June 21, 1927. 1,633,465

J. C. ST. CLAIR

COMBINED COAL STOKER AND BURNER

Filed July 22. 1925 2 Sheets-Sheet 1

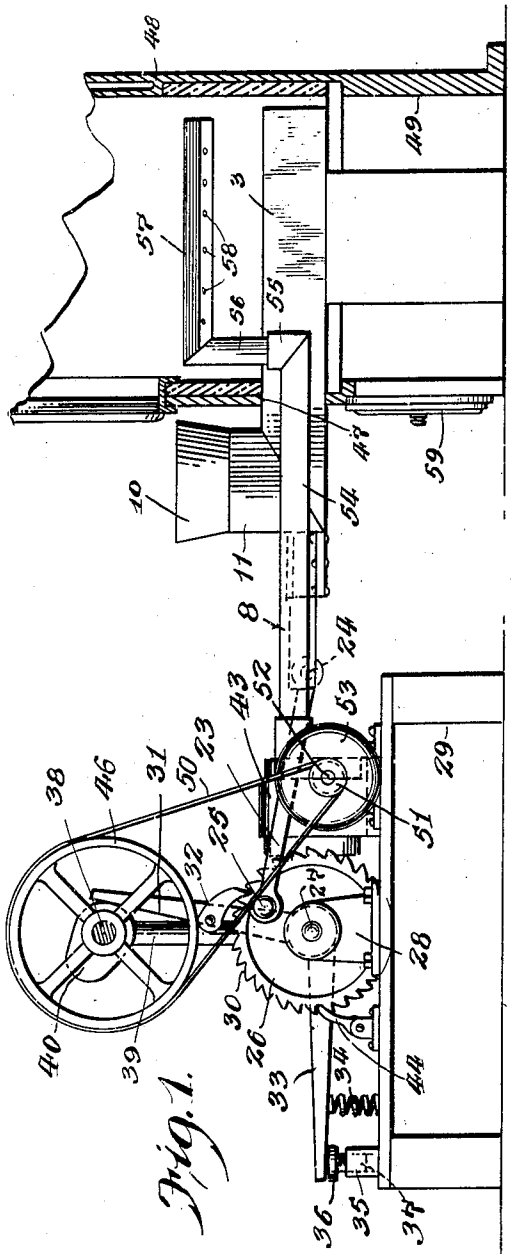


Fig. 1.

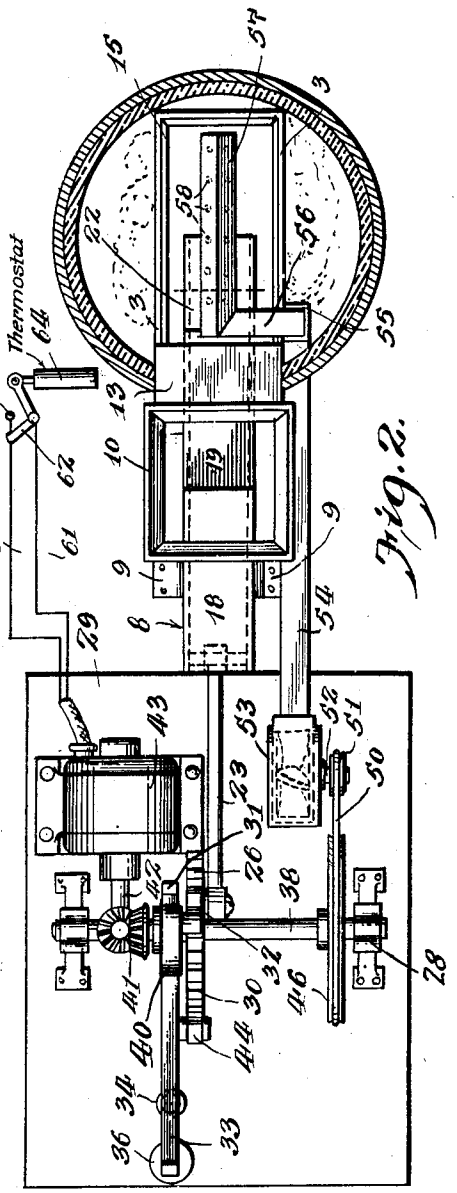


Fig. 2.

WITNESSES

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Fig. 4.

