

Aug. 24, 1937.

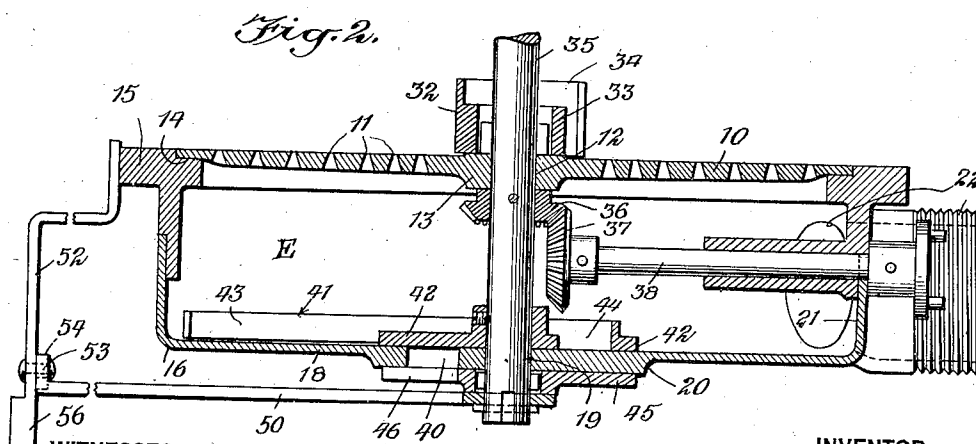
V. M. CRUIKSHANK

2,090,622

STOKER

Filed Sept. 23, 1931

2 Sheets-Sheet 1



WITNESSES

Geo. W. Taylor
Hugh N. Ott

~~HugrNOH~~

INVENTOR
Virginius M. Cruikshank
 BY *Munn & Co.*
 ATTORNEYS

INVENTOR
Virginus M. Cruikshank

BY

numbers

ATTORNEYS

Aug. 24, 1937.

V. M. CRUIKSHANK

2,090,622

STOKER

Filed Sept. 23, 1931

2 Sheets-Sheet 2

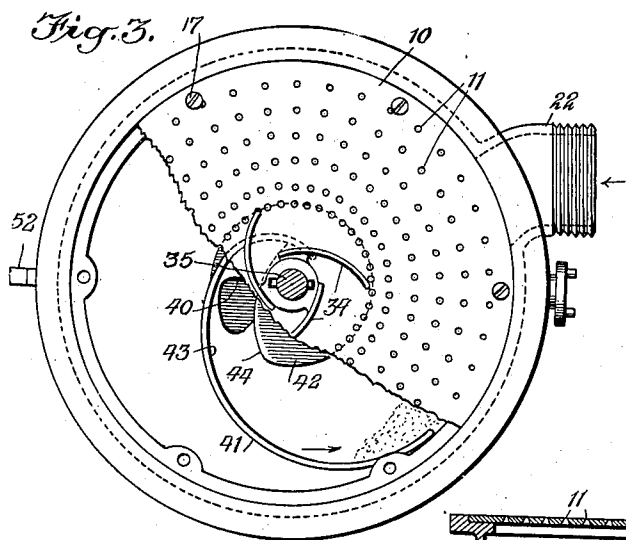


Fig. 6.

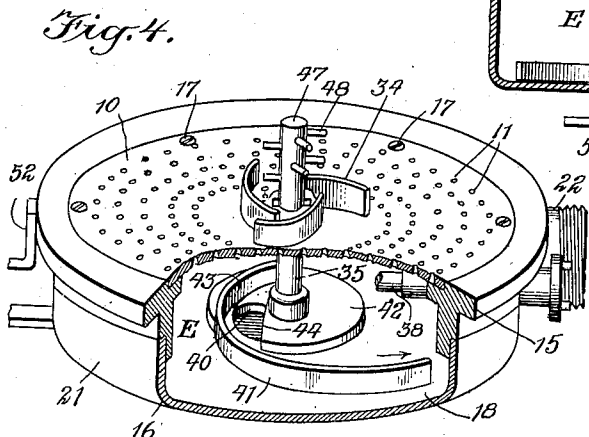
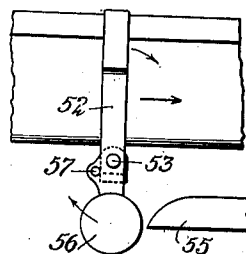


Fig. 8.

