

Feb. 4, 1936.

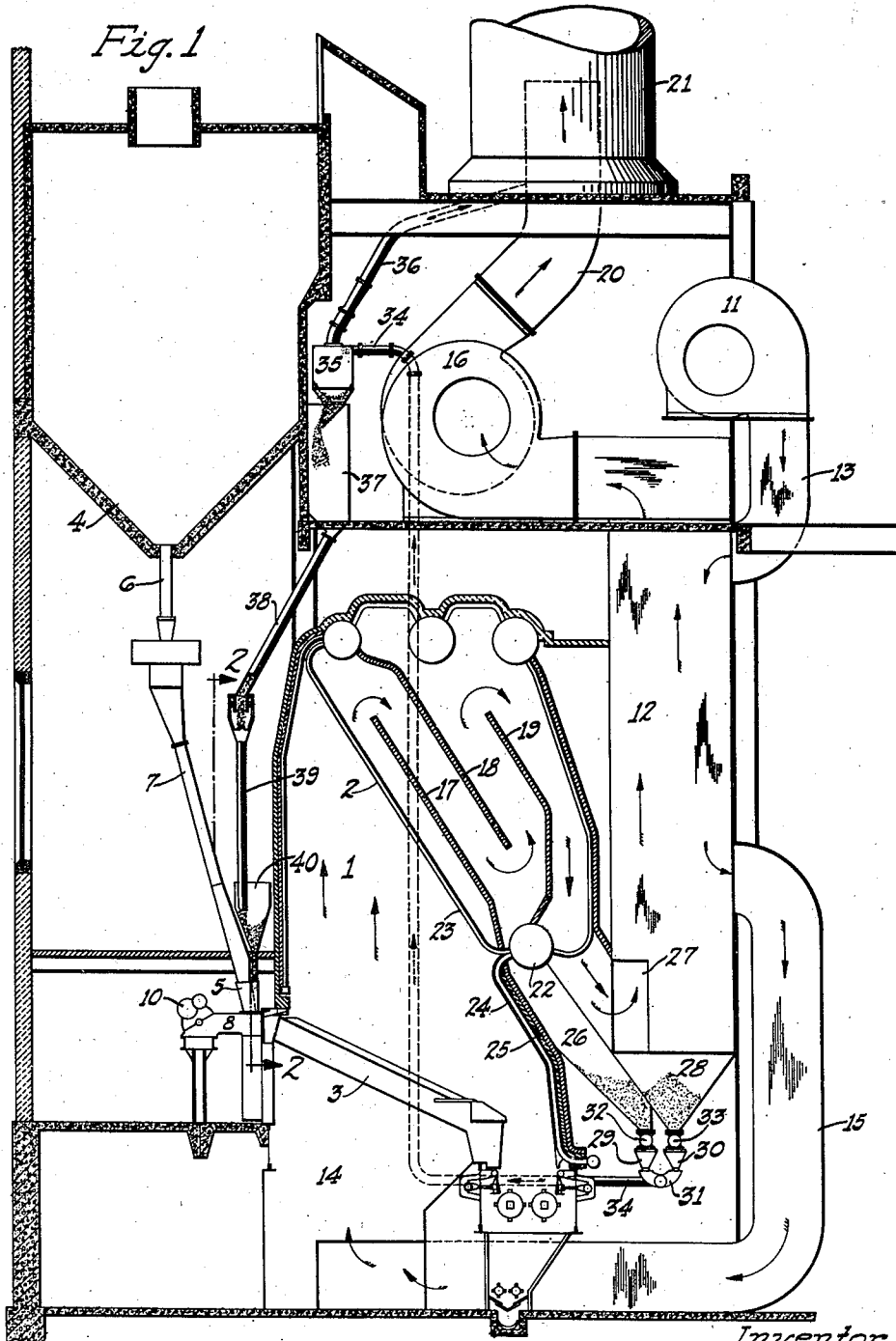
J. S. BENNETT

2,029,285

FURNACE

Filed Nov. 3, 1932

2 Sheets-Sheet 1



Inventor
Joseph S. Bennett
By *Carl A. Sibbe*
Attorney

Feb. 4, 1936.

