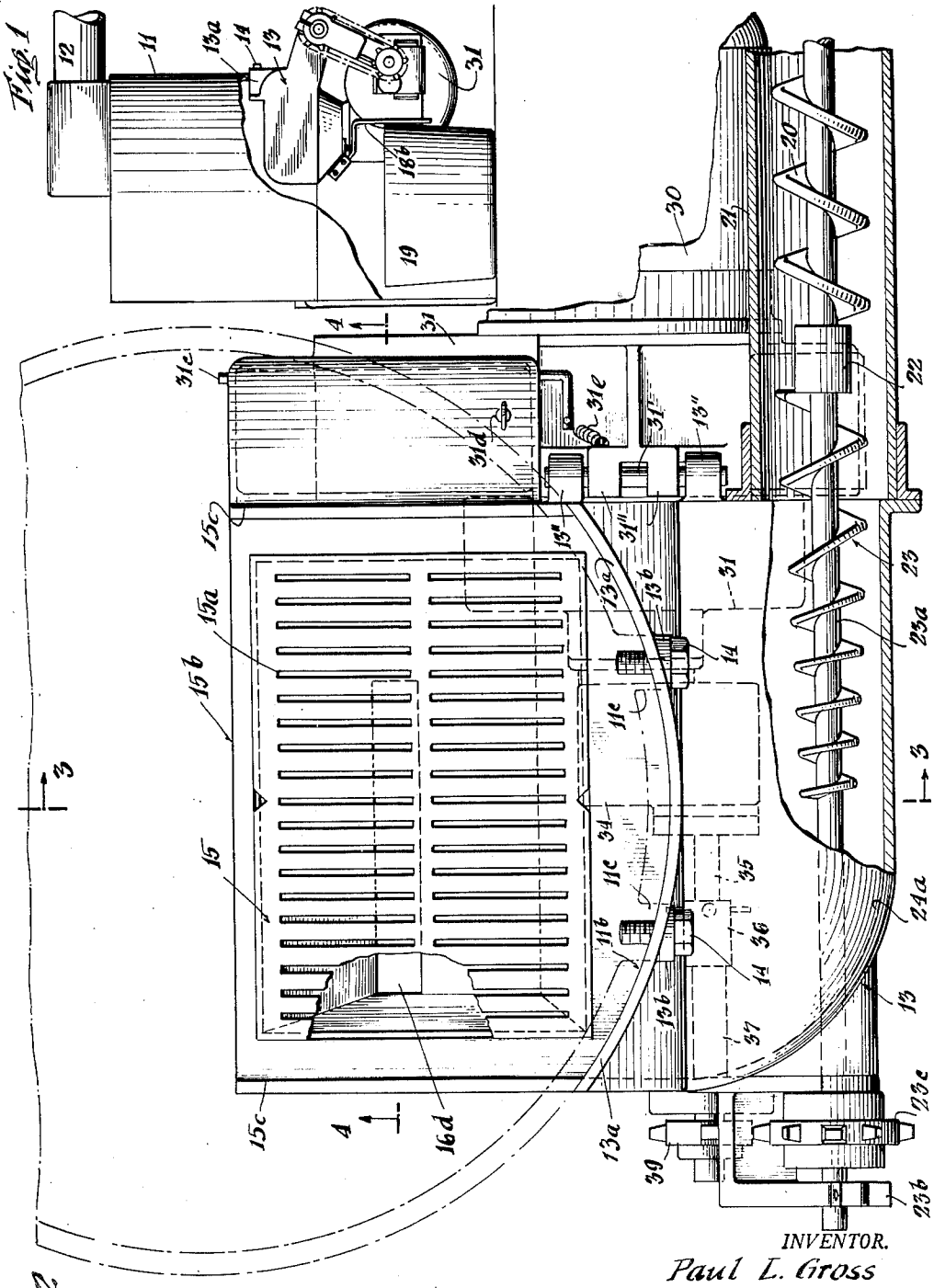
Feb. 24, 1953 P. L. GROSS 2,629,350

SOLID FUEL BURNER

Filed June 28, 1949 3 Sheets-Sheet 1



INVENTOR.
Paul L. Gross
BY
