May 16, 1939. H. C. CARTER ET AL 2,158,673

OVERFEED STOKER

Filed May 6, 1935 2 Sheets-Sheet 1

FIG. 1.

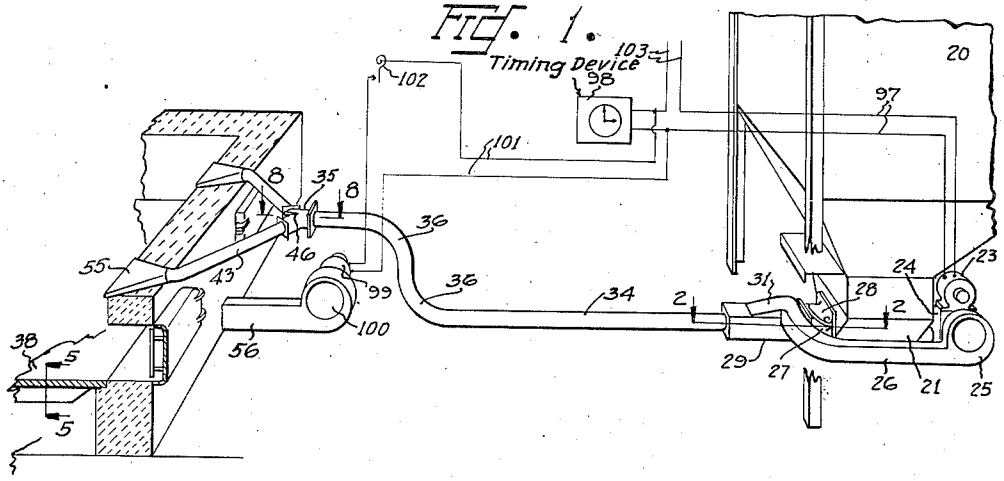


FIG. 2.

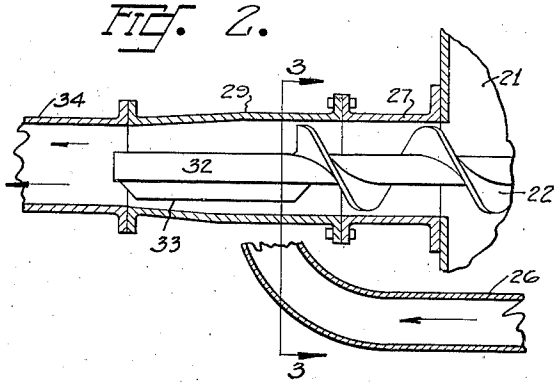


FIG. 3.

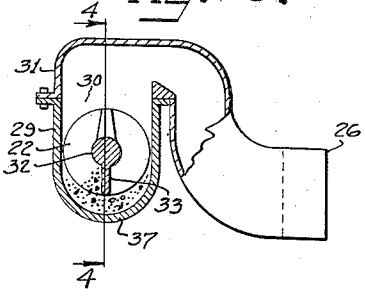


FIG. 4.

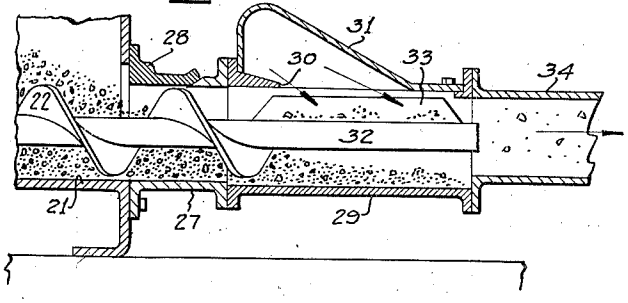
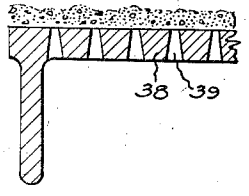


FIG. 5.



INVENTORS
H. C. CARTER
T. A. MARSH
BY
ATTORNEY

May 16, 1939. H. C. CARTER ET AL 2,158,673

OVERFEED STOKER

Filed May 6, 1935 2 Sheets-Sheet 2

Fig. 6.

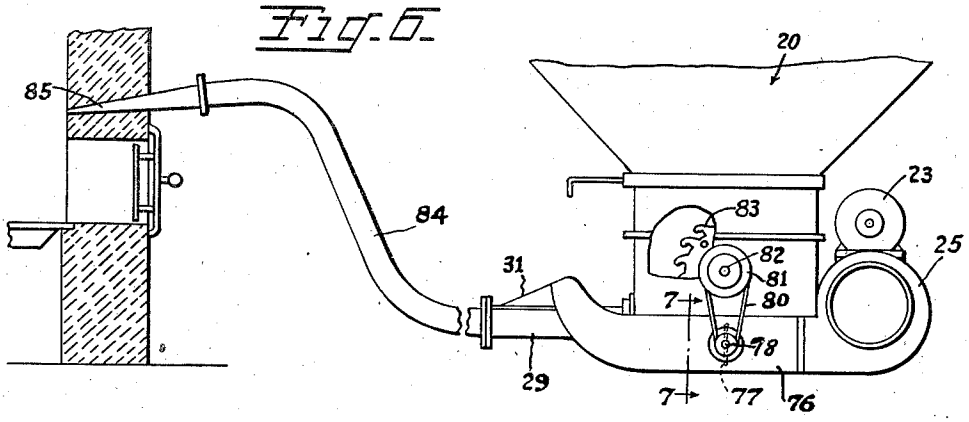


Fig. 10.