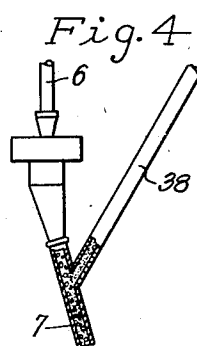
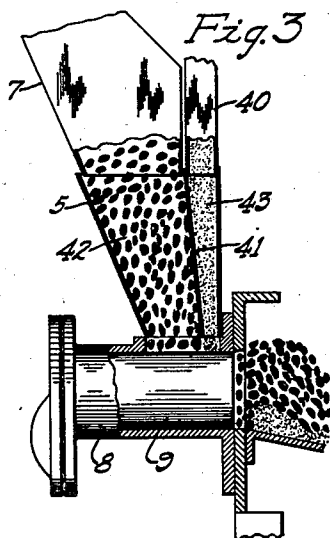
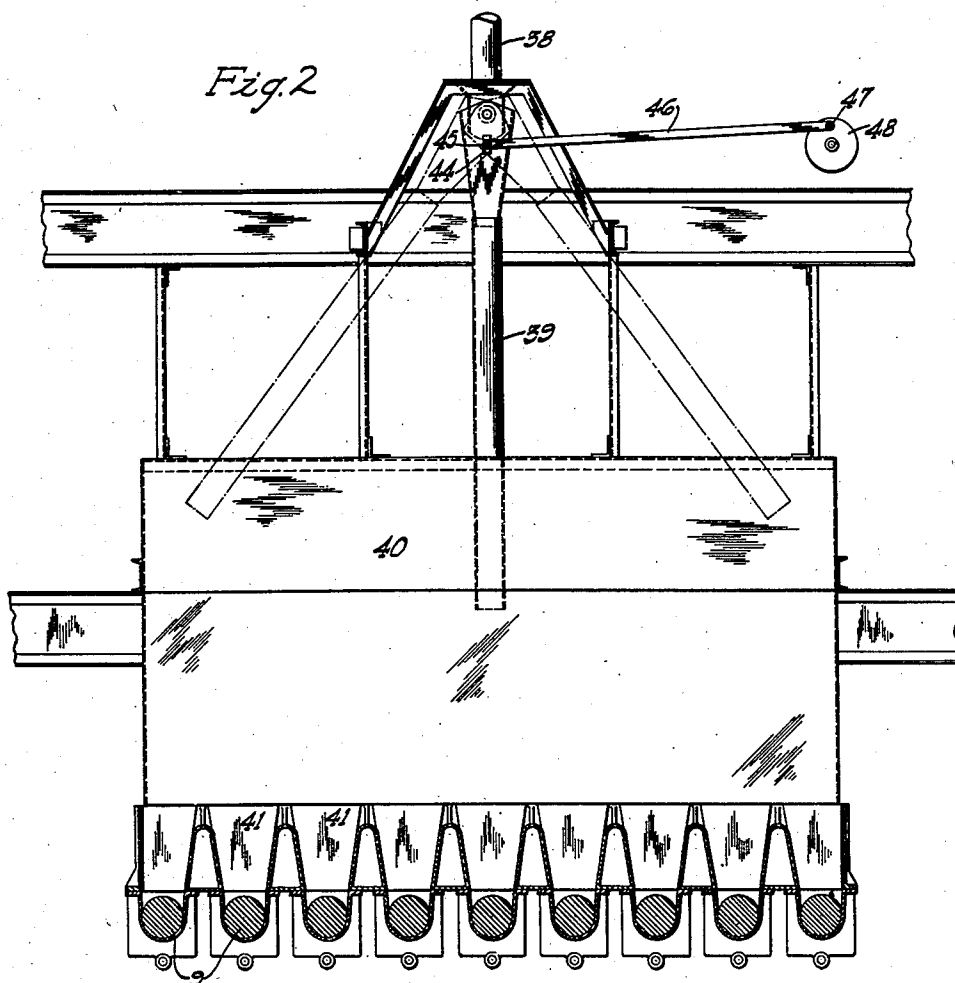
J. S. BENNETT

