Aug. 11, 1936. L. W. CORBETT 2,050,747

HEATING APPARATUS

Filed Jan. 26, 1932 2 Sheets-Sheet 1

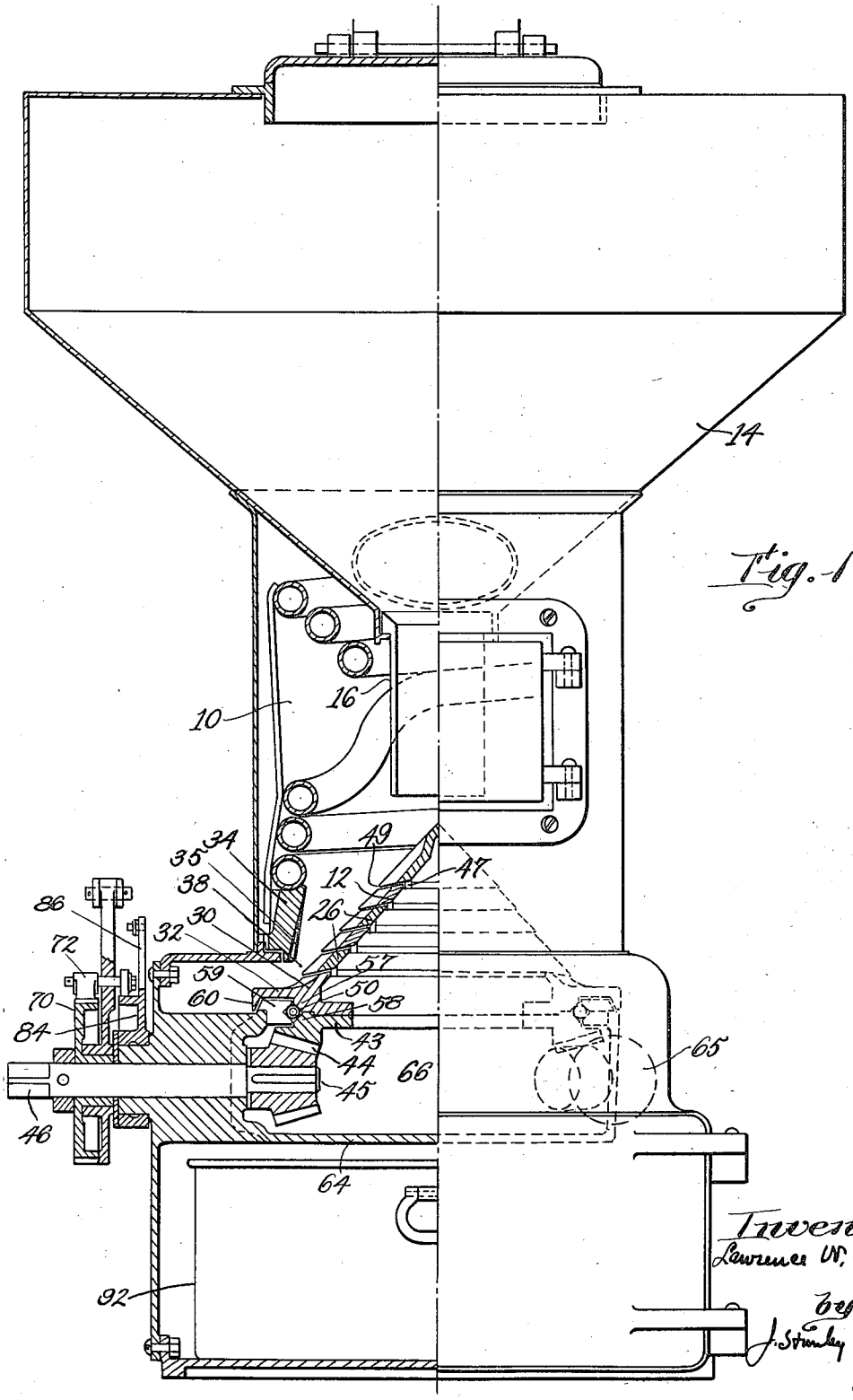


Fig. 1.

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Fig. 2.

