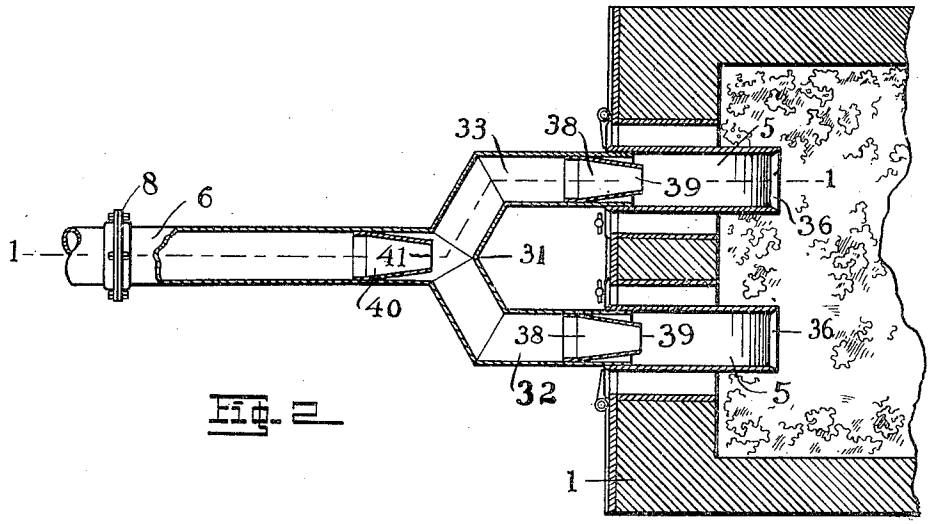


Fig. 2

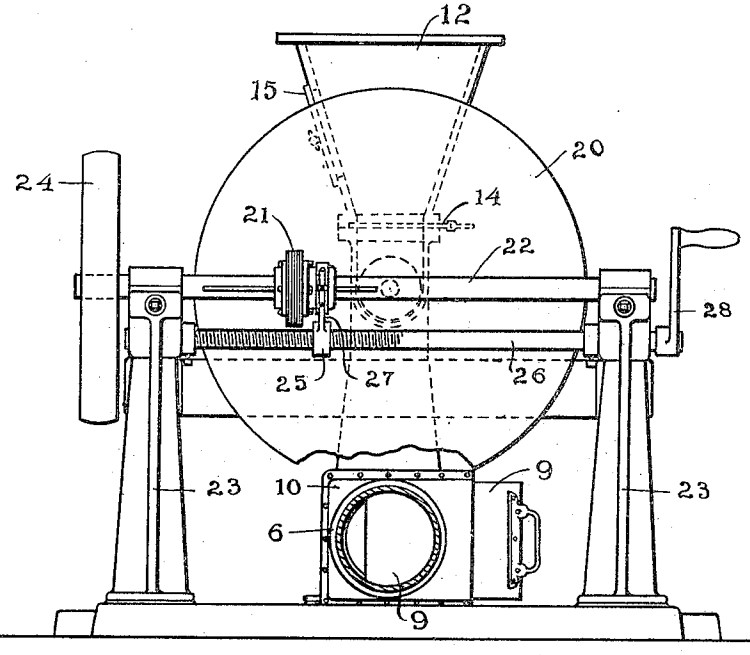


Fig. 3

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DEVICE FOR FEEDING PULVERIZED FUEL.

No. 804,160. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed March 14, 1904. Serial No. 197,974.

To all whom it may concern:

Be it known that I, EVERETT J. NEVILLE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Devices for Feeding Pulverized Fuel, of which the following is a specification.

This invention relates to devices for feeding pulverized fuel to furnaces; and it has for its objects the production of a device of that character which will be simple and economical in construction, which will prevent the deposition of fuel in transit to the furnace, and which will cause the fuel and air to be thoroughly mingled before they enter the furnace, so that the delivery of fuel will be uniform and the fire will be steady.