Uhlich and Padlon
ATTORNEYS

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Fig. 3

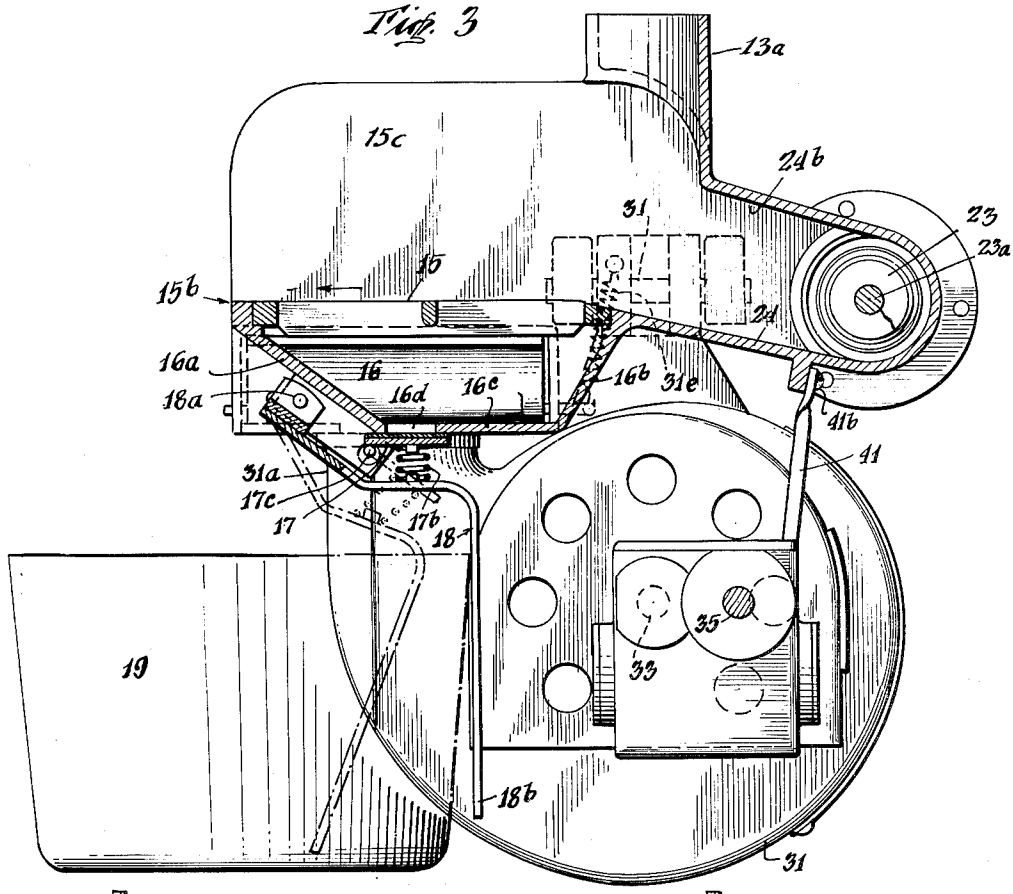
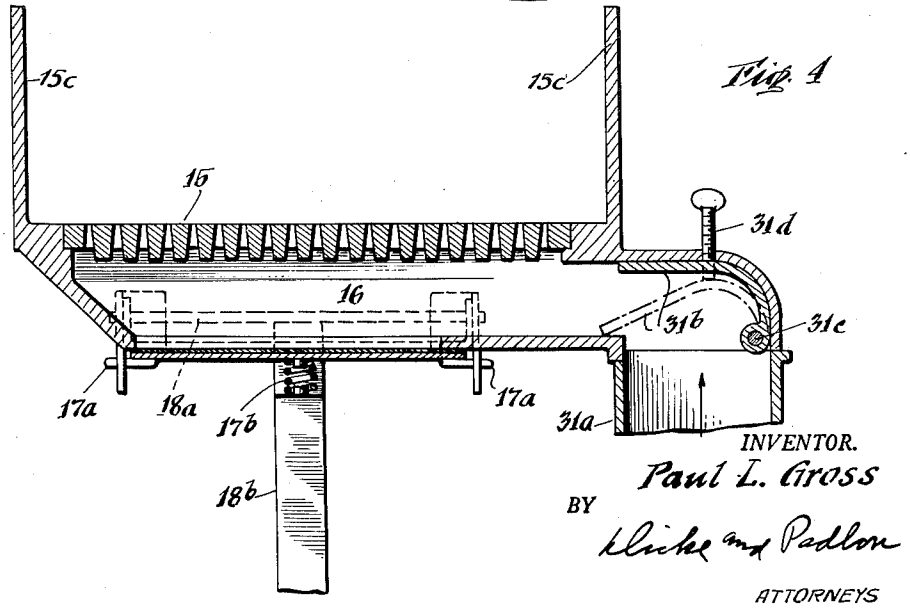