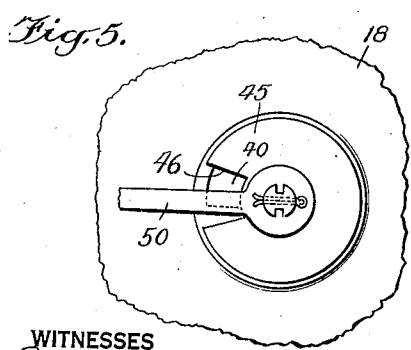
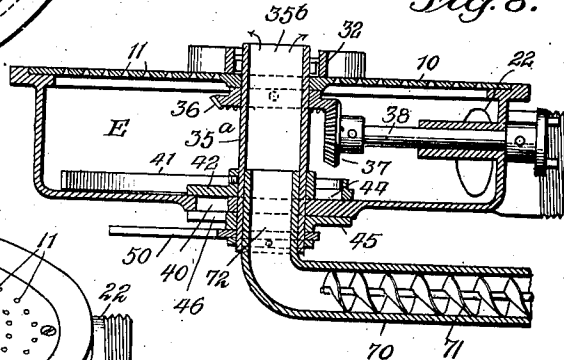
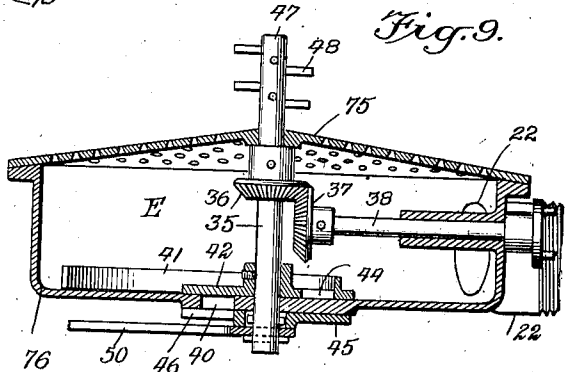


Fig. 9.



WITNESSES
John W. Taylor
August H. Ott

INVENTOR
Virginus M. Cruikshank
 BY *Munn & Co.*
 ATTORNEYS

UNITED STATES PATENT OFFICE

2,090,622

STOKER

Virginus M. Cruikshank, Shamokin, Pa.

Application September 23, 1931, Serial No. 564,641

8 Claims. (Cl. 110—101)

This invention relates to automatic stokers for furnaces and comprehends an improved stoking mechanism which is preferably built into and forms an integral part of a furnace, although it is to be understood that the same, within the scope of the invention, may, if desired, be formed as a separate unit attachable to the furnace.

The invention broadly aims to provide an improved stoking mechanism which, in addition to effecting a material reduction in the number of parts required and a general simplification of the structure resulting in a corresponding economy of production, also affords a medium for obtaining the maximum thermal efficiency from the fuel consumed.

The invention further resides in a stoking mechanism which includes means by virtue of which the fuel is uniformly fed over a burner plate in such a manner as to insure the complete and effectual consumption and combustion of the fuel during its movement thereover, whereby the full benefit thereof is derived therefrom, before the ash or residue is discharged into a subterposed ash receiver.

More specifically, the invention contemplates in one of its forms, the employment of an impeller through the medium of which the coal is substantially and uniformly driven radially outward from its point of reception, preferably at the central portion of the burner plate, toward the margin and at a rate of speed proportionate to the proper air supply, so as to insure its complete consumption and combustion before it reaches the margin where the ashes, cinders, and other residue are discharged therefrom.

Another important feature of the invention flows from a novel and improved means for continuously and effectually removing and discharging from within the air supply chamber, the ashes or other residue which finds its way into said chamber, through the burner plate openings and this without admitting of any appreciable leakage of the air from the air chamber by virtue of said means.