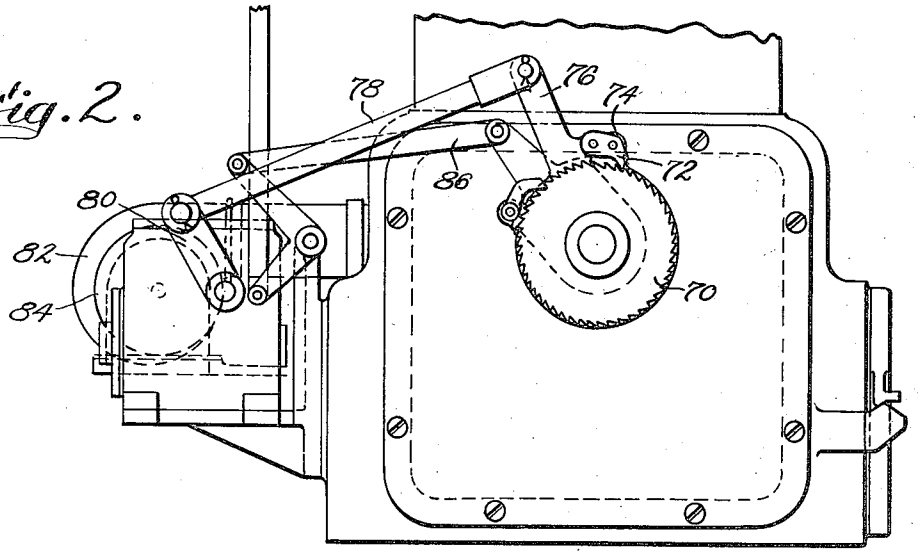
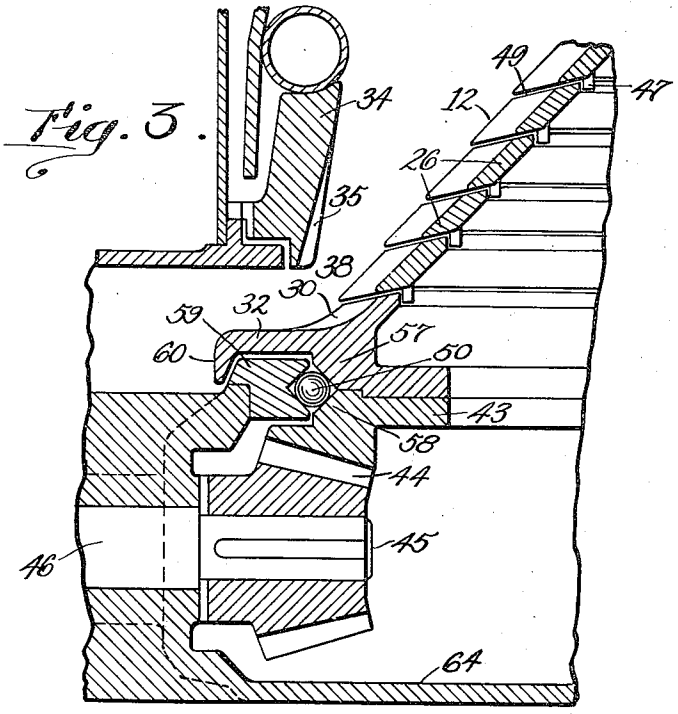


Fig. 3.



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UNITED STATES PATENT OFFICE

2,050,747

HEATING APPARATUS

Lawrence W. Corbett, Belmont, Mass., assignor, by direct and mesne assignments, of thirty-four per cent to William H. Doble, Quincy, Mass., and thirty-three per cent to Unimatic Heater Corporation, New York, N. Y., a corporation of Delaware

Application January 26, 1932, Serial No. 588,880

3 Claims. (Cl. 110—36)

This invention relates to a combustion apparatus and more particularly to heating apparatus for use in dwelling houses and for similar heating purposes where it is desired to burn solid fuel in an automatic manner.

The object of the invention is to provide a novel and improved construction of heating apparatus which may be economically manufactured and with which more efficient combustion may be obtained than with other heating apparatus of which I am aware.

With this object in view and such others as may hereinafter appear, the invention consists in the heating apparatus and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a view partly in section and partly in elevation of the present heating apparatus; Fig. 2 is a side elevation of the lower portion of the machine illustrating the mechanism for operating the grate; and Fig. 3 is an enlarged detail illustrating the lower portion of the improved grate and its relation to the walls of the combustion chamber.