Fig. 4



INVENTOR.
Paul L. Gross
BY
Hicks and Padlon
ATTORNEYS

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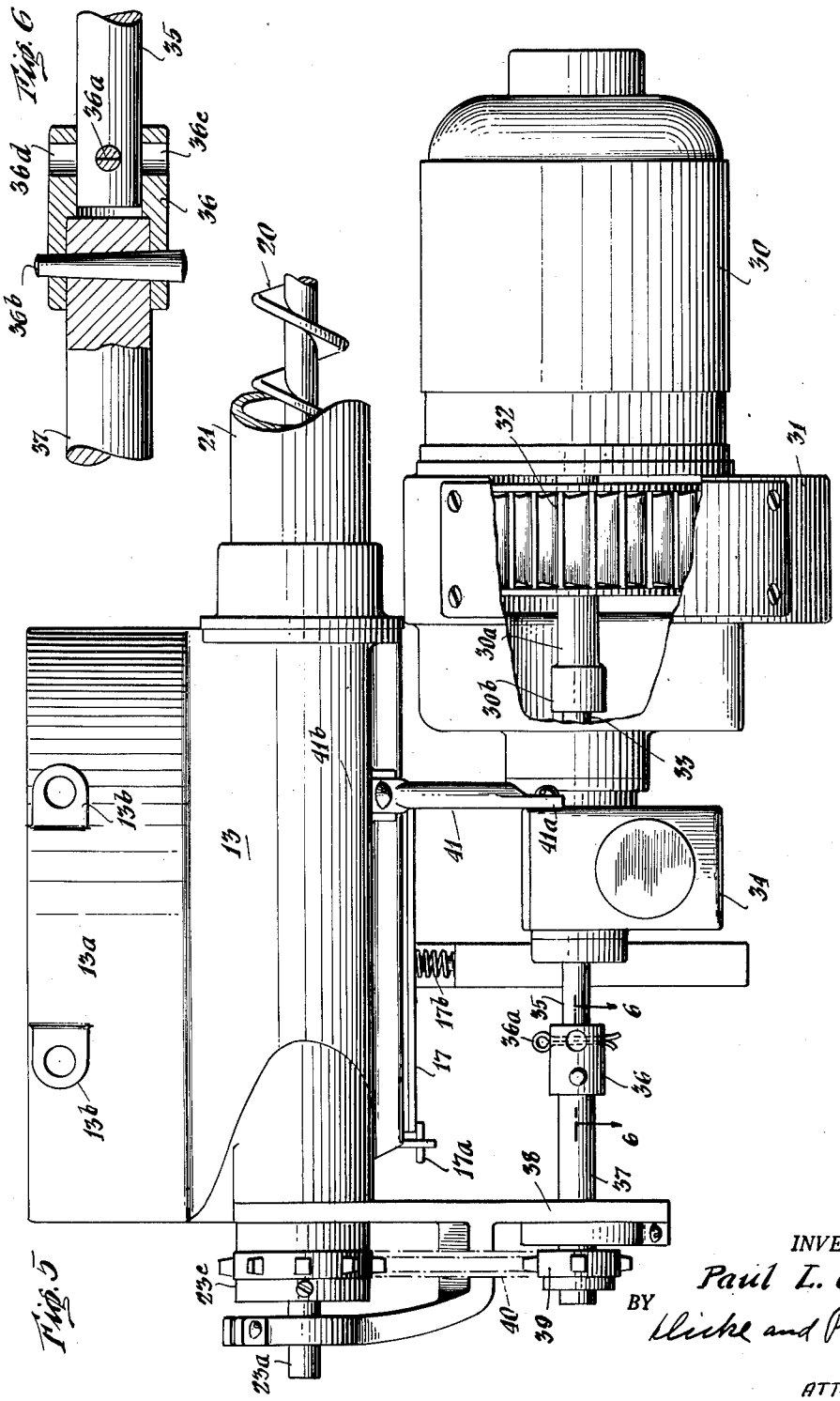