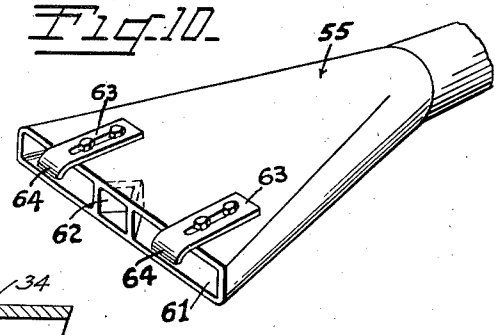


Fig. 8.

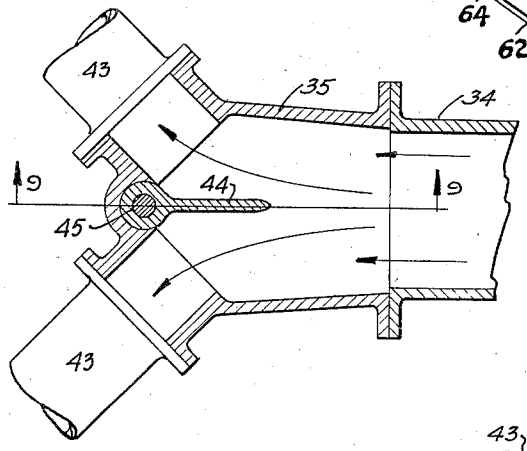
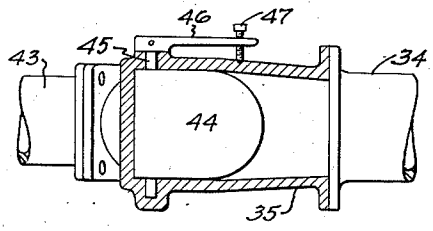


Fig. 9.



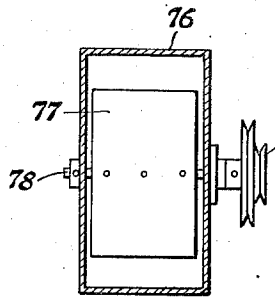


Fig. 7.

INVENTORS
H.C. CARTER
T.A. MARSH
BY
ATTORNEY

Patented May 16, 1939 2,158,673

UNITED STATES PATENT OFFICE

2,158,673

OVERFEED STOKER

Haskell C. Carter, Portland, Oreg., and Thomas A. Marsh, Chicago, Ill., assignors to Iron Fireman Manufacturing Company, Portland, Oreg.

Application May 6, 1935, Serial No. 20,088

2 Claims. (Cl. 110—104)

This invention relates generally to overfeed stokers and particularly to a stoker employing air for the purpose of conveying coal to the furnace.

The main object of this invention is the provision of an exceedingly simple and efficient means for feeding coal into a furnace above the grates by what is commonly known as overfeeding.

The second object is to construct a stoker wherein the coal supply may be placed at a distance from the furnace, and the number of mechanical parts involved is reduced to a minimum.

The third object is to provide a stoking device whereby coal of varying proportions of sizes and moisture content may be successfully delivered from a remote source of supply to a furnace by high velocity air, the speed of travel of the fuel being appropriately reduced by changes of direction or elevation along the fuel line.

The fourth object is to construct a stoker in which complete and desirable distribution of fuel may be obtained over the entire grate surface.

The fifth object is the construction of a stoker of the class described in which working parts are not subjected to the direct heat of the furnace.

The sixth object is to construct a stoker having one or more nozzles, making it adaptable to various widths and lengths of grates and different types of furnaces, and in each instance giving a desired spread of fuel on the grates.

The seventh object is the provision of a stoker of the class described wherein the fines are burned in suspension and the lumps and intermediate sizes are projected uniformly over the grate area.

The eighth object is to construct a stoker which employs a mechanism for controllably feeding a positive supply of coal into a conveying air stream, and delivering coal to the air stream with a worm or other form of feeding mechanism in a manner to insure against packing or clogging of the fuel.

The ninth object is to provide a special form of nozzle for deflecting the fuel and distributing it over the grate area.