In general the present invention contemplates a construction of combustion apparatus in which an inclined grate and preferably a conical grate is supported for rotation within a combustion chamber. Provision is made for feeding fuel from a supply hopper preferably on the overfeed principle, to the upper portion of the grate. Air for supporting combustion is supplied through the grate and through the fuel bed, and provision is made for automatically moving the grate so that during continued combustion the ash in the fuel bed gradually moves down the grate to be discharged over the base thereof. I have found that the efficiency of the apparatus may be increased by restricting the discharge of the ash over the base of the grate, and for this purpose I prefer to provide the bottom of the grate with a substantially horizontal skirt the upper surface of which is relatively smooth and unobstructed which cooperates with the contiguous portions of the walls of the combustion chamber, and also with the inclined grate to form a restricted throat or passage for the discharge of the ash. I have found that while this horizontal skirt efficiently diminishes the rate of discharge of ash as compared with similar constructions of grate having no skirt, upon rotation or movement of the grate the ash is positively discharged but at the diminished rate. The effect of the diminished rate of ash discharge is to cause the fuel to remain upon the active portion of the grate and within the combustion zone for a sufficient period of time to enable a maximum proportion of the fuel to be consumed so that the ash being discharged contains a minimum proportion of unburned fuel, thus contributing to the efficiency of the apparatus.

Referring now to the drawings, which as above stated illustrate the preferred embodiment of the invention, 10 represents a combustion chamber, 12 a conical grate, 14 a supply hopper for retaining a supply of the solid fuel such as coal and from which the coal is discharged through a coal discharge tube 16 down onto the conical grate. The end of the discharge tube terminates a short distance above the conical grate, and during the operation of the apparatus a constant bed of fuel is maintained. It is preferred to construct the conical grate of a plurality of sections 26 which interlock to rotate as a unit, and the lower section 30 is preferably cast to provide a skirt 32, the upper surface which is relatively smooth and unobstructed is preferably substantially horizontal and of a sufficient width so that the skirt projects outwardly a substantial distance beyond the inner wall of the lower portion of the combustion chamber. The lower portion of the inner wall may be provided with a dead ring 34 having ribs 35 for cooperation with the rotary grate in grinding ash and such clinker as may be formed. The upper surface of the skirt 32 is spaced from the lower portion of the inner wall of the combustion chamber to form a throat or constricted passage indicated at 38.

The conical grate 12 is, as herein shown, made up of a plurality of sections, and each section is provided with depending lugs 47 which cooperate with recesses in the next succeeding section to lock the sections together and to space one section a short distance from the next lower section so as to provide a series of downwardly and outwardly extending air channels 49 through which the primary air may be caused to pass through the fuel bed supported upon the grate. The lower section of the grate is bolted or otherwise secured to a ring 43 having a ring gear 44 cooperating with a driving pinion 45 secured upon the end of a drive shaft 46 rotated through suitable mechanism, as will be described. The grate is supported on a series of ball-bearings 50 within a raceway formed by cooperative surfaces 57, 58 of portions of the lower section of the grate and ring 43 respectively, and by an angular

recess in a supporting ring 59 mounted upon the frame, as shown. The skirt 32 projecting from the lower section of the grate is provided with a downwardly turned lip 60 extended over the supporting ring 59 illustrated in detail in Fig. 3 to thereby assist in protecting the bearings against the entrance of ash and dirt.

The conical grate 12 is hollow, and as herein shown, cooperates with the bottom wall 64 of the burner pot to form a closed chamber 66 to which air is admitted under pressure through an air inlet pipe 65 from any convenient source of supply, as for example a blower or fan, not shown. During the operation of the apparatus the air under pressure from within the closed air chamber 66 passes through the narrow air passages 49 between successive sections of the grate to supply air for the combustion of the fuel. The construction of air pressure chamber 66 formed within the grate and burner pot serves to assist in preventing the entrance of ash or dirt into the bearings 50 by reason of the pressure through the bearings and outwardly under the projecting skirt.

During the operation of the apparatus, provision is made for rotating the grate, and as herein shown, the driving shaft 46 upon which the driving gear 45 is mounted, has affixed to its outer end a ratchet wheel 70 with which a pawl 72 cooperates to advance the ratchet wheel and consequently to effect rotation of the conical grate when the pawl is advanced. The pawl is carried upon the top of a pawl arm 74, as best shown in Fig. 2, which is conected to an arm 76, the latter being connected by a link 78 to a crank 80. The crank 80 is arranged to be revolved from an electric motor 82 through the medium of a reduction gearing 84 of any usual or preferred form now upon the market. Provision is made for controlling the effective throw of the pawl 72 to control the extent of grate movement at each revolution of the crank 80, and as herein shown, a shield member 84 pivoted upon the shaft 46 is arranged to be moved relative to the pawl so as to slide under a pin projecting from the pawl to maintain the nose of the pawl disengaged from the teeth of the ratchet wheel for the desired portion of the normal stroke of the pawl to thereby prevent it from picking up any desired number of teeth. The pivoted shield is preferably connected to a control link 86 running from a thermostat or from a manual control.

