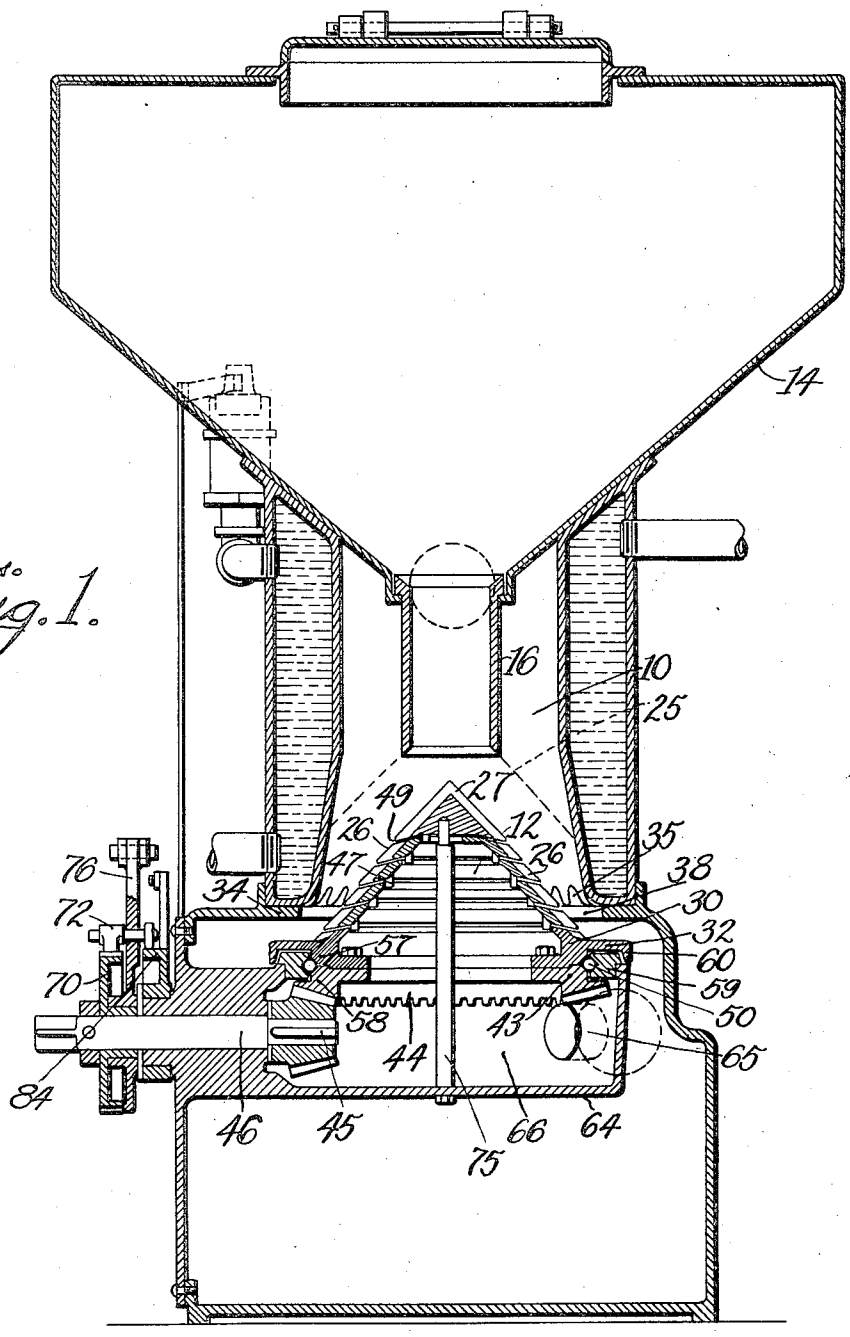
Dec. 10, 1935. L. W. CORBETT 2,023,577

COMBUSTION APPARATUS

Filed Jan. 26, 1932 2 Sheets-Sheet 1

Fig. 1.



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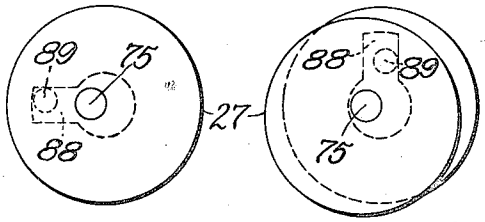


Fig. 3. Fig. 4.

