

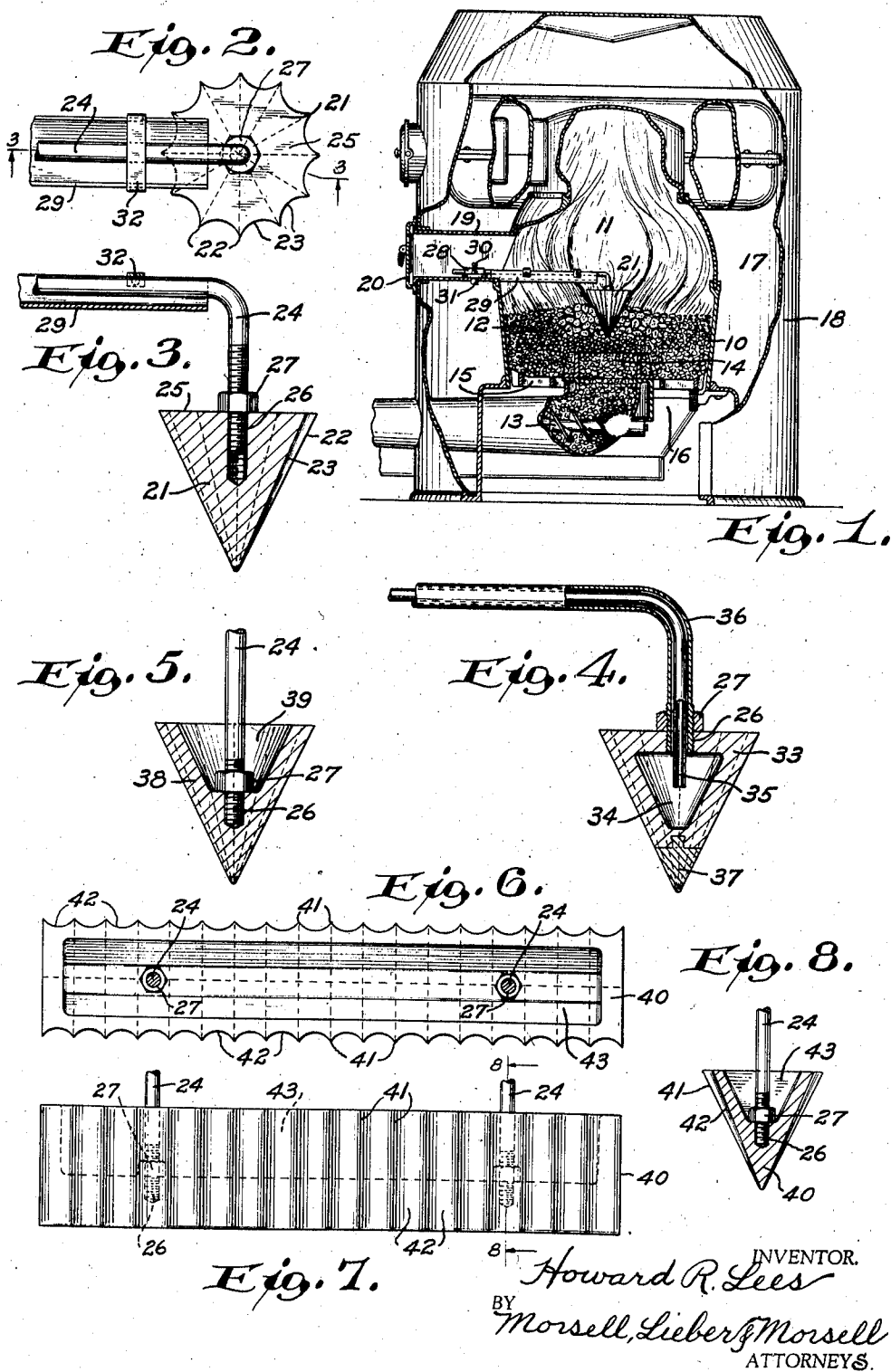
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FURNACE APPLIANCE

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FURNACE APPLIANCE

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7 Claims. (Cl. 110-45)

My invention relates in general to an improved appliance for the combustion chambers of furnaces or boilers, and relates more specifically to improvements in the construction and operation of fuel and hot gas distributors for stoker fed furnaces or the like.