The tenth object is the utilization of a variable velocity of the air stream to cause the coal to be spread forwardly and backwardly along the grates.

The eleventh object is to utilize a special form of protection against foreign substances, such as tramp metal, wood, stones, etc., which will prevent these substances from clogging the fuel delivery pipe, or injuring the feeding apparatus itself.

The twelfth object is the construction of a form of overfeed stoker which will render unnecessary the remodeling of the boiler front, the stoker being easily adaptable to any of the existing types of installation.

The thirteenth object is to provide an improved form of holdover mechanism whereby a fire may be maintained on the grates during shut down periods in spite of the relatively small depth of fire bed normally carried.

The fourteenth object is the construction of an improved form of transfer box whereby coal may be delivered from a hopper or bin by a feeding mechanism to an air line.

The fifteenth object is to provide fittings which are readily accessible at points most subject to clogging.

We accomplish these and other objects in the manner set forth in the following specification as illustrated in the accompanying drawings, in which:

Fig. 1 is a partially diagrammatic perspective view showing a representative form of the device with a boiler setting broken away in section.

Fig. 2 is a section taken along the line 2—2 in Fig. 1.

Fig. 3 is a section taken along the line 3—3 in Fig. 2.

Fig. 4 is a section taken along the line 4—4 in Fig. 3.

Fig. 5 is a section taken along the line 5—5 in Fig. 1, showing a representative form of grate employed for this device.

Fig. 6 is a side elevation with part broken away showing a modified form of the device including a means for causing a surging in the conveying air supply.

Fig. 7 is a section taken along the line 7—7 in Fig. 6.

Fig. 8 is a section taken along the line 8—8 in Fig. 1.

Fig. 9 is a section taken along the line 9—9 in Fig. 8.

Fig. 10 is a perspective view of one form of nozzle employed in this device.

Similar numbers of reference refer to similar parts thoughout the several views.

Referring in detail to the drawings, there is shown in Fig. 1 a bin 20 in which fuel is stored. Below the bin 20 is disposed a worm housing 21 in which is placed a fuel feed worm 22, which is driven by a motor 23 through a transmission contained within the gear box 24. The motor 23

also drives a fan contained within the casing 25 to which is connected an air discharge duct 26.

At the outlet end of the housing 21 is placed a flanged clean-out section 27 having a removable cover 28. Connected to the section 27 is a flanged transfer box 29 having an opening 30 in the top thereof, which communicates with the duct 26 through the downturned end 31 of the duct 26.

The worm 22 has a shaft extending through the transfer box 29, and it has formed along that portion of its length which occupies the transfer box 29, a radial vane 33.

The purpose of this construction is to permit the worm 22 to move coal from the housing 21 into the transfer box 29, and the vane 33 in swinging about the axis of the worm shaft 32, carries coal around with it to the top side of the shaft 32, this coal being blown out by air from the duct end 31 into the coal delivery tube 34, which may go directly into the branch fitting 35, or the tube 34 may contain numerous bends 36 if necessary for the convenient installation of the stoker.

The lower side 37 of the transfer box 29 is spaced from the under side of the worm 22 for the purpose of affording greater protection against foreign substances.

In Fig. 5 is illustrated a common form of pinhole grate 38, whose openings 39 may be tapering, or they may assume any of the desired forms without departing from the spirit of this invention.

In Fig. 8 is shown an enlarged view of the branch fitting 35, which connects the coal tube 34 with the branch pipes 43. The proportion of fuel delivered to each of the pipes 43 is determined by means of an adjustable vane 44 which is pivotally mounted on the trunnions 45, on one of which is attached an operating arm 46, which may be secured in any desired position by means of the set screw 47.

It will be understood that the air that is admitted with the fuel for the purpose of conveying same is referred to as primary or conveying air, and that air which is admitted to the under side of the grates 38 through the duct 56 is referred to as secondary air.

In Fig. 10 is shown a nozzle 55 having a somewhat rectangular outlet 61, which has disposed at an intermediate point, a divider or spreader 62 for the fuel stream. This may be fixed or adjustable as appears desirable for a given condition.

Adjustable deflector bars 63 are also provided on the flat sides of the nozzles 55, and the ends 64 of the deflectors 63 is turned in front of the outlet 61.

Obviously, any number of deflectors 63 may be employed, and their individual or joint width may be varied without departing from the spirit of this invention.

In the form of the device shown in Fig. 6, the air discharge duct 76 is provided with a revolvable damper 77, which can only partially close the duct 76.

On the shaft 78 of the damper 77 is secured a pulley 79 which is connected by means of a belt 80 to a pulley 81 on the shaft 82 of a toothed agitator wheel 83, which meshes with the fuel feed worm 22, the purpose of which is to utilize the movement of the slowly rotating worm 22 and the consequent rotation of the toothed agitator wheel 83 to revolve the damper 77, and produce a surging action of the air flowing through the pipe 84; and thereby vary the distribution of fuel ejected from the nozzle 85.