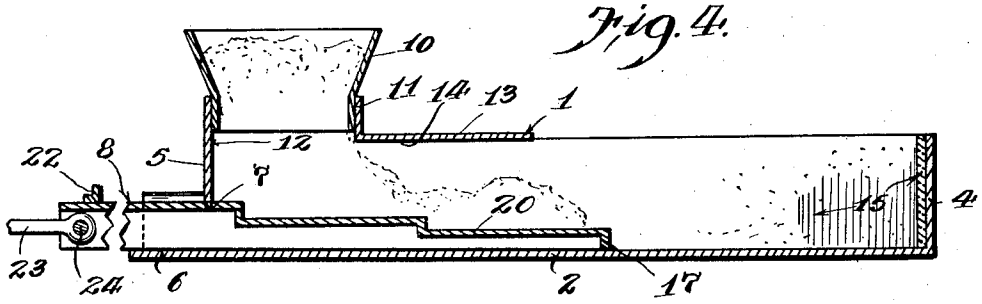


Fig. 3.

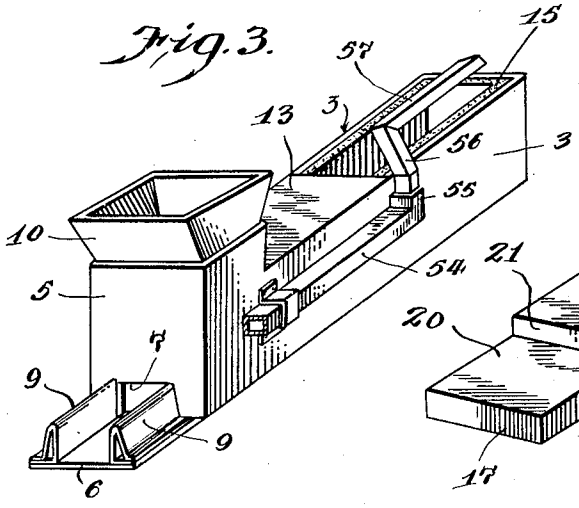


Fig. 5.

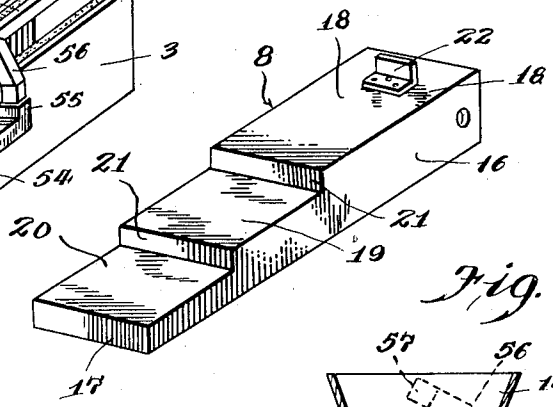


Fig. 7.

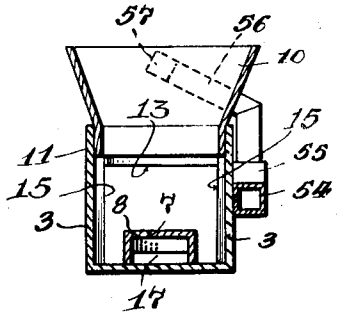
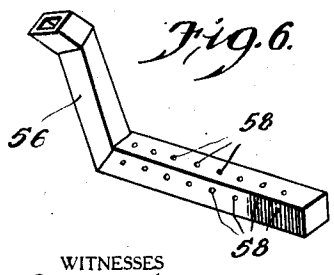


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN CHRISTIAN ST. CLAIR, OF BUTTE, MONTANA.

COMBINED COAL STOKER AND BURNER.

Application filed July 22, 1925. Serial No. 45,367.

My invention is a combined coal stoker and burner, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of the invention is the provision of a device which affords facilities for feeding coal or like fuel to the flame in a furnace casing at regular intervals and for supporting the burning fuel.

A further object of the invention is the provision of a device of the character described which has means for supplying air to the burning fuel to support combustion and to blow the loose ashes from the upper part of the fuel bed.

A still further object of the invention is the provision of a device of the character described having a reciprocating plunger and means for operating the plunger to feed fuel to the flames, said operating means being capable of adjustment to vary the interval of time elapsing between the working or fuel feeding strokes of the plunger. A still further object of the invention is the provision of a device of the character described which will be automatic in action and will require but little, if any, attention after the initial installation and adjustment thereof.