2,029,285

FURNACE

Filed Nov. 3, 1932

2 Sheets-Sheet 2



Inventor
Joseph S. Bennett
By Carl A. Sibbe
Attorney

UNITED STATES PATENT OFFICE

2,029,285

FURNACE

Joseph S. Bennett, Merion, Pa., assignor to
American Engineering Company, Philadelphia,
Pa., a corporation of Pennsylvania

Application November 3, 1932, Serial No. 640,959

7 Claims. (Cl. 110—165)

This invention relates to furnaces, and more particularly to devices associated therewith for collecting the cinders and fly ash blown from the fuel bed and conveying them to hoppers where they may be fed to the furnace and burned with other fuel.

During operation of the furnace a considerable quantity of partially consumed fuel is blown from the fuel bed by the draft air. The fuel so removed from the furnace is usually in the form of cinders which contain a high percentage of carbon. The quantity of fuel removed from the furnace in this manner varies directly with the load and it has been found by experiment that under full load conditions as much as fifteen percent of the entire quantity of fuel fed to the furnace may be lost. This loss of fuel obviously increases the cost of operation considerably as well as reduces the overall efficiency of the unit. The emission of cinders and fly ash from the stacks of power plants is also objectionable to inhabitants in the neighborhood of such plants.

The principal object of the present invention is to provide means whereby the cinders blown from the furnace by the draft air may be collected and conveyed to the fuel hoppers from which they are fed to the stoker and burned with other fuel, thus reducing the cost of operation of the furnace as well as increasing the overall efficiency of the unit.

Another object of the present invention is to provide means for distributing evenly in the fuel hopper the cinders so gathered.

A further object is to collect the cinders and fly ash blown from the furnace before reaching the stack, thus eliminating to a certain extent the objectionable foreign matter emitted from the stacks of power plants.

Other and further objects will become apparent as the description of the invention progresses.

Of the drawings:

Fig. 1 is a sectional elevational view taken through the furnace showing the arrangement of the various elements contained therein including the cinder and fly ash collecting and conveying means comprising the present invention.

Fig. 2 is a view taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a view partly in section showing the construction of one of the fuel hoppers of the stoker and the fuel feeding means associated therewith.

Fig. 4 is a fragmentary view of an alternative

construction showing the cinder spout connected directly to the coal spout.

Referring to the drawings, the numeral 1 designates generally a boiler furnace which comprises a boiler 2, fired by a multiple retort underfeed stoker 3. Fuel from the coal bunker 4 gravitates to the hoppers 5 of the stoker 3 through the usual spouts 6 and 7. The hoppers 5 communicate with ram cylinders 8 of the stoker, and the rams 9 reciprocating therein feed predetermined quantities of fuel to the stoker at each reciprocation thereof. Any suitable power mechanism 10 may be employed for operating the rams 9. Draft air is supplied to the furnace by means of a fan 11, and the air drawn through fan 11 is conducted to a preheater 12 through a duct 13, and the heated air discharging from the preheater is conducted to the plenum chamber 14 beneath the stoker 3 through a duct 15. An induced draft fan 16 draws the gases from the furnace in the direction of the arrows around baffles 17, 18 and 19 of the boiler 2. These gases then pass through the preheater 12, fan 16, duct 20, and into the stack 21 of the plant. During the operation of the furnace a considerable quantity of unconsumed fuel is blown from the furnace by the force of the draft air and if no means were provided to collect this matter a considerable portion thereof would be carried out through the stack. A certain quantity of this material would also lodge in various of the passages and thus impair proper operation of the furnace and boiler unless removed at frequent intervals. In order to prevent the loss of fuel carried from the furnace in this manner, and to eliminate the gathering of such material in undesirable places, I have devised the following mechanism.

