G. W. SHORT.

APPARATUS FOR FEEDING PULVERIZED FUEL.

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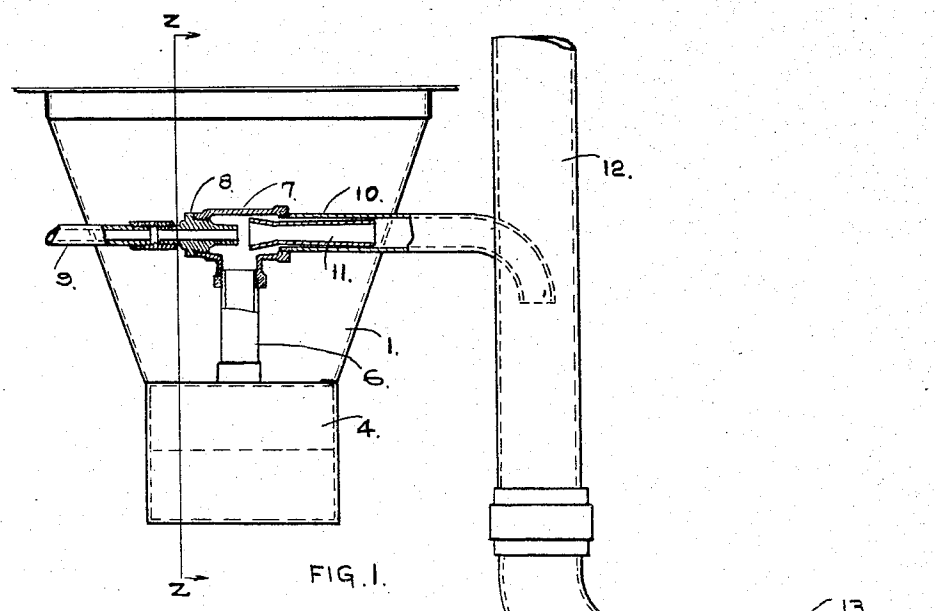
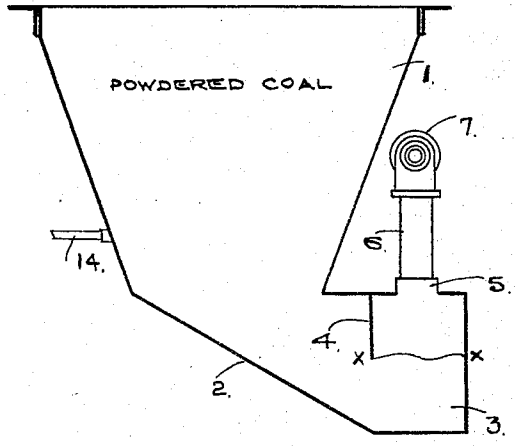


FIG. 1.



SECTION Z Z

FIG. 2.

WITNESSES

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APPARATUS FOR FEEDING PULVERIZED FUEL.

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To all whom it may concern:

Be it known that I, GEORGE W. SHORT, a citizen of the United States, residing at Sharon, in the county of Mercer and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Feeding Pulverized Fuel, of which the following is a specification.

This invention relates to apparatus for feeding pulverized fuel to furnaces, etc.

One of the purposes of the invention is the provision of means whereby a fuel feed of sufficient volume and at the same time, absolute uniformity is obtained.

As is well known in the art, before pulverized fuel, particularly coal, is burned, the coal is dropped or otherwise injected into a blast pipe and the mixture of air and coal then blown into the furnace. When such fuel is used for open hearth furnaces, it is absolutely essential to the most perfect operation of the furnace that the proportion of coal to air be uniform and constant for each heat. Various mechanical means have been resorted to in an effort to accomplish this result; the most common being the employment of a conveyer screw for feeding the coal into the blast pipe. In the passage of the coal along the conveyer pipe to the point of discharge therefrom there is a continual rising and slipping of the coal on the screw which results in a constant fluctuation of discharge into the blast pipe. On the other hand, the prior attempts of employing air to feed the fuel into the blast pipe have met with no greater success. Where direct suction has been used it was found that the variation in the lift has given as unsatisfactory results as under the mechanical process. In obtaining a uniform lift resort has been had to an air chamber in which the coal coming from a fixed point is fluffed and carried to the blast pipe by air. Under this method sufficient volume is unobtainable in that impact instead of either suction or pressure alone is relied on.

In obtaining the desired result, I have provided means whereby the fuel is constantly maintained at a fixed level by gravity. From this point the fuel is drawn a fixed distance by a strong suction and then blown under high pressure into the blast pipe.

A still further end which I obtain by my apparatus, is the ability to feed a more finely pulverized coal than can be successfully used, under the present processes. By eliminating atmospheric influences and relying entirely on direct and confined impelling means, I am able to use coal running 95 per cent. 100 mesh and 75 to 85 per cent. 200 mesh.

Another purpose of the invention is the employment of means, for accomplishing the foregoing results, which are simple in construction and operation and require a minimum of attention and expense in its operation.

Other objects and purposes of the present invention will appear from an inspection of the drawing, the description thereof and the claims appended thereto, in which are particularly set forth the combination of elements, arrangement of parts and specific structural details properly comprised within the scope of the same.

Referring now to the drawing in which is shown a preferred embodiment of my invention, Figure I, is a front elevation of my apparatus showing the hopper, feed chamber, vacuum arrangement thereon and connections leading into the blast pipe. Fig. II, is a side elevation on line Z—Z of Fig. I.