Other objects and advantages of the invention will be apparent from the following description, considered in conjunction with the accompanying drawings, in which:

Figure 1 is a side elevation of the complete device operatively applied to a furnace casing, the furnace casing being shown only partially and in vertical section,

Figure 2 is a plan view of the structure shown in Fig. 1 with the furnace casing shown in horizontal section,

Figure 3 is a perspective view of the body of the device, showing a portion of an air conducting conduit supported thereon,

Figure 4 is a longitudinal section through the body of the device,

Figure 5 is a perspective view of the fuel feeding plunger of the device,

Figure 6 is a perspective view of the nozzle of the air delivery conduit, and,

Figure 7 is a transverse vertical section, through the body of the device.

The device has a substantially channel shaped body designated generally at 1, which comprises a horizontal bottom 2, a pair of upstanding parallel side walls 3, an inner end wall 4 and an outer end wall 5. The bottom 2 extends beyond the plane of the outer end wall 5 as indicated at 6, the outer end wall 5 being formed with a guide opening 7 in its lower part, through which a plunger generally indicated at 8 may slide on the bottom 2. The plunger is guided in its reciprocation on the bottom 2 through the opening 7 by means of a pair of spaced upstanding guide members 9 which are provided on the extended end portion 6 of the bottom 2, the inner faces of said guides being substantially in line with the side walls of the opening 7.

The body 1 is provided at its rearward end with an upstanding hopper 10 which may be supported in an upstanding tubular extension 11 on the rearward end portion of the body. The space within the rearward end portion of the body beneath the hopper 10 may be termed a fuel supply chamber and is indicated at 12. The body is provided with a top wall 13 which extends from the upstanding tubular extension 11 for part of the length of the body, whereby a fuel feeding passage which is closed at its top and is indicated at 14 will be produced in the body 1 directly in the rear of the fuel supply chamber. The portion of the body between the fuel feeding passage 14, and the inner end wall 4 constitutes the fire box or burner portion of the body and the side walls and the inner end wall of the body 1 may be lined with fire brick or other refractory material as indicated at 15 in Figures 3, 4 and 7.

The plunger 8 is an inverted channel shaped member comprising a top and a pair of side walls 16, and an inner end wall 17. The top comprises a plurality of vertically stepped horizontal portions, such as indicated at 18, 19 and 20 respectively, the lowermost portion of the top being at the inner end thereof. Vertical shoulders 21 thus are produced between the adjacent portions of the top which are located at different levels. The highest or outer end portion of the plunger has a cross sectional area slightly less than that of the opening 7 so that the plunger can be slid on the edges of the side walls thereof until only the outer end portion of the plunger remains outwardly of the plane of the outer end wall 5 of the body of the device. A stop 22 is secured on the highest portion of the top of the plunger adjacent the outer end thereof and indicates externally of the body of the device where

the forward stroke should stop when adjustment is being made of the length of the working stroke of the plunger.

A pitman or connecting rod 23 is swingingly supported at one end on a transverse pivot element 24 in the outer end portion of the plunger and is pivotally supported at its outer end on a wrist pin 25 which is carried by a crank disc 26. The crank disc 26 is supported on a horizontal shaft 27. The shaft 27 is supported in horizontal position on one or more brackets such as indicated at 28 in Fig. 1, such bracket or brackets being supported on a base 29. The crank disc 26 is a ratchet wheel also, having teeth 30 in its periphery. A bell crank is fulcrumed on the shaft 27 at one side of the crank disc 26, and comprises an upper arm 31 which extends upwardly above the level of the upper edge of the crank disc 26 and carries a pivoted gravity pawl 32 which is in engagement continuously with the teeth 30 of the ratchet crank disc. The other arm of the bell crank is indicated at 33 and extends laterally of the shaft 27 beyond the outer edge of the ratchet crank disc. A tension spring 34 connects the arm 33 of the bell crank with the base 29 and tends to draw the arm 33 downward toward the base to position against the upper end of a vertically adjustable stop or bumper, which comprises a block 35 that is fixed to the base and a head screw portion 36 having the shank thereof in threaded engagement with a threaded vertical socket 37 in the block 35.

