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APPARATUS FOR FEEDING PULVERIZED FUEL

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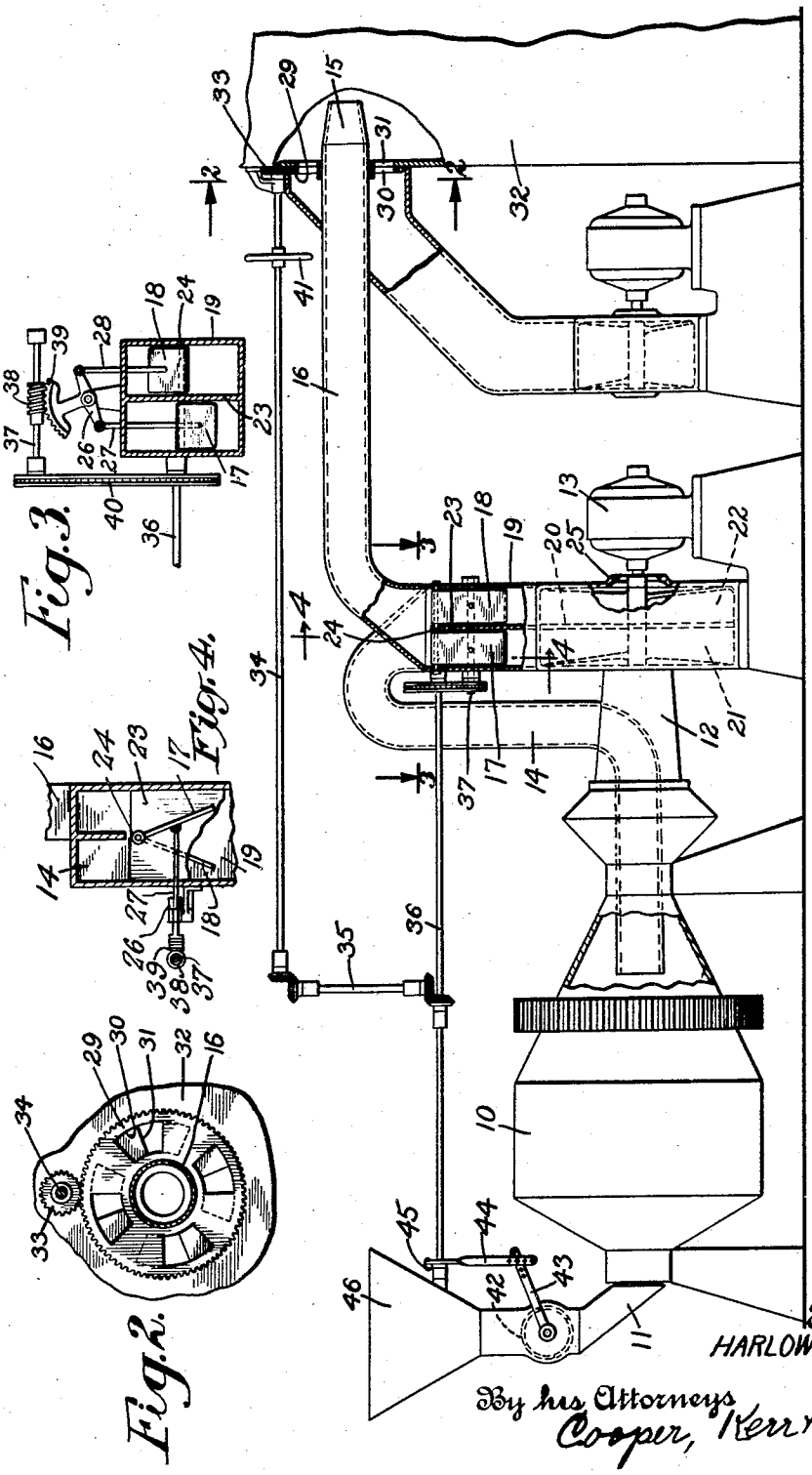


Fig. 1.

Fig. 3.

Fig. 4.

Fig. 2.

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APPARATUS FOR FEEDING PULVERIZED FUEL

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This invention relates to systems for feeding pulverized fuel.

An object of the invention is to provide means for permitting regulation of the operation of a pulverized fuel feeding system whereby the quantity of fuel and of air handled by the system may be controlled in such a manner as to maintain desirable operating conditions, under different load conditions.

A further object involves the idea of coordinating by conjoint and concomitant control the proportions of pulverized fuel and of fuel carrying fluid passing to the furnace, the quantity of air necessary to support combustion, and the quantity of raw fuel, such as coal, entering the system.

Other objects may be gleaned from a detailed description of a system embodying the principles of my invention.

Fig. 1 is a general elevation of a fuel feeding system.