Referring to Fig. 1, it will be seen that the baffle 17 is spaced from the lower drum 22 of the boiler 2. A certain quantity of the cinders and fly ash may thus gravitate between the portion of the tubes 23 of the boiler 2, and the tubes 24 of the rear water wall 25 extending between baffle 17 and drum 22, and into a hopper 26. The remainder of the cinders and fly ash are carried by the gases to the preheater 12 and are trapped as the gases pass through a trap 27 provided at the lower end of said preheater. Trap 27 communicates with a second hopper 28 positioned adjacent to hopper 26. The lower ends of hoppers 26 and 28 communicate with spouts 29 and 30, respectively, which in turn communicate with a blower 31. Valves 32 and 33 are provided in spouts 29 and 30, respectively, so that the dis-

charge of cinders and fly ash from the hoppers 28 and 28 into the blower 31 may be controlled. The valves 32 and 33 may be of any suitable type, such, for example, as the star or screw feeder type of valves which permit the passage of cinders from the hoppers to the blower but prevent the passage of gases therethrough. A duct 34 leads from blower 31 to a trap 35 positioned some distance above the boiler 2. The air utilized in forcing the cinders and fly ash from the blower 31 to the trap 35 discharges through a duct 36 connecting said trap with the duct 20. Trap 35 communicates with a hopper 37 which in turn communicates with a downwardly extending spout 38. Spout 38 has pivotally attached to the lower end thereof a second spout 39 which communicates with a hopper 40 extending upwardly from and in communication with hopper 5 of stoker 3.

Referring to Fig. 3, a longitudinal partition 41 is provided in each fuel hopper 5, forming compartments 42 and 43 therein. Compartments 42 and 43 communicate with coal spout 7 and cinder hopper 40, respectively, and also with ram cylinder 8. By this construction, it is seen that as the ram 9 moves forwardly after a feeding operation, the opening at the bottom of compartment 43 is first uncovered causing the cinders to gravitate into the rearward end of cylinder 8, and as the ram continues its forward movement the coal from compartment 42 fills the remaining space of cylinder 8 evacuated by the ram. As the ram moves rearwardly the coal and cinders are fed to the stoker. During this feeding operation the coal and cinders are compressed and as they leave the cylinder 8 the coal is forced over the cinders as shown in Fig. 3. Thus the cinders are held down by the coal and will not be blown from the furnace by the draft air. Inasmuch as the cinders are light in weight, and thus could readily be carried from the fuel bed by the air, it is important that they be fed to the stoker in the manner shown herein and be covered by the heavier particles of coal.

In order to distribute the cinders evenly in the hoppers so that a uniform amount of cinders and coal will be fed to each of the retorts of the stoker the following mechanism is provided.

Referring to Fig. 2, it is seen that spout 39 has secured near the upper end thereof a bracket 44 having a laterally extending stud 45 secured thereto. One end of a link 46 is pivotally attached to stud 45, the other end being pivoted to a crank pin 47 provided on a disc 48. Upon rotation of disc 48 it is seen that spout 39 will oscillate between the positions shown in dotted lines in Fig. 2, thereby distributing the cinders evenly in the hopper 5. Any suitable means may be provided for rotating disc 48.

Other mechanisms obviously may also be employed to distribute the cinders in the hoppers 5. For example, the spout 38 may be extended and connected directly to the coal spout 7 as shown in Fig. 4. By this construction the coal and cinders would be mixed before entering the hoppers 5.

From the foregoing description, it is seen that a highly useful means has been provided, and that by its use in furnaces a considerable saving in fuel is effected and that the efficiency of the unit is greatly increased. It will also be observed that by mixing the cinders uniformly with the fuel fed to the stoker complete combustion thereof is assured.