Generally defined, an object of my present invention is to provide a simple and durable appliance which will effectively prevent undesirable mass coking and clinkering of the fuel fed into a combustion chamber by an automatic stoker or the like, and which will insure most efficient distribution of the fuel and of the hot gases with respect to the heat transfer surfaces.

When utilizing an ordinary automatic stoker to deliver solid fuel such as partially pulverized coal upwardly into the central portion of a furnace combustion chamber, the fuel directly above the inlet tends to congeal into a solid mass of coke which rises high into the chamber and eventually clinkers. The air admitted to the combustion chamber near the fuel inlet, rises more or less in the form of a tube from the base of the coke column and does not spread uniformly throughout the fuel bed; and when the column has attained excessive height it topples over toward one side of the fire pot and thus causes extremely uneven distribution of the fuel. The ideal condition is to maintain a fuel bed of substantially uniform thickness and consistency with uniform flow of fresh air throughout the entire area of the bed, and this condition is not attainable with the prior ordinary stoker assemblages.

It is therefore a more specific object of my present invention to provide simple means applicable to various types of upwardly feeding automatic stokers, so as to produce uniform distribution of fuel over the entire fuel bed and uniform flow of air therethrough, without in any manner interfering with the normal operation of the stoker.

Another specific object of the invention is to provide a new and useful combined fuel breaker and fuel and air distributor, especially applicable to automatically supplied fuel combustion chambers, which may be conveniently installed and requires no care or attention after proper installation.

A further specific object of the present invention is to provide a simplified fuel and air distributor for furnaces, which will effectively withstand the heat of combustion, and which may be manufactured and installed at moderate cost.

Still another specific object of my invention is to provide an improved appliance for effecting most efficient distribution of fuel and gases in a combustion chamber, and which may also be utilized to heat liquid for diverse purposes.

These and other specific objects and advantages of the invention will be apparent from the following detailed description.

A clear conception of several embodiments of my invention, and of the mode of constructing and of utilizing appliances built in accordance with the improvement, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a central vertical section through a typical hot air furnace equipped with an automatic fuel stoker and having one of my appliances installed therein, this illustration showing the normal functioning of the improved device;

Fig. 2 is an enlarged top view of one type of the improved appliance especially adapted for use in circular combustion chambers;

Fig. 3 is an approximately central vertical section through the appliance of Fig. 2, the section being taken along the line 3-3;

Fig. 4 is a true central vertical section through another type of the improved appliance, adapted to heat liquid and having a special heat resisting guide point;

Fig. 5 is a central vertical section of still another type of my appliance adapted for use in circular combustion chambers;

Fig. 6 is a top view of a modified form of the improved appliance applicable to an elongated substantially rectangular fire box;

Fig. 7 is a side elevation of the assemblage shown in Fig. 6; and

Fig. 8 is a transverse vertical section through the device of Figs. 6 and 7, taken along the line 8-8 of Fig. 7.

While the invention has been shown herein as being applied to a certain type of hot air furnace having a particular type of automatic fuel stoker associated therewith, it is not the intention to thereby unnecessarily limit the scope or utility of the improvement.

Referring especially to Figs. 1 to 3 inclusive of the drawing, the device as shown therein is especially applicable to a furnace of the type illustrated in Fig. 1 having an approximately circular fire pot 10 above which a combustion chamber 11 is located, and to the lower central portion of which solid fuel 12 is adapted to be fed by 55

means of a stoker 13 having an upwardly directed fuel delivery opening 14. The fuel opening 14 is directly surrounded by a grate 15 through which air for supporting combustion is admissible from an air duct 16; and the fire pot 10 and combustion chamber 11 are embraced by an air space 17 formed by the outer casing 18, and through which the heat conveying air circulates. A conduit 19 connects the combustion chamber 11 with the exterior of the outer casing 18 at one side of and above the fire pot 10, and is provided with an inspection door 20; and all of these elements of the assemblage are relatively standard in both hot air furnaces and in hot water boilers, except that in the latter the space 17 is replaced by suitable water conveying passages or flues.