Fig. 2 is a section on line 2—2 of Fig. 1 with parts removed.

Fig. 3 is a detail section on line 3—3 of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 1.

In the drawing, 10 designates a pulverizer which is representative of any kind of a disintegrating mill which one would desire to use for the purpose of pulverizing coal or other fuel. The type of mill illustrated is of the well-known conical type and reference may be had to U. S. Patent No. 1,506,120 for a more detailed description.

It is a usual practice to conduct fuel to the mill by a chute 11 and, in the conical type of pulverizer, the balls or pebbles (not shown) within the pulverizer reduce the fuel to the fineness desired. Fuel is withdrawn from the pulverizer through conduit 12 by means of fluid currents which pick up the fine particles of fuel within the disintegrating mill. The fluid currents are created by fan blades of an exhauster-motor unit 13 and this unit causes an elastic fluid to be delivered to the pulverizer 10 through conduit 14.

The fuel-laden fluid leaving the pulverizer through conduit 12 is diverted, in part, to the pulverizer through conduit 14 and, in part, to the burner 15 through conduit 16. The portions of the fuel-laden fluid returned to the pulverizer and directed to the burners is controlled by means of a pair of dampers 17, 18 disposed in an open ended box 19 at the discharge side of the exhauster-motor unit 13. The exhauster of this unit is illustrated as having a single housing but the blades are divided into two sections by a disk 20 which creates two chambers 21 and 22 in the exhauster housing. The open ended box 19 at the discharge side of the exhauster housing is also divided into two chambers by means of a wall 23.

Conduit 14 which returns fuel-laden fluid to the pulverizer is connected to the open ended box 19 at its rear side and conduit 16 which conducts fuel-laden fluid to the burners is connected to the open ended box at the front side of the box. Dampers 17 and 18 are pivoted on a rod 24 at the juncture of conduits 14 and 16.

In order to maintain constant operating conditions, it is apparent that the amount of elastic fluid delivered to the pulverizer must be constant and it therefore becomes necessary to introduce into conduit 14 an amount of fuel-free fluid equal to the amount of fuel-laden fluid which has been diverted to the burners through conduit 16. Chamber 22 of the exhauster is the fuel-free fluid chamber through which air, or flue gases or the like are drawn. The fuel-free air taken in through inlet 25 is distributed between conduits 14 and 16, in proportions depending upon the position of damper 18. It is apparent that for ordinary conditions the positions of dampers 17 and 18 are complementary to each other so that a constant quantity of fluid carrying medium will always pass through the pulverizer.

Damper 17 on the fuel-laden fluid side of wall 23 controls the distribution of fuel-laden fluid as between conduits 14 and 16, and damper 18 on the fuel-free fluid side of wall 23 controls the distribution of fuel-free fluid as between conduits 14, 16. For example, when both dampers are in a medial plane, the respective fluids are divided

equally. Equal portions of the fluids are then delivered to the respective conduits and the fluids are commingled. For obtaining a maximum delivery of fuel to the burner, damper 17 will be in a most rearward position, as viewed from above, and damper 18 will be in a most forward position. With this setting of the dampers, all the fuel-laden fluid will be diverted into conduit 16 and all of the fuel-free fluid will be diverted into conduit 14.

When the burners are not functioning, damper 17 will be in a most forward position, as viewed from above, and damper 18 will be in a most rearward position. In order to make the positions of dampers 17 and 18 complementary to each other, a lever 26 and rods 27, 28 having connections with the lever and with damper 17, 18, respectively, are provided, Fig. 3.

It is apparent that when dampers 17 and 18 are so positioned as to cause a large quantity of pulverized fuel to be carried to the burners through conduit 16 it is necessary that the quantity of air necessary to support combustion at the burners be greater than when a lesser quantity of fuel is being fed to the burners, and vice versa. In order to regulate the quantity of air required for combustion purposes in accordance with the quantity of fuel to be consumed, I provide means which will control through conjoint operation the quantity of air required for combustion purposes in accordance with the positions of dampers 17 and 18. In the present embodiment of my invention I control the quantity of air by providing a valve in the form of a large gear-wheel 29 having openings 30 therein adapted to be brought in registry with holes 31 in the wall of the furnace 32, Fig. 2. Any type of valve desired may be utilized and gear-wheel 29 may be conveniently mounted upon conduit 16.

Gear-wheel 29 is rotatable through the agency of a pinion 33, fast to shaft 34. Shaft 34 is geared to shaft 35 which is, in turn, geared to shaft 36. Shaft 37, Fig. 3, is provided with a worm 38 for actuating a worm-gear sector 39 carried by lever 26. Control shaft 37 may be operated from shaft 36 through the medium of a chain and gear mechanism 40. The shafting and gearing just described is intended to be operable from any convenient location and a hand wheel 41 is provided for that purpose. With this shafting and gearing arrangement it is apparent that any change in the position of dampers 17 and 18 will also bring about, concurrently, a change in the size of uncovered area of openings 31 at the furnace.