INVENTOR.
Paul L. Gross
BY
Klicke and Padlow
ATTORNEYS

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SOLID FUEL BURNER

Paul L. Gross, Trucksville, Pa.

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2 Claims. (Cl. 110—32)

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This invention relates to improvements in solid fuel burners and has for an object to provide an improved burner of this type which may be preassembled into a unitary structure which structure is readily attached to a furnace of standard or special construction.

Another object is to provide such a device having a helical feed screw, the pitch and diameter of which are varied to produce the desired uniform feeding and distribution of the fuel.

Another object of the invention is to provide an improved burner of this type comprising a motor, a blower driven thereby, an extension shaft extending beyond the blower and connected to suitable reduction gearing having an output shaft which is suitably connected to drive the fuel feed screw.

Another object is to provide such a burner in which the feed screw is operated by driving that end of the feed screw shaft away from the fuel hopper or other fuel supply devices.

Another object is to provide such a burner having a retort the bottom of which is formed as a grate or tuyère through which combustion air is supplied in the fuel bed under pressure, an air chamber being formed under the grate and being formed with a trap door through which accumulated fines and ash may be removed.

Another object is to provide such a fines removing trap door which is normally biased to open position but which is held closed by means of the ash tub or other receptacle.

Other objects will appear from the following description of an illustrative embodiment of the invention taken together with the attached drawings wherein:

Fig. 1 is a side elevation of a furnace with one form of improved burner attached thereto, parts of the furnace being broken away to show the burner and also the ash receptacle in its usual position,

Fig. 2 is a plan view of the burner of Fig. 1 with a part of the grate section and a part of the conveyor section broken away,

Fig. 3 is a vertical cross section taken along the line 3—3 of Fig. 2,

Fig. 4 is a vertical cross section taken along the line 4—4 of Fig. 2,

Fig. 5 is a rear elevation of the burner, parts being broken away to show the fuel conveyor screw and the blower; and

Fig. 6 is a detail view showing an improved form of shear pin construction.

Referring to said drawings, the numeral 11

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indicates a furnace of usual or special construction provided with a flue 12 for removing the combustion gases. The furnace contains gas passages for transferring heat to the water in the boiler or to air if a hot air furnace is employed, these passages being of usual or special construction. At least the rear portion of the furnace 11 is preferably of circular conformation as at 11b. Lying thereagainst is a corresponding circularly formed attachment segment 13a of the burner proper which is generally designated 13. The furnace is formed with suitable bosses 11c, formed with threaded openings therein for receiving the holding screws 14 which pass through lugs 13b formed on the segment 13a. These screws 14 preferably form the sole connection between the burner and the furnace so that the burner may be manufactured and assembled as a self-contained unit and readily bolted to the furnace, no other connecting elements being required.