Referring again to Fig. 1, it will be seen that the motor 23, which operates the coal delivery, is connected by means of a circuit 97 to a time interval contactor 98, the details of which are not illustrated or described herein as devices of this class are in common use on the market, the same merely operating to close the circuit 97 at fixed intervals of time. The motor 99, which operates the fan 100 for supplying secondary air to the under side of the grates 38, is connected by means of the circuit 101 including the thermostat 102 or equivalent device across the circuit 97 to shunt out the time interval contactor 98. The power is supplied to the circuit 97 from the power line 103.

In the form shown in Fig. 1, fuel from the bin 20 is delivered by the worm 22 to the transfer box 29 from whence it is blown by air from the duct 26 through the coal delivery tube 34 out of the nozzles 55.

It will be observed that the coal is horizontally fed into the transfer box 29, but that the air is admitted over the top thereof so that the uppermost portion of the coal is blown therefrom, and that moreover, the vane 33 serves to separate portions of the incoming coal and elevate it in a trough between the vane 33 and the shaft 32 thereby facilitating its discharge into the tube 34.

It will be noted that owing to the manner in which the fuel is conveyed by air, it is not necessary that the pipes 34 be in a perfectly straight line. In fact, it is desirable in many instances to provide curves in the pipe for the purpose of reducing the velocity of the coal passing therethrough.

By controlling the setting of the arm 46, lateral distribution can be regulated at will, and by adjusting the positions of the deflectors 63, uniform coverage may be obtained over the entire grate area. This distribution in many cases will be still further improved through the operation of the damper 77 shown in Fig. 6, thereby giving a continuous change in the delivery of the fuel, that is, in a forward and backward direction.

Since certain types of coal are best burned by the overfeed method and with a relatively thin fuel bed, it is imperative that the distribution be as uniform as possible, not only as far as the depth of fuel is concerned, but also with regard to the proportions of various sizes distributed over the grates; that is to say, it would be objectionable to have an excess of coarse pieces in one portion of the grate and fines in another portion. This condition is a common characteristic of overfeed stokers wherein mechanical devices such as paddle wheels are employed to discharge the fuel upon the grates, and one of the principal advantages arising from the use of the construction herein described is to obtain that ideal distribution with regard to the sizes of the pieces and the depth of the fuel bed.

As previously stated, because of the wide range of sizes findable in a given quantity of coal and the great number of different sizes of coal in use, as well as the variations in the moisture content thereof, it is clear that any one single arrangement or setting cannot possibly suit all probable conditions. In addition thereto is the ever present problem of a specific type of equipment, that is to say, other things being equal, the details of our device will be dependent largely upon the particular type of furnace with which it is employed.

The type of nozzle employed is equally dependent upon the requirements of the individual installation. This element will be treated only in a general way in this application.

One of the problems encountered in overfeed

firing and occasioned by the relatively shallow fuel bed is the inability to hold a fire over any considerable shutdown period unless suitable preparations are made. This is commonly done by means of a scoop shovel, the fireman merely piling coal on a portion of the grates to hold the fire; but our device, by use of a time interval contactor 98 supplies coal and primary or conveying air alone to the combustion chamber at timed intervals while there are no calls for heat; but when there is a call for heat, for example, as indicated by the thermostat 102, then the stoker not only feeds coal and primary air, due to the operation of the motor 23, but also secondary air, due to the operation of the motor 99. That is, when heat is not required, only enough coal and air are furnished to maintain the fire in readiness for any call for heat from the thermostat 102 or equivalent device.

It will also be noted that owing to the means which we employ to convey fuel into the furnace, no special furnace front is required, and only a very limited amount of alteration is needed to install this equipment in any furnace.

We claim:

1. In a stoker, fuel feeding means, a motor for driving said means, a blower, a second motor for driving said blower, a thermal switch, a power circuit including in series, said switch and both motors, and time controlled means shunting the blower motor and the switch to complete at timed intervals a shorter power circuit including the fuel feeding motor, whereby whenever the thermal switch is closed both motors operate but when the thermal switch is open, the time controlled means closes the shorter circuit and the fuel feeding motor operates alone.

2. In an overfeed stoker having a grate, means for discharging fuel and air above the grate, a motor for driving said means, a blower for discharging air beneath the grate, a motor for driving the blower, a circuit including a heat responsive switch for energizing both motors, and time controlled means shunting the thermal switch and the blower motor for causing the fuel feed motor to operate at regular intervals of time for chosen periods to keep the fire alive in absence of calls for heat, whereby combustion air will be delivered below the grate in response to a call for heat but will not be delivered upon a timed feeding to keep the fire alive.

HASKELL C. CARTER.
THOMAS A. MARSH.