In order to complete my automatic control of the unitary pulverizing and fuel feeding system, I regulate the amount of coal delivered to the pulverizer. For example, when fuel is being consumed at the burner 15 it is necessary to replenish the fuel which is being withdrawn from the pulverizer. To accomplish this end, I connect the oscillatory lock-valve 42 by means of an arm 43, link 44 and arm 45, to the counter-shaft 36. Lock-valve 42 is of the usual type utilized for controlling the feed of material from a hopper to a pulverizer.

When hand-wheel 41 is operated for causing damper 17 to divert a greater amount of fuel into conduit 16, gear-wheel 29 will be rotated to uncover a greater portion of the openings 31 and lock valve 42 will be rocked to permit a greater quantity of fuel to descend from hopper 46 into chute 11 and into pulverizing mill 10. Likewise, when the amount of fuel-laden fluid diverted into conduit 16 is reduced, the area of the uncovered portions of the openings 31 at the furnace will be reduced and the lock valve 42 will permit a lesser quantity of coal to enter the pulverizing mill 10. It is therefore apparent that the mechanism just described is such as to coordinate by conjoint and concomitant control the proportions of pulverized fuel passing to the furnace, the quantity of air necessary to support combustion, and the quantity of raw fuel such as coal, entering the system.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim:

1. A system of the class described comprising, in combination, a pulverizer, a furnace, means for withdrawing fuel from said pulverizer and feeding the fuel so withdrawn to said furnace, means for supplying raw fuel to said pulverizer, and interdependent means for concomitantly varying the quantity of raw fuel supplied to said pulverizer and the quantity of fuel fed to said furnace.

2. A system of the class described comprising, in combination, a pulverizer, means for supplying raw fuel to said pulverizer, a furnace, means for withdrawing a variable quantity of pulverized fuel from said pulverizer and feeding the fuel so withdrawn to said furnace, and interdependent means for concomitantly regulating the quantity of raw fuel supplied to said pulverizer and the quantity of fuel fed to said furnace.

3. A system of the class described comprising, in combination, a pulverizer, a furnace, means for withdrawing fuel from said pulverizer and feeding the fuel so withdrawn to said furnace, means for supplying

raw fuel to said pulverizer, means for supplying an auxiliary quantity of air to said furnace for combustion purposes, and manually controlled means for varying the quantities of fuel and auxiliary air supplied to said furnace and raw fuel supplied to said pulverizer interdependently and in definite relation to one another.

4. A system of the class described comprising, in combination, a pulverizer, a furnace, means for supplying by flotation to said furnace fuel withdrawn from said pulverizer, means for regulating the quantity of raw fuel introduced into said pulverizer, means for supplying air to said furnace for combustion purposes, and means for varying the quantity of air supplied to said furnace and the quantity of raw fuel supplied to said pulverizer concomitantly with a variation in the quantity of fuel supplied to said furnace.

5. A system of the class described comprising, in combination, a furnace, a pulverizer having an air swept pulverizing chamber, means for withdrawing air and pulverized fuel from said pulverizer and feeding the air and pulverized fuel so withdrawn to said furnace, means for supplying raw fuel to said pulverizer, means controlling the quantity of pulverized fuel withdrawn from said pulverizer and fed to said furnace, and means associating said last two named means for concomitant operation of both.

6. In a system of the class described the combination with a furnace, of a pulverizer, means for feeding fuel to said pulverizer, means for withdrawing pulverized fuel from said pulverizer and feeding the pulverized fuel so withdrawn to said furnace, and interdependent means for concomitantly varying the quantity of fuel fed to said pulverizer and the quantity of pulverized fuel withdrawn from said pulverizer, said last named means including an adjustable device whereby said last named means may be adjusted to effect a different relation between the rate of feed of fuel to the pulverizer and the rate of withdrawal of pulverized fuel from the pulverizer.

7. In a system of the class described, the combination with a furnace, of a pulverizer, means for withdrawing pulverizer fuel from said pulverizer by fluid flotation and propulsion and feeding the pulverized fuel so withdrawn to said furnace, said means including a conduit leading from said pulverizer to said furnace and a conduit branching from said conduit and returning to the pulverizer, valve means controlling the flow of elastic fluid through both of said conduits and the removal of pulverized fuel from said pulverizer, means controlling the supply of fuel to said pulverizer, and means associated with said valve means and said fuel supply controlling means for causing variation in the supply of material to the pulverizer upon a variation of the operating condition of said valve means.

In testimony whereof I hereto affix my signature.

HARLOWE HARDINGE.