The burner proper consists of the hearth or retort portion 15 formed with slots or other openings 15a which act as tuyères for admitting combustion air to the fuel bed. Located at each side of the hearth is a side wall 15c. Located immediately below the hearth is an air chamber 16 having side walls, front wall 16a, a rear wall 16b, and a bottom wall 16c. The latter is provided with an elongated opening 16d. This opening is normally closed by a trap-door 17 preferably hinged as at 17a. It is normally held up against opening 16d by means of a spring 17b supported by a lever 18 which is pivoted at 18a and has a downwardly extending arm 18b, these parts being held in the position shown in Figs. 1 and 3 by the usual ash tub 19. In operation the fuel is fed across the hearth or retort more or less in the direction shown by the arrows in Figs. 2 and 3. Combustion has been completed by the time the forward edge 15b has been reached so that the ash remaining drops over the edge thereof into the ash tub 19.

It is impossible to avoid having a certain quantity of fuel fines and ash drop through the openings 15a into the air chamber 16. While cleanout doors may be provided to remove these materials, this operation is frequently overlooked with the result that an undue accumulation occurs so that proper operation of the burner would be impossible. It will be noted that with the construction shown and described that when the ash tub 19 is removed for emptying, the trap door 17 will be automatically opened, preferably by gravity, the parts assuming the position shown

in dotted lines in Fig. 3. When this occurs, the fines and accumulated ash will be allowed to fall out on to the floor. This construction assures that these materials will not be allowed to accumulate and interfere with proper operation, this being automatically effected without requiring the attention of the operator.

The fuel is supplied to the burner by means of a conveyor screw 20 operating in feed tube 21. Its further end (not shown) may underlie a fuel hopper or lead directly to the fuel bin. The conveyor screw 20 is connected by means of a coupling 22 to a fuel feed screw 23 formed on shaft 23a, the further end of which is supported in bearing 23b and is provided with a sprocket 23c. It will be noted that the screw 23 is gradually reduced in diameter and that its pitch is gradually decreased to assure a proper distribution of the fuel. By referring to Fig. 3, it will be noted that the fuel feed screw 23 is located to the rear of a fuel ramp 24 which slopes upwardly from the screw to the hearth 15. It will also be noted by referring to Fig. 2 that the feed screw chamber is rounded as at 24a so that as the fuel is fed to the left by the feed screw (as viewed in Fig. 2) the curved wall 24a will guide some of the fuel around said corner changing its direction forwardly. The flow of the coal immediately adjacent said rounded corner similarly affects the flow of coal somewhat removed therefrom. Similarly the fuel located along the length of feed screw 23 is forced forwardly due to an accumulation between the inclined ramp 24 and the upper wall 24b so that the entire mass of fuel is moved forwardly (upwardly as viewed in Fig. 2) in more or less parallel lines across the grate surface. Proper proportioning of pitch of the feed screw 23 and properly varying its diameter is important to assure that the fuel will be fed forwardly across the grate at the same speed and in parallel lines to assure that the fuel bed is of uniform thickness from right to left, as viewed in Fig. 2.

Referring to Fig. 5, 30 designates an electric motor preferably of the flange mounted type attached to and supported by the blower housing 31 in any desired manner such as by the pin 31' passing through lugs 31'' and 13''. Within the blower housing is located the blower rotor 32 preferably mounted directly upon the motor shaft 30a which is formed with a coupling 30b to which is connected a shaft 33 which may be the input shaft of a speed reducer 34 having an output shaft 35 which through coupling 36 drives shaft 37 which is supported in a bearing at 38 and carries a sprocket 39 which through suitable sprocket chain 40 drives the sprocket 23c mounted on the shaft 23a of the feed screw. The speed reducer is desirably held in place by means of a bracket 41 attached as at 41a to the speed reducer and at 41b to the burner frame. It will be noted that the motor 30 drives the blower 32 at motor speed and drives the feed screw shaft 23a at very much reduced speed via the speed reducer 34. Thus all of the driven parts are driven from the motor by means of a unitary mechanism all supported on the frame 13a of burner 13 so that all of the parts may be preassembled and attached to the furnace merely by bolts 14.