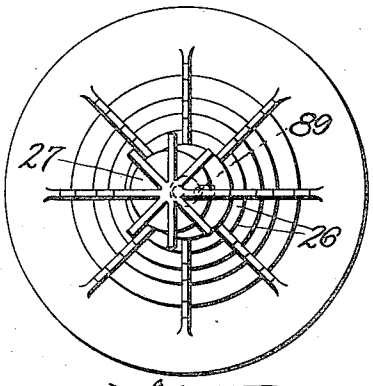


Fig. 7.

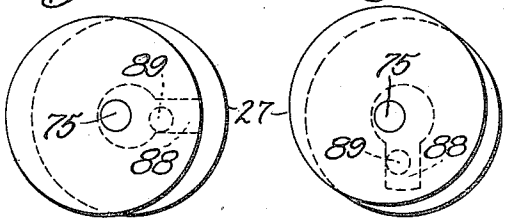


Fig. 5. Fig. 6.

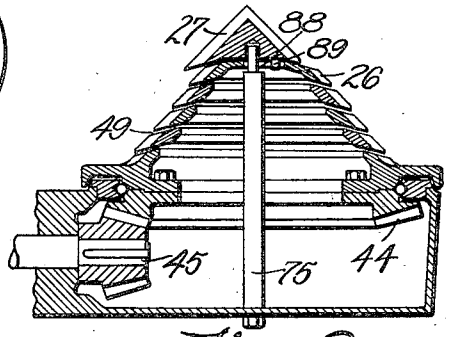


Fig. 8.

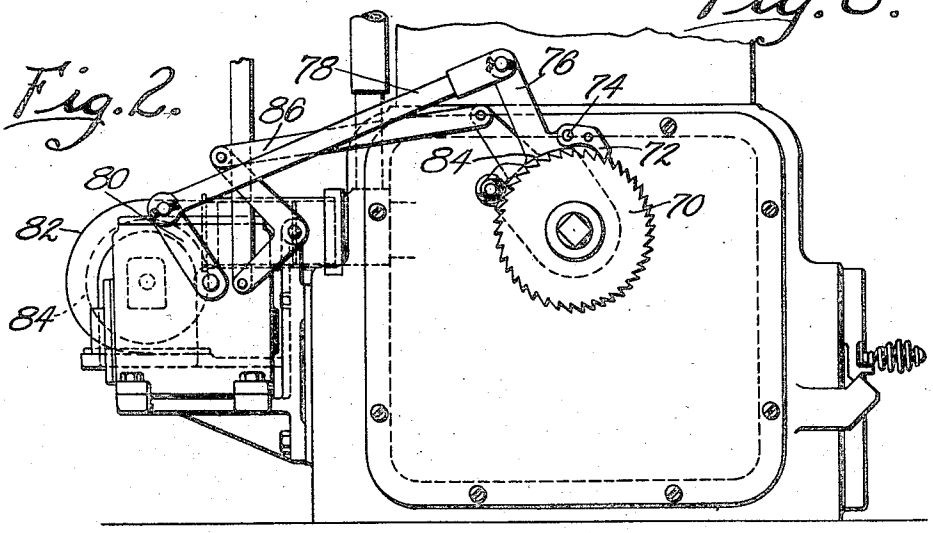


Fig. 2.

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UNITED STATES PATENT OFFICE

2,023,577

COMBUSTION APPARATUS

Lawrence W. Corbett, Belmont, Mass., assignor, by direct and mesne assignments, of thirty-three per cent to Blanche L. Doble, Hingham, Mass., and thirty-four per cent to William H. Doble, Quincy, Mass.

Application January 26, 1932, Serial No. 588,881

2 Claims. (Cl. 110—36)

This invention relates to combustion apparatus for burning solid fuel, and more particularly to heating apparatus for domestic purposes, such as to apparatus for heating dwelling houses and garages, moderate sized buildings, and also for heating water for domestic purposes.

In general, the invention has for an object to provide a novel and improved construction of heating apparatus of the character specified which is adapted to efficiently burn the various commercial grades of coal and coke in such manner as to avoid interruption in its operation by reason of the formation of clinker in the fuel bed.