With these objects in view I have invented the apparatus shown in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view through the furnace and the feeding apparatus, the same being taken substantially on the plane indicated by the line 1 1 of Fig. 2, a portion of the blast-pipe being broken away. Fig. 2 is a horizontal section through the furnace and a portion of the blast-pipe, showing the arrangement of the nozzles within the latter. Fig. 3 is a front elevation of the feeding apparatus with the blower removed and a portion of the feeding-disk broken away; and Fig. 4 is a detail view taken substantially on the line 4 4 of Fig. 1, showing the diverging sides for the slit for causing the air and fuel to be fanned out within the furnace.

Referring to the drawings, in which similar reference characters designate corresponding parts throughout the several views, 1 represents the front wall of a boiler-furnace; 2, the grate-bars, and 3 the bridge-wall, while the boiler itself is represented at 4.

Projecting through the front wall of the furnace over the forward ends of the grate-bars is the delivery-section 5 of a blast-pipe 6, said blast-pipe being connected with a suitable means for supplying compressed air thereto, said means consisting, as shown, of a blower 7. The blast-pipe may be made up of any desirable number of sections, said sections being connected together by flanged rings 8, which are bolted together, as shown. At any suitable point in the blast-pipe I interpose a blast-gate, shown at 9, (see Fig. 3,) by means of which the supply of air through the pipe may be regulated or entirely cut off. This blast-gate consists, preferably, of a plate, which is adapted to be slid back and forth in a transverse slideway in the pipe between the flanges 10. The blower may be driven by any suitable means, as by the pulley 11.

The pulverized fuel is furnished in any suitable way to a delivery hopper or spout 12, from which it is allowed to pass into a feeding tube or pipe 13, the supply of fuel being regulated by means of a slide-gate 14 in the bottom of the hopper. In order that the fuel may be broken up or loosened in case it should become packed and if for any other reason it should not feed properly, I provide the hopper with a side gate 15, which may be opened so that the operator can insert his hand into the hopper.

Connecting the feeding-tube 13 with the blast-pipe 6 is a delivery-pipe 16, through which the fuel passes into the pipe. This delivery-pipe is provided with a hand-plate 17, which is adapted to be removed, so that the interior of the pipe can be inspected, if desired. The delivery-pipe is open at each of its ends to the blast-pipe and feeding-tube, respectively.

Journaled in the end plates of the feeding-tube, so as to rotate within the tube, is a feeding-screw 18, the said screw being mounted so that it will coöperate with the bottom of the tube and push the fuel rearwardly thereon in a well-known manner. It is desirable that the fuel be fed to the delivery-pipe 16 as uniformly as possible, and in order to break up the quantities of fuel that will be fed rearwardly by the various turns of the forward end of the feeding-screw I provide the rear end of the latter with a quadruple set of feed-plates, as shown at 19. By this means the fuel is delivered to the pipe 16 with greater regularity than it would be delivered if the double screw were continued throughout its entire length. The screw 18 is driven by means of a large disk 20, that is secured to its forward end, said disk being turned by means of a friction-pulley 21, that bears against its front surface. This pulley is preferably formed of a plurality of leather washers that are clamped together by means of bolts, as shown in Fig. 3. The pulley 21 is keyed to turn with a shaft 22, said shaft being suitably journaled in standards 23 of the frame of the machine, and the shaft is turned by means of a pulley 24. The pulley 21 is adapted to be slid back and forth on its shaft 22 for the purpose of regulating the speed that is imparted to the disk 20, said sliding movement

being effected by means of a nut 25, that is mounted upon a screw-threaded shaft 26 and that has a yoke connection 27 with the hub of the pulley 21. The screw-shaft 26 is turned by means of a crank 28, and when so turned the nut 25 and the pulley 21 will be moved back and forth across the face of the disk 20. Any other suitable driving mechanism may be employed, however, for imparting motion to the feed-screw.