For the purpose of illustration, I have shown my invention to be applied to a furnace employing a stoker and boiler of a particular type. It is

obvious, however, that other types of stokers and boilers may be employed without departing from the invention. Instead of employing a blower for conducting the cinders and fly ash from the hoppers positioned adjacent the boiler and preheater, other forms of conveyers, such, for example, as the bucket and belt types of conveyers may also be employed. Some of the elements of the mechanism shown herein may also be arranged in a different manner to better adapt it for use in other types of furnaces.

It therefore is to be understood that it is not intended to limit the invention to the one embodiment herein shown, since it may be embodied in other forms, all coming within the scope of claims which follow.

What is claimed is:

1. In a device of the class described, the combination with a fuel burning furnace, of a fuel hopper, a boiler provided in said furnace, baffles provided on said boiler forming passages through which the gases in said furnace are circulated, cinder and fly ash collecting means associated with said baffles, means for conducting the cinders and fly ash so collected to a hopper, an oscillatory spout associated with said hopper, and means for oscillating said spout to evenly distribute the cinders and fly ash so conducted in the fuel hopper.

2. In a device of the class described, the combination of a furnace, a boiler provided in said furnace, a preheater, hoppers provided adjacent said boiler and preheater into which the cinders and fly ash blown from the furnace are collected, a fuel hopper, means for conducting the cinders and fly ash from said hoppers first named to said fuel hopper, and oscillatory means for evenly distributing the cinders and fly ash so conducted in said fuel hopper.

3. In a furnace, the combination with a boiler of a stoker positioned beneath said boiler and having a fuel hopper, a series of baffles provided on said boiler for circulating the gases passing therethrough, a hopper disposed beneath certain of said baffles for receiving cinders and fly ash blown from said stoker, a passage formed by other of said baffles, a preheater communicating with said last mentioned passage, a trap provided in said preheater for preventing the passage therethrough of cinders and fly ash, a hopper communicating with said trap, a second trap, means for conducting the cinders and fly ash collected in said hoppers communicating with said baffles and first mentioned trap to said last mentioned trap, a hopper communicating with said last mentioned trap, a spout communicating with said hopper, a second spout communicating with said first named spout, and means for oscillating said last mentioned spout to evenly distribute the cinders and fly ash in said fuel hopper.

4. In a furnace, the combination with a stoker, of a fuel hopper for said stoker, a cylinder communicating with said hopper having a ram operating therein, partition means provided in said hopper dividing said hopper into compartments, means for supplying coal to one of said compartments and cinders to another of said compartments, and means for operating said ram to feed the coal and cinders gravitating into said cylinder to said stoker at each reciprocation of said ram.

5. In a furnace, the combination with a stoker, of a fuel hopper for said stoker, fuel feeding means communicating with said hopper, partition means in said hopper dividing said hopper into separate compartments, means for supply-

ing coal to one of said compartments and cinders to another of said compartments, and means for operating said fuel feeding means to feed said coal and cinders to said stoker.

5 6. In a furnace, the combination with a stoker, of a fuel hopper for said stoker, a cylinder communicating with said hopper, a ram operating in said cylinder, partition means in said hopper forming compartments therein, means for depositing coal in one of said compartments and cinders in another of said compartments, said compartments being so arranged that the cinders will first enter said cylinder upon recession of said ram and coal will thereafter enter said cylinder, and means for operating said ram to feed said cinders and coal to the stoker in such a manner that a portion of the coal will overlie said cinders.

7. In a furnace, the combination with a mul-

tiple retort underfeed stoker, of a cylinder for each of said retorts having a ram operating therein, a fuel hopper communicating with said cylinders, partition means in said hopper forming compartments therein, means for supplying coal to one of said compartments, means for supplying cinders to another of said compartments, said compartments being so arranged that upon recession of said rams the cinders will first enter said cylinders and coal will thereafter completely fill said cylinder, means for actuating said rams to feed the cinders and coal to the retorts of said stoker, in such a manner that a portion of the coal will overlie the cinders, and means for evenly distributing the cinders in said hopper so that a uniform quantity of cinders and coal will be fed to each retort of said stoker.

JOSEPH S. BENNETT.