With this object in view and such other objects as may hereinafter appear, the invention consists in the combustion apparatus and in the 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 vertical sectional view of the preferred form of combustion apparatus; Fig. 2 is a side elevation of the lower portion of the heater illustrating the mechanism for rotating the grate; Figs. 3 to 6 are diagrammatic details in plan illustrating different positions assumed by contiguous portions of the upper and next lower sections of the grate; and Figs. 7 and 8 are views in plan and vertical section respectively of the improved grate.

In general, the present invention contemplates a combustion apparatus for burning solid fuel, such as any of the commercial grades of coal, in which provision is made for reducing to a minimum the formation of clinker in the fuel bed. The combustion apparatus is provided with a combustion chamber and with a grate for operatively supporting the fuel bed. The grate may and preferably will be inclined and the fuel deposited upon the upper portion thereof to maintain a continuous fuel bed upon the grate as combustion proceeds. Provision is made for agitating the fuel bed to reduce the formation of clinker, and for this purpose the grate is preferably provided with a section movable with relation to the main body of the grate in a direction such as to cause displacement of the fuel bed and to thereby effect agitation thereof. In the preferred form of the invention the grate is preferably of conical shape and the upper portion of the grate is made separate from the body of the grate. Provision is made for rotating the entire grate and, at the same time, for effecting oscillation of the upper section of the grate in an eccentric path to agitate the upper portion of the fuel bed.

Referring now to the drawings, I have for purposes of illustration shown the invention as embodied in combustion apparatus suitable for heating dwelling houses and other moderate sized buildings, and for general water heating purposes, in which 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 in the position indicated by the dotted line 25 in Fig. 1. 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 of which 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 is provided with 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 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 on the pawl arm 74, as best shown in Fig. 2, which is connected 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 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 of 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 length of 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 not shown.

Referring now more particularly to Figs. 3 to 8, in the form of grate illustrated therein, provision is made for effecting relative displacement or movement of the upper section 27 of the grate with relation to the remainder of the grate, and for this purpose the upper section 27 of the grate is mounted independently of the remainder of the grates upon the upper end of a post 75 affixed to the burner pot so to as to permit the upper grate section to rotate about the axis of the post 75. The next lower of the grate sections 26 is provided with a slot 88 of the shape illustrated and within which a pin 89 depending from the upper grate section 27 is adapted to travel, so that during the rotary movement of the main body of the grate about its own axis, the upper grate section 27 is moved by the engagement of the walls of the slot 88 with the pin 89. The post 75 is mounted at one side of the axis of the conical grate, and with this construction, as the conical grate is rotated through the driving mechanism previously described, the upper grate section is caused to be displaced with relation to the main body of the rotating grate in the manner illustrated diagrammatically in Figs. 3, 4, 5 and 6. The result obtained during combustion is that the upper section of the conical fuel bed is agitated by what amounts to a revolution of the conical grate about the post 75, thus expanding and contracting or kneading the upper portion of the conical fuel bed in a manner such as to reduce to a minimum the tendency of the ash to fuse together and form clinker at this point.

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 combustion apparatus of the character described, in combination, a combustion chamber, a conical grate mounted within the chamber with the apex thereof uppermost in a position to be rotated about the main vertical axis, means for slowly rotating the grate, means for automatically supplying fuel to the upper portion of the grate including a fuel discharge tube terminating in close proximity to the grate, said grate being provided with a top section movably mounted with relation to the remainder of the grate upon an axis which is non-coincident with the axis of the grate and connections between said top section and the remainder of the grate whereby during rotation of the main body of the grate about its axis the upper section of the grate is moved in an eccentric path with relation to the axis of the grate to thereby reduce to a minimum the formation of clinker in the upper portion of the conical fuel bed supported on the grate.

2. In a combustion apparatus of the character described, in combination, a combustion chamber, a conical grate mounted within the chamber with the apex thereof uppermost in a position to be rotated about the main vertical axis, means for slowly rotating the grate, means for automatically supplying fuel to the upper portion of the grate, said grate being provided with a top section movably mounted with relation to the remainder of the grate upon an axis which is non-coincident with the axis of the grate and connections between said top section and the remainder of the grate whereby during rotation of the main body of the grate about its axis the upper section of the grate is moved in an eccentric path with relation to the axis of the grate to thereby reduce to a minimum the formation of clinker in the upper portion of the conical fuel bed supported on the grate.

LAWRENCE W. CORBETT.