The invention further embodies means for continuously trimming from the margin of the burner plate ashes, cinders, or other residue, and for leveling the contents of the ash receiver to insure a complete filling of the same.

The invention further embraces an agitating means for effectually loosening the fuel at the point of supply to the burner plate, thus insuring against failure of supply due to clogging in the hopper outlet.

As a still further object, the invention compre-

hends a supply hopper having a restricted outlet disposed in juxtaposition to the burner plate for gravitationally supplying the coal or fuel thereto for movement thereover, and which juxtaposition may be varied to increase or decrease the feed desirable.

The invention further embodies means for shutting off the fuel supply of the hopper outlet, when desired, for the purpose of effecting repairs or renewing parts, which means is of such a nature as not to afford interference with the ordinary operation of the stoker, and which means, when not in use, is not subjected to the detrimental action of the heat generated in the furnace.

With the above recited and other objects in view, reference is made to the following specification and accompanying drawings, in which several preferred embodiments are disclosed, while the appended claims define the actual scope of the invention.

In the drawings—

Figure 1 is a vertical sectional view through a furnace equipped with a stoking mechanism constructed in accordance with the invention.

Figure 2 is a fragmentary enlarged vertical sectional view through the burner plate and casing defining the air chamber and the component parts thereof.

Figure 3 is a plan view of the burner plate and casing on an enlarged scale with reference to Figure 1, with parts broken away and shown in section to disclose the underlying structure.

Figure 4 is a perspective view thereof with parts broken away.

Figure 5 is a fragmentary bottom plan view of the casing.

Figure 6 is a fragmentary side view, particularly illustrating the trimming means.

Figure 7 is a fragmentary perspective view illustrating the fuel supply cut-off in active use, applied to the outlet end of the hopper which is shown in broken lines.

Figure 8 is a vertical sectional view of a burner plate and casing illustrating a modified adaptation of the invention.

Figure 9 is a similar view of a further modification of the invention.

Referring to the drawings by characters of reference, there is illustrated in Figure 1 a furnace A of any approved type defining a combustion chamber B and a base C for the accommodation of an ash receptacle D.

The stoking mechanism which constitutes the present invention includes a burner plate 10, which is preferably, although not necessarily, in

the nature of a flat circular plate or disc formed with apertures, perforations or openings 11, extending through the thickness thereof, and spaced from a central opening 12 formed through a bossed or thicker central portion 13. The burner plate at its marginal edge is seated in the rabbeted portion 14 of the upper rim 15 of the casing 16 to define, together with said casing, an air chamber E. Preferably, the burner plate 10 is anchored in place by screws or other equivalent securing devices 17. The bottom wall 18 of the casing 16 is provided with a central opening 19 disposed in axial alignment of the opening 12 and extending through a medial or central thickened portion 20 of an appreciable diameter. The side wall 21 of the casing is provided with an exteriorly threaded intake nipple 22, connected with an air supply pipe 23, which leads through the furnace wall from a blower 24 operatively connected with and driven by a suitable driving means, such as the motor 25. The casing 16, and the burner plate 10 secured thereto, are supported in any suitable manner within the lower end of the combustion chamber B of the furnace, such as by the brackets 26.

In the form of the invention illustrated in Figure 1, a coal or fuel hopper 27 is built into the furnace structure and forms an integral part thereof, and said hopper has a discharge chute 28 extending therefrom into the combustion chamber with its lower restricted outlet end 29 preferably disposed centrally over and spaced above the axial center of the burner plate 10, the said hopper having an open upper end 30 which may be closed by a displaceable cover 31 to permit of the charging of the hopper with the coal or fuel, which is gravitationally fed toward the outlet 29, where it is discharged on to the burner plate 10.