A shaft 38 is supported in bearings at the upper end of standards, such as indicated at 39 on the base 29, the shaft 38 being directly above the shaft 27, and parallel to the latter. The arm 31 bears against the periphery of a cam disc 40 which is secured on the shaft 38, the point of contact of the arm 31 with the cam disc being at the side of the latter nearest to the pitman 24 and farthest from the arm 33 of the bell crank whereby the spring 34 will act to hold the arm 31 continuously in contact with the periphery of the cam disc. The shaft 38 is connected by gearing such as indicated generally at 41, or like transmission mechanism, with the drive shaft 42 of a motor 43 which is supported on the base 29. The arrangement is such that shaft 38 will be turned clockwise when the motor 43 is in operation and the rotation of the shaft 38 will oscillate the arm 31 of the bell crank. The oscillation of the bell crank will cause a rotary motion to be imparted to the ratchet crank disc through the pawl 32 and the teeth 30, whereby a certain number of complete revolutions of the cam 40 will be required to cause a rotation of the ratchet crank disc through 360 degrees. The return rotary movement of the ratchet crank disc when the pawl 32 is sliding over the teeth as the bell crank lever arm 31 moves inwardly toward the axis of the shaft 31 is prevented by a pivoted stop pawl 44 which is supported on the base 29 in position to engage the teeth 30 at a point on the periphery of the ratchet crank disc which is substantially diametrically opposite the point of engagement of the driving pawl 32 with the teeth of the ratchet crank disc. The shaft 38 may carry a pulley 46, which is provided for a purpose to be presently described.

The body 1 of the device is arranged to extend partially through an opening 47 in a vertical wall of a furnace casing 48 so that the portion of the body which comprises the feed passage extends within the furnace casing, the portion of the body which constitutes the fire box is supported and disposed completely within the furnace casing and the portion of the body that is provided with the fuel supply chamber is disposed completely at the outer side of the casing.

The bottom of the body of the device is horizontal. The base 29 is located relatively to the furnace casing so that the plunger 8 can be reciprocated on the bottom 2 of the body as a result of motion transmitted to the plunger through the connecting rod 23. The bottom 2 is supported above the level of the bottom of the furnace so that a space such as indicated at 49 will be provided beneath the inner end portion of the body for the reception of ashes. The side walls of the portion of the body that is within the furnace casing are spaced from the side walls of the furnace casing to permit ashes to fall from the fire box portion of the device into the space 49 when the device is operated in a manner which will be presently described.

The pulley 46 is connected by means of a belt 50 with a pulley 51 on the drive shaft 52 of a blower fan 53. The blower fan 53 discharges into a conduit which includes a section 54 extending through an opening in the furnace casing and provided within the furnace casing at one side of the fire box portion of the body 1 with an upstanding socket portion 55, in which is fitted the lower end of the supporting portion 56 for the nozzle or discharge section 57 of said conduit. The nozzle section 57 is supported above the fire box portion of the body of the device preferably above the longitudinal median line of said body, the supporting portion 56 being bent above its lower end to incline inwardly and upwardly as best seen in Fig. 3. The nozzle section 57 may be rectangular in cross-sectional contour and in that event, it is supported with the line of junction of two adjacent sides thereof, lowermost and such adjacent sides are provided with longitudinally extending series of spaced discharge apertures or ports as indicated at 58, whereby the air blasts from

such ports will be discharged downwardly and outwardly into the fire box for supporting combustion of fuel in the upper part of the fire box and for blowing loose ashes from the upper part of the fire box laterally outward so that such ashes will fall between the fire box and the inner wall of the casing into the space 49, from which they can be removed through the opening which is normally closed by the door 59.

The nozzle 57 need not be rectangular in cross-section and may be circular but in any event two or more rows of spaced discharge ports are provided in the lower portion thereof so that air blasts will be directed downwardly and outwardly from the nozzle into the fire box.

From the foregoing description of the various parts of the device the operation thereof may be readily understood. The fuel supply chamber 12 is filled with coal or like fuel which is introduced thereinto through the hopper 10. When the motor 43 is operated, the plunger 8 will be actuated to shove or push fuel from the lower part of the fuel supply chamber 12 through the fuel feeding passage 14 into the fire box portion of the body of the device, such fuel being fed at intervals to the fuel bed in the fire box at the bottom of the latter. The fuel in the fire box having been ignited, combustion thereof will be supported by air blasts which are directed onto the top of the fuel bed from the nozzle 57 in the manner hereinbefore described. The frequency of the working stroke of the plunger can be varied at will by adjusting the height of the vertical stop or bumper 35—36 to vary the length of oscillatory movement of the upper end of the arm 31 of the bell crank and therefore to vary the number of degrees through which the ratchet crank disc will be rotated, during the complete rotation of the shaft 38. The height of the stop 35—36 can be adjusted so that the arm 31 of the bell crank will not be actuated by the cam during rotation of the shaft 38 and therefore the plunger will be held inactive even though the motor is operated to permit continued feeding of air from the nozzle 57 to the fuel bed. The motor operated circuit may include the conductors 60 and 61 respectively as shown in Fig. 2 and one of these conductors may be connected with a movable switch arm 62 and the other conductor 60 connected with a stationary contact 63 with which the switch arm 62 is adapted to cooperate. The switch arm 62 is controlled by a thermostat 64 which in actual practice will be placed in such position with respect to the furnace that the thermostat will be actuated to cause opening of the switch 62—63 when a desired temperature has been reached because of combustion in the fire box. The opening of the switch 62—63 of course will break the motor operating circuit and no more fuel will be fed to the fuel bed until a lower temperature has been reached.