In order that the air and fuel in the blast-pipe may be thoroughly commingled, I provide the latter with nozzles having orifices of different diameters, which are arranged to be best adapted to set the air in agitation. The first nozzle (shown at 29) is located with its orifice 30 substantially below the front portion of the discharge-pipe 16, by which structure the blast of air is directed across the mouth of the discharge-pipe. The feeding-tube 13 being occupied by the screw and the fuel, there is practically no access of air to the discharge-pipe 16, and said pipe is, in effect, closed at its upper end to the atmosphere. The blast of air directed across the mouth of this pipe sets the air within the same in violent circulation, much the same as the air in a bottle when one blows across its mouth. This violent circulation causes the pulverized fuel in the pipe to be set in motion and thoroughly mixed with the air before it is delivered to the blast-pipe.

In small furnaces, which are able to accommodate but one of the delivery-sections 5, the said section is placed in line with the rest of the blast-pipe. However, in most furnaces it is preferable to employ two of these discharge-sections, such a structure being shown in Fig. 2. In this case the main part of the blast-pipe is divided at 31 into two branches 32 and 33, the said branches being connected at their rear ends with their discharge-sections. These sections are preferably of the shape shown in section in Fig. 1, consisting of a flat top plate 34 and a curved bottom portion 35, the said bottom portion being joined to the top plate along the edges of the latter except at the extreme rearward end, where there is provided a slot 36. This slot permits the escape of the air from the blast-pipe, and the sides of the slot are beveled outwardly at 37 in order that the blast of air carrying the fuel will be fanned out and spread over a large surface of the grate-bars. By curving the bottom portion 35 upwardly toward the slot 36 the air is gradually compressed, so that it issues from the slot with greater force than it otherwise would do.

Just before the branches of the blast-pipe enter the delivery-sections they are provided with nozzles 38, the orifices 39 in which are larger than the orifice 30 of the nozzle 29, and just in advance of the division of the blast-pipe 6 into the branches 32 and 33 I provide another nozzle 40, the orifice 41 in which is also larger than the orifice 30. The object in view in making the orifices 39 and 41 larger than the orifice 30 is to provide a fall in pressure after the air passes the nozzle 29, as by so doing the air in the pipe is more thoroughly agitated and the fuel is more evenly commingled therewith. The nozzle 40 directs its blast of air against the diverging rear walls of the branch pipes 32 and 33, so that the air is deflected against the outer portions of the branch pipes and turned by them into the nozzles 38. The arrangement of the nozzle 40 with respect to the branch pipes is such that the air is thrown into still greater agitation, and as the air passes from the nozzles 38 into the large chambers in the discharge-sections it will circulate therein until the air and fuel become thoroughly mixed. I have found that by the use of a plurality of nozzles in the blast-pipe, with an extended space or duct therebetween, counter currents are set up in such space or duct by the second nozzle, the fuel is prevented from being deposited in such space or duct, and the commingling of the air and fuel is greatly facilitated. Any number of nozzles may be employed; but I consider the numbers shown as being sufficient when arranged as described.

While the orifices in the slits 36 are larger than in the nozzle 29, the slits are still small enough to maintain the pressure in the pipe above the atmospheric pressure, whereby the air and fuel are kept thoroughly commingled.

By projecting the top plate 34 rearwardly of the slot 36, as at 42, the blast of air and fuel is prevented from passing upwardly, but is directed into a horizontal plane. It will be understood, however, that different-shaped delivering-sections may be employed which are adapted to direct the blast in other planes from the horizontal.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device for feeding pulverized fuel, the combination of a blast-pipe, a closed duct for pulverized fuel communicating with said pipe, and a nozzle in the pipe in front of said duct, substantially as specified.

2. In a device for feeding pulverized fuel, the combination of a blast-pipe, a feeding device for fuel, a duct extending between said device and said pipe and communicating therewith, means including said feeding device for cutting off said duct from communication with the atmosphere, and a nozzle in the blast-pipe in front of said duct, substantially as specified.

3. In a device for feeding pulverized fuel, the combination of a blast-pipe, a feeding-pipe for the fuel, means for supplying pulverized fuel to the said feeding-pipe, a feeding-screw in said feeding-pipe, a delivering-pipe communicating with the feeding-pipe and con-

nected thereto at a point remote from the point of introduction of fuel thereinto, said delivering-pipe connecting and communicating with said blast-pipe, and a nozzle in the blast-pipe in front of the delivering-pipe, substantially as specified.