In order to provide means for uniformly feeding the coal or fuel radially outward over the burner plate 10 from its point of supply, an impeller, designated generally by the reference character 32, is mounted, preferably centrally, of the burner plate 10, to act upon and insure the movement of the coal or fuel. As illustrated in Figures 1 to 4, this impeller consists of a hub 33 and a plurality of radial blades or projections 34 which are preferably of arcuate formation. In order to provide means for actuating the impeller, a shaft 35 is provided, to which the impeller is keyed, and said shaft extends vertically through and is journaled for rotation in the openings 12 and 19. Motion is transmitted to the shaft 35 in any desired manner, preferably by intermeshing miter gears 36 and 37, the former being keyed to the shaft 35 and the latter keyed to a drive shaft 38, which extends through the side wall 21 of the casing and is operatively connected with any suitable type of gearing which may be driven by the motor 25 and which is enclosed in the housing or gear box 39. It will thus be seen that the coal or fuel supplied from the hopper 27 through the outlet 29 is uniformly moved radially outward by the impeller 32, the speed of which movement is regulated in proportion to the air supply from the air chamber E to insure a complete and proper consumption thereof before it reaches the marginal edge of the rim 15, where the ashes, cinders, or other residue are discharged and gravitate into the subterposed ash receptacle D.

In view of the fact that ashes, dust, and other material finds its way into the air chamber E

through the apertures 11 during the movement of the fuel radially outward over the burner plate, it is essential to remove said material from the air chamber and to this end, the bottom wall 18 at the thicker medial portion 20 is formed with a discharge opening 40. In order to effect the collection and discharge of the foreign matter which enters the air chamber E, a spiralled collector arm 41 is provided, which is secured at its inner end to a plate or disc 42, which plate or disc is secured to the shaft 35 for turning movement therewith. The underside of the plate rests upon and the lower edge of the arm will move over the upper surface of the bottom wall 18, and the arm 41 protrudes from the plate or disc 42 substantially radially with its terminal in closely spaced relation to the side wall 21, whereby upon each complete revolution, said arm 41 will gather up and effect the radial inward movement of the foreign matter lodged on the upper surface of the bottom wall 18. The front or leading face 43 of the collector arm 41 merges at the inner end of the arm into a notch 44, which extends inwardly from the periphery of the disc or plate 42, and which notch, during a part of its revolution, registers with the discharge opening 40 in the thickened medial portion of the bottom of the casing. In order to avoid leakage or dissipation of the air from the air chamber while the notch 44 is in registry with the opening 40, a lower disc or plate 45 is keyed to that portion of the shaft 35 which protrudes below the bottom of the casing 16, and said lower plate or disc 45 is disposed in contact with the lower surface of the thickened medial portion 20. The lower plate or disc 45 is provided with a slot or notch 46 opening through its periphery and disposed in staggered relation to the notch 44 in the upper disc or plate 42, but in a position whereby it will, during a part of its revolution, register with the discharge opening 40 to allow the material received therein to gravitate therefrom.

In order to insure the proper supply of the coal or fuel from the hopper and to avoid clogging of the same in the outlet 29, the shaft 35 may extend upwardly into the outlet, and the upper end 47 thereof may be provided with radially projecting pins 48, or other equivalent means for agitating the fuel at this point.

Due to the fact that the ashes, cinders, or other residue discharged over the margin of the rim 15 have a tendency to form an annular heap in the ash receptacle D, thereby hindering the complete and proper filling of the receptacle, a leveling element 50 is provided, which is in the nature of a radial arm keyed, or otherwise secured, at its inner end to the lower extremity of the shaft 35, whereby said arm turns with the shaft to level off the ashes or residue in the receptacle D.

In order to augment the proper discharge of clinkers, cinders, or other residue from the margin of the rim 15, a trimming element 52 is employed, which may be, and preferably is, in the nature of a vertical bar, which is pivotally attached, as at 53, to the terminal 54 of the arm 50, so that the trimmer moves around the margin, or periphery of the rim 15, coincident with the turning of the shaft 35. In order to permit the trimmer bar 52 to clear the air supply pipe 23, shaft 38 and supporting brackets 26, or other obstructions, means such as the cams 55 are interposed in the path of movement of the lower weighted end 56 of the trimmer bar 52, which cams swing the upper portion of the trimmer bar

forwardly and downwardly to a non-interfering position. The trimmer bar, however, is held against rearward swinging movement so as to effectually trim the clinkers, cinders, or the like, from the margin by means of a stop pin 57.