In the drawing in which like reference characters designate like parts, (1) is a hopper, which, in operation, is maintained well filled with pulverized fuel—for the present explanation, coal. Extending forwardly from the bottom of the rear side of this hopper is the bottom plate (2) which is inclined at an angle of approximately 45 degrees. The plate (2) leads into a feed chamber (3). This chamber, which is equal in width to the bottom of the hopper, has its bottom, front and two sides inclosed. The rear wall (4) of the chamber extends down half way from the top, so that it acts as a check or baffle to the coal flowing into the chamber from the hopper.

The top of the chamber is provided with a circular aperture (5). Extending upwardly from this aperture is a pipe (6), which at its upper end enters the central under portion of the vacuum chamber (7). Entering the rear end of the vacuum chamber is an inlet nozzle (8). Air enters the

nozzle (8) from the air pipe (9). A pipe (10), of approximately the same diameter as the pipe (6), extends from the forward end of the chamber (7) into a blast pipe (12). Leading from the inner central portion of the chamber (7) into the pipe (10) is a concentrating nozzle (11). The latter has its ends increasing in diameter from a contracted portion between such ends; each end being of a greater internal diameter than that of the inlet nozzle (8), from which it is separated by an intervening space, though alined and concentric therewith.

The blast pipe terminates in a burner nozzle (13) through which the coal and air is blown into the furnace.

My apparatus operates as follows: The hopper is kept well filled with pulverized coal. An air pressure of from five (5) to twenty-five (25) pounds is supplied to the pipe 9, while the air pressure in the blast pipe is about 12 oz. The coal slides from the hopper down the plate 2, into the feed chamber 3. The baffle 4 checks the coal and maintains a normal level at approximately the line X—X as shown in Fig. II. The high pressure air passing from the nozzle 8 into 11 creates a vacuum in the surrounding portion of chamber 7, and the comminuted coal is sucked up to take the place of the exhausted air. It will be readily understood that as fast as coal is drawn from the level X—X, the coal in the hopper, impelled by gravity, slides into the feed chamber to maintain the level. The coal now drawn up the pipe 6 into the chamber 7 is driven into the concentrating nozzle 11, and thence through the pipe 10 into the blast pipe 12, where the fuel is mixed with the proper quantity of air and blown into the furnace.

From the foregoing, it will be seen that the coal is first gravity fed, then lifted by vacuum and finally air driven into the furnace. At the same time a constant force acts for a fixed distance in each of the several steps.

I have found that when the furnace is shut down for some time, the pulverized coal in the hopper and feed chamber tends to cake. I have overcome any difficulty in starting the flow by providing the air inlet (14) in the rear of the hopper just above the bottom plate. By admitting a light air pressure, the caking is immediately broken up and the flow started, after which the air is shut off at this point.

I claim,

1. An apparatus of the class described comprising in combination, a supply hopper, a feed chamber, means connecting said supply hopper and said feed chamber to enable material in said supply hopper to feed by gravity into said feed chamber, a baffle plate for controlling the flow of said material to maintain a predetermined level of material in said feed chamber, an ejector nozzle above said feed chamber, a pipe connecting said ejector nozzle with said feed chamber, a blast pipe leading to a burner, and a supply pipe from said ejector to said blast pipe.

2. In an apparatus of the class described in combination, a supply hopper, a feed chamber, an inclined floor leading from said supply hopper to said feed chamber to permit material in said supply hopper to be fed by gravity to said feed chamber, a baffle plate adjacent said feed chamber to control the height of material in said feed chamber, an ejector nozzle above and operatively connected to said feed chamber to draw material vertically from said feed chamber, a high pressure pipe leading to said ejector nozzle, a delivery pipe leading from said ejector nozzle, and a blast pipe adapted to convey air under low pressure to a burner, said delivery pipe terminating within said blast pipe.

3. An apparatus for feeding pulverized fuel to a furnace comprising in combination a fuel supply hopper provided with an inclined floor, a feed chamber adjacent the lower end of said inclined floor, means to regulate the height of material within said feed chamber, a high pressure ejector above said feed chamber, a vertical pipe leading from the upper portion of said feed chamber to said ejector, a burner nozzle, and means for conducting material from said ejector to the burner nozzle.

4. In an apparatus for feeding pulverized fuel to a furnace, the combination of a supply hopper, a feed chamber below said supply hopper, means to conduct material from said supply hopper to said feed chamber, means to maintain a predetermined level of material within said feed chamber, a high pressure ejector nozzle above said feed chamber, a burner nozzle, and connections for delivering material from said ejector to said burner nozzle.

5. In a device of the character described in combination, a supply hopper, a feed chamber, means for conducting material by gravity from said supply hopper to said feed chamber, means for maintaining said material within said supply hopper at a predetermined height, devices for lifting said material from said feed chamber by means of ascending currents of air at a pressure less than atmospheric pressure, said last mentioned means including an ejector having provision for a high pressure air current, a burner nozzle, and a conduit leading from said ejector to said burner nozzle.

6. In an apparatus for feeding pulverized fuel to a blast furnace, the combination of a supply hopper, a feed chamber, means for maintaining material in said feed chamber

at a predetermined level, an ejector mounted above said feed chamber, a low pressure pipe from said ejector being operatively connected with the upper portion of said feed chamber, a burner nozzle, a blast pipe leading to said burner nozzle, and a delivery pipe leading from said ejector nozzle to substantially the middle of said blast pipe and having its end directed toward said burner nozzle.

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

GEORGE W. SHORT.

Witnesses:

KATHERINE BURKE,

EUGENE E. ANDERSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."