It will be manifest that the device will operate automatically to feed fuel at desirable pre-determined intervals to the flames within the fire box so long as the thermostat in the motor operating circuit has not been heated above a given temperature and that very little, if any, attention need be given to the device after it has been installed to assure continued operation of the furnace. Since the plunger slides on the edges of the sides thereof and is open at its rearward end and hollow underneath, dust or particles of fuel will not accumulate between the plunger and the bottom of the device to interfere with the reciprocation of the plunger since such particles of fuel as can not pass between the lower edges of the sides of the plunger and the bottom in which the fuel feeding passage of the body, will be ejected at the outer end thereof.

Obviously the invention is susceptible of movement in forms other than that which is illustrated in the accompanying drawings, and I therefore consider as my own all such modifications and adaptations thereof as fairly fall within the scope of the appended claims.

I claim:

1. In a device of the character described, an elongated hollow body having a bottom and formed to produce a fuel supply chamber at one end of the body, a fire box at the opposite end of the body and a fuel feeding passage connecting said fuel supply chamber and said fire box, a plunger movable longitudinally in said fuel supply chamber and said fuel feeding passage for feeding fuel from the fuel supply chamber to said fire box, said plunger being movable through an opening in the outer end wall of said fuel supply chamber and comprising an inverted channel shaped member closed at its inner end and open at its bottom, the inner end wall of said plunger extending at right angles with the longitudinal axis of said plunger.

2. In a device of the character described, an elongated hollow body having a bottom and formed to produce a fuel supply chamber at one end of the body, a fire box at the opposite end of the body and a fuel feeding passage connecting said fuel supply chamber and said fire box, a plunger movable in said fuel supply chamber and said fuel feeding passage for feeding fuel from the fuel supply chamber to said fire box and means for reciprocating said plunger, said plunger being movable through an opening in the outer end wall of said fuel supply chamber and comprising an inverted channel shaped member closed at its inner end, said plunger

being open at its bottom and having side walls in sliding contact at their lower edges with said bottom of the body and being reduced in height at intervals from its outer end to its inner end, thus defining spaced inwardly facing shoulders at the upper side of said plunger, said side walls of the plunger being uniform in thickness through their height.

3. In a device of the character described, an elongated hollow body having a bottom and formed to produce a fuel supply chamber at one end of the body, a fire box at the opposite end of the body and a fuel feeding passage connecting said fuel supply chamber and said fire box, a plunger movable in said fuel supply chamber and said fuel feeding passage for feeding fuel from the fuel supply chamber to said fire box and means for reciprocating said plunger, said plunger being movable through an opening in the outer end wall of said fuel supply chamber and comprising an inverted channel shaped member closed at its inner end, said plunger being open at its bottom and at its outer end and having side walls in sliding contact at their lower edges with said bottom of the body and being reduced in height at intervals from its outer end to its inner end, thus defining spaced inwardly facing shoulders at the upper side of said plunger, said side walls of the plunger being uniform in thickness through their height, and a pair of guides carried by said bottom of the body at the sides of said opening in the outer wall of said fuel supply chamber for guiding said plunger during its reciprocation.

4. In a device of the character described, an elongated hollow body having a bottom and formed to produce a fuel supply chamber at one end of the body, a fire box at the opposite end of the body and a fuel feeding passage connecting said fuel supply chamber and said fire box, a plunger movable in said fuel supply chamber and said fuel feeding passage for feeding fuel from the fuel supply chamber to said fire box and means for reciprocating said plunger, said plunger being movable through an opening in the outer end wall of said fuel supply chamber and comprising an inverted channel shaped member closed at its inner end, said plunger being open at its bottom and at its outer end and having side walls in sliding contact at their lower edges with said bottom of the body and being reduced in height at intervals from its outer end to its inner end, thus defining spaced inwardly facing shoulders at the upper side of said plunger, a pair of guides carried by said bottom of the body at the sides of said opening in the outer wall of said fuel supply chamber for guiding said plunger during its reciprocation and a stop carried by said plunger on the upper side of its outer end portion for indicating externally of the body of the device where the forward stroke should stop when adjustment is being made of the length of the working stroke of the plunger.

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