In order to provide means for cutting off the supply of fuel when it is desired for any purpose, such as for instance for the purpose of effecting repairs or the replacement of parts, a closure element 60 is provided having a blade 61 and a handle 62. The blade is notched as at 63 to accommodate the upwardly protruding end 47 of the shaft 35. The side edges of the blade 61 are formed with inturned flanges 64, which are designed to interengage or interfit with laterally projecting flanges or beads 65 formed on the outlet end of the hopper chute 28. This affords a convenient means for closing the outlet chute which may be removed, except when in active use, so as not to be subjected to the detrimental action of the heat generated in the furnace.

In the modified form of the invention illustrated in Figure 8 of the drawings, an arrangement is shown whereby the fuel may be supplied to the center of the burner plate 10, or approximately so, from an under-feed in which instance, a tubular shaft 35^a replaces the shaft 35, and a fuel pipe or conduit 70 leading from a source of supply is equipped with a suitable feeding mechanism, such as the spiral conveyor 71, which forces the fuel through the pipe or conduit 70, the inner end 72 of which extends into and communicates with the tubular shaft 35^a, so that the fuel is fed upwardly through said tubular shaft 35^a and is discharged through the upper open outlet end 35^b to which the impeller 32 is attached. In this instance, the tubular shaft 35^a is rotated, to impart motion to the impeller 32.

In the form of the invention illustrated in Figure 9, the burner plate 75 is mounted for rotary or other equivalent relative movement with respect to the casing 76 with which it combines to form the air chamber E. In this instance, the impeller 32 is dispensed with and the burner plate 75 is of substantially conical shape presenting an annular declining fuel supporting surface, the declination of which is such that radial outward feeding of the fuel is effected when the burner plate is either intermittently rotated or oscillated. The declination of the fuel supporting surface presented by the burner plate, combined with the movement thereof, will be so proportioned as to insure a proper and uniform radial outward movement of the fuel at a rate of speed proportionate to the air supply so as to insure a complete and proper consumption of the fuel before it reaches the marginal edge. Obviously, the burner plate 75 may be driven in any suitable manner and by any suitable means to impart the desired motion thereto. The fuel may be supplied to the center of the burner plate 75 either from an overhead supply or by means of the under feed, as disclosed in Figure 8.

From the foregoing, it will thus be seen that a comparatively simple, yet highly efficient and economical stoking mechanism has been devised, and while various structural details have been disclosed by way of example, it is to be understood that variations and modifications thereof which properly fall within the scope of the claims, may be resorted to when desired.

What is claimed is:

1. The combination with a heater having a combustion chamber and an ash pit below the same, of an automatic stoker located in the heat-

er and comprising a circular casing constituting an air chamber and of less diameter than the ash pit so that ash may fall from the edge of the casing into the ash pit below, a stationary horizontal apertured upper wall of the casing constituting a burner plate secured to the casing, means for supplying fuel onto the burner plate at the central portion thereof, said central portion being free from perforations, a rotary impeller located above the imperforate central portion of the plate, and means for turning the impeller to cause the fuel to be uniformly moved radially outward over the burner plate as it is burnt, and causing the ash to drop over the edge of the plate and casing.

2. The combination with a heater having a combustion chamber and an ash pit below the same, of an automatic stoker located in the heater and comprising a circular casing constituting an air chamber and of less diameter than the ash pit so that ash may fall from the edge of the casing into the ash pit below, a stationary horizontal apertured upper wall of the casing constituting a burner plate secured to the casing, means for supplying fuel onto the burner plate at the central portion thereof, said central portion being free from perforations, a rotary impeller located above the imperforate central portion of the plate, means for turning the impeller to cause the fuel to be uniformly moved radially outward over the burner plate as it is burnt, and causing the ash to drop over the edge of the plate and casing, means in the casing for collecting ash which falls therein, and means permitting the escape of said ash without the escape of air through the bottom of the casing.