4. In a device for feeding pulverized fuel, the combination of a blast-pipe, a pair of nozzles mounted in said pipe and spaced apart to form an extended commingling-space therebetween, and means for supplying pulverized fuel to said pipe intermediate of said nozzles, substantially as specified.

5. In a device for feeding pulverized fuel, the combination of a blast-pipe, a pair of nozzles mounted in said pipe and spaced apart to form an extended commingling-space therebetween, and a delivering-pipe for pulverized fuel communicating with said blast-pipe adjacent to and in the rear of the forward nozzle, substantially as specified.

6. In a device for feeding pulverized fuel, a blast-pipe, a closed duct for delivering the fuel to said pipe, a nozzle in the blast-pipe in front of said duct, and a second nozzle at the rear of said duct, said second nozzle having a larger discharge-orifice than the first nozzle, substantially as specified.

7. In a device for feeding pulverized fuel, the combination of a blast-pipe, said pipe being provided with a slitted discharge-orifice in the rear end thereof and a plurality of restricting-nozzles mounted within the same, the discharge-orifice in the first nozzle being smaller than the discharge-orifice in either of the other nozzles or the slit, means for supplying pulverized fuel to the pipe at the rear of the first nozzle, and means for supplying a common pressure fluid through said nozzles and slit, substantially as specified.

8. In a device for feeding pulverized fuel, the combination of a blast-pipe, said pipe being divided into a plurality of branches, a smooth unobstructed surface being provided at the point of divergence of said branches, a nozzle within said pipe immediately in front of the point of divergence of said branches, and means for admitting fuel to the pipe in advance of said nozzle, substantially as specified.

9. In a device for feeding pulverized fuel, the combination of a blast-pipe that is divided near its rear end into a plurality of branches, said pipe being provided with a constriction just in advance of the point of divergence of the said branches and being also provided with a second constriction arranged in advance of the first-mentioned constriction, the discharge-orifice through said second constriction being smaller than that through the first-mentioned constriction, and means for admitting fuel to the blast-pipe between said constrictions, substantially as specified.

10. In a device for feeding pulverized fuel to a furnace, the combination of a blast-pipe, a delivering section or burner connected to the rear end of said blast-pipe, said section comprising a flat top plate and a bottom plate, said top plate extending in substantially the same plane as the top of the blast-pipe and the lower plate having its front end in substantially the plane of the bottom of the blast-pipe and its rear end inclined upwardly and extending in close proximity to the top plate, substantially as specified.

11. In a device for feeding pulverized fuel to a furnace, the combination of a blast-pipe, and a delivering section or burner for said blast-pipe, said delivering section or burner comprising a top plate and a bottom plate, the top plate extending in substantially the plane of the top of the blast-pipe and the front portion of the bottom plate extending in substantially the plane of the bottom of the blast-pipe and having its rear end inclined upwardly to form a discharge-slit between the same and the top plate, said top plate extending beyond the bottom plate, substantially as specified.

12. In a device for feeding pulverized fuel, a blast-pipe that is divided toward its rear end into a plurality of diverging branches, delivering-sections connected with the rear ends of each of said branches, said delivering-sections having slits through which the air and fuel issue, nozzles in the branch pipes at the entrance to the delivering-sections, a nozzle in the blast-pipe in advance of the point of divergence of the branches of the pipe, said nozzle being so positioned as to direct the air against the diverging sides of the branches, for the purpose specified, means for delivering fuel to the blast-pipe, and a nozzle in the blast-pipe in front of the said delivering means, the orifice in the last-mentioned nozzle being smaller than the orifices in either of the other nozzles, and also smaller than the slits in the delivering-section, whereby the pressure of the air in the pipe is diminished after it passes the nozzle with the smaller orifice, so that the air is permitted to circulate and thus thoroughly commingle the fuel therewith.

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

EVERETT J. NEVILLE.

Witnesses:
S. E. FOUTS,
C. MCELROY.