Coupling 36, which will be seen best in Fig. 6, includes a shear pin 36a, preferably in the form of a cotter pin, and a pin 36b connecting the coupling to shaft 37. The shear pin 36a is made weaker than the pin 36b so that if the conveyor screw or the feed screw should become clogged,

the pin 36a will be sheared off thus saving other parts from excessive strain and possible breakage. In shear pins of this type it is always difficult to remove that part of the sheared pin which remains in the shaft. To facilitate removal thereof relatively large openings 36c and 36d are provided, these being so located that they are normally at right angles to the pin 36a. After breakage of pin 36a has occurred, shaft 35 is rotated until the hole therein aligns with holes 36c, 36d whereupon the broken part or parts of pin 36a may be readily driven out. Thereupon the shaft 35 is rotated one-quarter turn and a new shear pin inserted.

As will be seen in Fig. 3, the blower housing 31 is of the usual spiral conformation so that its spacing from the blower rotor gradually increases and forms a delivery duct 31a (Figs. 3 and 4) which connects with the air chamber 16 under the grate or hearth 15. Mounted in said duct is an air valve 31b pivoted at 31c and adjustable by means of a thumb screw 31d. The air valve is biased to its open position by means of a spring 31e (Figs. 2 and 3). Thus, by adjusting thumb screw 31d the amount of air delivered to the fire can be readily and definitely controlled.

The burner proper is open at the top so that the combustion gases may rise into the usual combustion space of the furnace and pass through the heat exchange areas of the furnace. There the gases transfer most of their heat to the water in the boiler (or to air if a hot air furnace is used) and the gases are subsequently discharged at much lower temperatures through flue 12 into the chimney. The word "furnace" as used herein is intended to apply to a heating unit wherein the heat of the combustion gases is transferred either to water or air or other medium.

It will be noted that the construction shown and described will serve admirably to accomplish the objects stated above. It is to be understood, however, that the construction disclosed above is intended merely as illustrative of the invention and not as limiting as various modifications therein may be made without departing from the invention as defined by a proper interpretation of the claims which follow:

I claim:

1. A solid fuel burner, comprising a generally horizontal grate arranged to receive fuel at one side and to discharge ash at another side, said grate having a plurality of tuyères therethrough, an air chamber for supplying air to said tuyères, means for supplying air to said air chamber, means to feed fuel to the receiving side of said grate and across said grate toward the ash discharge side thereof, the bottom of said air chamber being formed with an opening through which fuel fines and ashes may periodically be removed, a closure for normally closing said opening, and biased toward open position, an ash receptacle positioned below the ash discharging side of said grate and means cooperating with said ash receptacle and said closure for holding the closure in closed position when the ash receptacle is in place to receive ashes from said grate.

2. A solid fuel burner, comprising a generally horizontal grate arranged to receive fuel at one side and to discharge ash at another side, said grate having a plurality of tuyères therethrough, an air chamber for supplying air to said tuyères, means for supplying air to said air chamber, means to feed fuel to the receiving side of said grate and across said grate toward the ash dis-

charge side thereof, the bottom of said air chamber being formed with an opening through which fuel fines and ashes may periodically be removed, a closure for normally closing said opening, means for biasing said closure to open position, an ash receptacle adapted to be slid under said grate to a point where it is positioned below the ash discharging side of said grate and means for holding the closure in closed position when the ash receptacle is in place to receive ashes from said grate, said closure being so constructed that it is removed from said opening as an incident to the removal of said receptacle from its ash receiving position.

PAUL L. GROSS.

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