In order to supply fuel to the conical grate to maintain a substantially uniform bed or fuel thereon, as herein shown a bulk supply of fuel is stored within a fuel reservoir 14 located above the grate in a position from which the fuel may automatically flow onto the grate by gravity. The flow of the fuel is controlled by the rate of consumption of the fuel bed in cooperation with the ash discharged therefrom and as long as fuel remains in the hopper a substantially uniform fuel bed is maintained upon the grate. During the combustion sufficient air is supplied through the fuel bed to maintain practically the entire fuel bed incandescent, and the ash resulting from the combustion gradually slides and works downwardly toward the restricted throat or passage between the skirt 32 and the dead ring 34 preparatory to being forced over the skirt to drop into the ash-pit where it may conveniently be caught in a removable ash receptacle 92.

From the description thus far it will be observed that in the operation of the combustion apparatus, and after combustion has proceeded for some time after the fire has been started, there is supported upon the conical grate an incandescent cone of fuel and the grate is rotated slowly to assist in causing the ash to progressively move down the grate. At the lower portion of the grate the proportion of ash becomes predominant in the fuel bed and fills the space between the projecting skirt 32 and the dead ring 34. I have found that the projecting skirt 32 contributes considerably in the control of the rate of combustion by reducing the rate of discharge of the ash from over the bottom of the grate, with the result that the fuel bed is maintained upon the active portion of the grate until a maximum amount of fuel has been consumed, so that in the ash deposited in the ash receptacle, a minimum amount of unburned fuel is deposited with the ash. This contributes to the efficiency of the combustion apparatus and is an economical and efficient method of maintaining the fuel bed upon the active portion of the grate for the desired time. An additional advantage is derived from the present skirt 32, and its effect in controlling the dicharge of the ash, namely, that it enables the grate to be rotated at a higher rate to dicharge a given amount of ash, thus obtaining greater agitation in the fire, as compared to a grate having no skirt.

This feature of the present invention by which the rate of discharge of the ash over the base of the conical grate may be thus efficiently controlled to obtain most efficient combustion, while particularly useful in connection with the illustrated apparatus, has nevertheless general utility in connection with other forms of heating apparatus involving a rotary inclined grate, and while the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:—

1. In a heating apparatus for domestic use in burning solid fuel, having a combustion chamber, a rotatable conical grate at the lower part of said combustion chamber, power operated means for slowly rotating said grate, means for feeding solid fuel from a chamber separate from the combustion chamber directly to the apex of said conical grate to provide a conical bed of fuel on said grate, said grate having means for permitting air to pass therethrough from within the grate and for preventing ash from passing downwardly through the grate, an open-topped air chamber beneath said grate adapted to supply air thereto, means for supplying air under pressure to said air chamber, and an ash pit immediately below said air chamber, the periphery of said grate being spaced from the walls of said combustion chamber to provide for the discharge of ash into said ash pit.

2. In a heating apparatus for domestic use in burning solid fuel, having a combustion chamber, a rotatable conical grate at the bottom of said combustion chamber, means for rotating said grate, means comprising a tube terminating adjacent the apex of said conical grate for feeding solid fuel from a chamber separate from the combustion chamber directly to said apex to provide a conical bed of fuel upon said grate, said grate having means for permitting air to pass

therethrough from within the grate and for preventing ash from passing downwardly through the grate, an air chamber beneath said grate and communicating with the interior thereof, means for supplying air under pressure to said air chamber, and an ash pit immediately below said air chamber, the periphery of said grate being spaced from the walls of said combustion chamber to provide for the discharge of ash into said ash pit.

3. In a heating apparatus for burning solid fuel having a combustion chamber, a rotatable conical grate at the lower part of said combustion chamber, power operated means for slowly rotating said grate, means for feeding solid fuel from a chamber separate from the combustion chamber directly to the apex of said conical grate to provide a conical bed of fuel on said grate, said grate having means for permitting air to pass therethrough from within the grate and for preventing ash from passing downwardly through the grate, means forming a closure for the bottom of the grade to provide an air chamber within the grate, means for supplying air under pressure to said air chamber and an ash pit immediately below said air chamber, said air chamber and ash pit being in non-communicating relation whereby to prevent the air under pressure from passing from the air chamber directly into the ash pit, the periphery of said grate being spaced from the walls of said combustion chamber to provide for the discharge of ash into said ash pit.

LAWRENCE W. CORBETT.