3. The combination with a heater having a combustion chamber and an ash pit below the same, of an automatic stoker located in the heater and comprising a circular casing constituting an air chamber and of less diameter than the ash pit so that ash may fall from the edge of the casing into the ash pit below, a stationary horizontal apertured upper wall of the casing constituting a burner plate secured to the casing, means for supplying fuel onto the burner plate at the central portion thereof, said central portion being free from perforations, a rotary impeller located above the imperforate central portion of the plate adapted to move the fuel radially outward as it is burnt, and to cause the ash to drop over the edge of the plate and casing, said casing having an opening in its bottom, an arcuate blade mounted to turn and move against the bottom to draw ash in the casing to said opening, means under the casing normally closing said opening, means on the upper face of the lower wall of the casing for closing said opening when the means on the bottom of the casing opens to permit the ash to fall and means to actuate all of said movable means.

4. The combination with a heater having a combustion chamber and an ash pit below the same, of an automatic stoker located in the heater and comprising a circular casing constituting an air chamber and of less diameter than the pit so that ash may fall from the edge of the casing into the ash pit below, a stationary horizontal apertured upper wall of the casing constituting a burner plate secured to the casing, means for supplying fuel onto the burner plate at the central portion thereof, said central portion being free from perforations, a rotary

impeller located above the imperforate central portion of the plate adapted to move the fuel radially outward as it is burnt, and to cause the ash to drop over the edge of the plate and casing, a segmental disk on the bottom of the casing mounted to turn, said casing having an opening in its bottom which is closed by the disk during a portion of the turning movement of the latter, a member carried by the disk adapted to scrape the bottom of the casing and draw ash in the casing to the opening, means under the casing normally closing the opening and adapted to be moved to open position only when said opening is closed by the disk and means to actuate all of said movable means.

5. The combination with a heater having a combustion chamber and an ash pit below the same, of an automatic stoker located in the heater and comprising a circular casing constituting an air chamber and of less diameter than the ash pit so that ash may fall from the edge of the casing into the ashpit below, a stationary horizontal apertured upper wall of the casing constituting a burner plate secured to the casing, means for supplying fuel onto the burner plate at the central portion thereof, said central portion being free from perforations, a rotary impeller located above the imperforate central portion of the plate, means for turning the impeller to cause the fuel to be uniformly moved radially outward over the burner plate as it is burnt, and causing the ash to drop over the edge of the plate and casing, a boiler section comprising an outer portion with a vertical double wall forming a water-jacketed casing for the combustion chamber, said fuel supplying means comprising an inverted frusto-conical funnel directing fuel into the combustion chamber, an outer frusto-conical funnel around the first mentioned funnel and constitut-

ing therewith a water-jacket, and a hopper communicating with the first mentioned funnel for directing fuel therinto, said inverted frusto-conical funnel having a restricted vertical opening at the lower end spaced above the center of the burner plate.

6. In a furnace, an air chamber into which ash may fall, said air chamber comprising a casing having a horizontal upper perforated wall and having an opening in its bottom, an arcuate blade mounted to turn and move against the bottom to draw ash in the casing to said opening, means under the casing normally closing said opening, and means on the upper face of the lower wall of the casing for closing said opening when the means on the bottom of the casing opens to permit the ash to fall.

7. The combination with an air chamber having a perforated top plate on which fuel is to be burned, of a frusto-conical funnel above the plate and adapted to direct fuel thereonto, a second frusto-conical funnel enclosing the first mentioned funnel and forming therewith a water jacket, said first mentioned frusto-conical funnel having a restricted vertical opening at the lower end spaced above the center of the said plate, and a hopper above said funnel for directing fuel therinto.

8. A coal burning device, comprising an air chamber, said air chamber consisting of a casing having a horizontal upper perforated wall and having an opening in its bottom, an arcuate blade mounted to turn and move against the bottom to draw ash in the casing to said opening, means under the casing normally closing said opening, and means on the upper face of the lower wall of the casing for closing said opening when the means on the bottom of the casing opens to permit the ash to fall.

VIRGINIUS M. CRUIKSHANK. 40