The improved appliance as illustrated in Figs. 1 to 3 inclusive, comprises an inverted downwardly converging tapered body or cone 21 formed of special heat resistant metal and having an annular series of projections 22 forming upwardly enlarging intervening recesses 23; a suspension arm or rod 24 secured to the central portion of the base 25 of the cone 21 by means of screw threads 26 and a lock nut 27; a support 28 for the outer end of the rod 24 adapted for attachment to the furnace inspection conduit 19; and a guard 29 for the intermediate portion of the rod 24 which is directly exposed to the flame and hot gases of combustion. In this embodiment of the invention, the cone 21 is formed of a solid block of metal, and the projections 22 and intervening recesses 23 form corrugations on the outer conical surface, which gradually increase in size approaching the base 25. These corrugations face the fuel admission opening 14 and are obviously inclined so as to direct the entering solid fuel 12 radially outwardly over the grate 15; and the projections 22 and recesses 21 while permitting the advancing fuel to spread uniformly, will prevent this fuel from sliding around the cone 21 and out of the radial planes of advancement. The space beneath the cone 21 and above the opening 14 is entirely free from permanent obstructions so that the entering fuel may seek its own path of travel, and the cone 21 may be adjusted vertically along the screw threads 26 to any desired height and may thereafter be locked in adjusted position with the aid of the nut 27. The suspension rod 24 is also formed of heat resistant metal, and the outer end of this rod is preferably adjustably secured to the support 28 by means of a cap screw 30 so that the cone 21 can be shifted within the chamber 11 both longitudinally of the rod axis and angularly about this axis. The support 28 is provided with a central vertical pivot 31 about which it is slightly angularly adjustable so as to permit slight angular displacement of the rod 24 laterally of its axis in a horizontal plane and these several adjusting means will obviously permit fixed location of the cone 21 in any desired position. The guard 29 which need not necessarily be used, may be formed of an inverted angle bar extending beneath the medial portion of the rod 24, and this guard 29 may be loosely suspended from the rod 24 by transverse clips 32.

In Fig. 4 I have shown another type of the improved appliance comprising a hollow body or cone 33 having an internal water heating chamber 34 provided with a cold water inlet pipe 35 and a hot water discharge pipe 36 sur-

rounding the pipe 35 and secured to the cone 33 by screw threads 26 and a lock nut 27. The inner and outer water circulating pipes 35, 36 may be utilized to provide a support for the cone 33, and the water admitted to the chamber 34 through the inlet 35 is delivered through the outlet pipe 36 in heated condition and may be utilized for any desired purpose. The modified cone 33 of Fig. 4 is preferably provided with a corrugated tapered outer surface as in the cone 25, but the modified structure is additionally provided with a special high-heat resistant point 37 which may be rigidly attached to the main body of the cone 33 in any suitable manner. Such a special point may also be applied to the cone 25 of Figs. 2 and 3, and to the other modifications hereinafter described.

In Fig. 5 is shown still another type of the improved device contemplated to save material from which the distributing cone is made. In this embodiment of my invention, the inverted cone 38 has a depression 39 therein, within which the screw threads 26 and lock nut 27 are confined and protected from the flame and hot gases. The suspension rod 24 of this modification, as well as the suspension devices of the other types, may be disposed vertically instead of horizontally as shown in Fig. 1, and in that case the upper end of the rod 24 may be attached to the top of the combustion chamber 11 in any suitable manner.

In Figs. 6, 7 and 8, I have shown a still further modification of my appliance, which is especially adapted for use in stoker fed combustion chambers of elongated rectangular form. This modification comprises an elongated downwardly converging body 40 formed of special heat resistant material and having external projections 41 and intervening recesses 42 forming fuel guiding and distributing corrugations; and one or more suspension rods 24 secured to the body 40 within a depression 43 therein, by means of screw threads 26 and lock nuts 27. The corrugations formed by the projections 41 and recesses 42 on the opposite sides of the body 40, form parallel upwardly and outwardly inclined guideways for conducting the upwardly advancing fuel uniformly over the grate and fire bed.

Since the operation or functioning of the several modifications is identical, it will suffice to describe the normal operation of the appliance as specifically illustrated in Fig. 1. After the parts have been constructed as herein above described, the support 28 may be attached to the conduit 19 of the furnace, and the suspension rod 24 may be secured to the support 28 after the cone 25 has been applied thereto. By manipulating the various adjusting means, the cone 25 may be located at any desired height or location with respect to the fuel inlet opening 14, and ordinarily a central disposition with the cone high enough so as not to undesirably obstruct the fuel flow, is desirable. After the cone 25 has been properly positioned and fixed in such position, operation of the stoker 13 will cause the column of fuel 12 rising through the inlet opening 14 to engage the downwardly directed apex of the inverted cone 25 and to travel along the projections 22 and recesses 23. The upwardly and outwardly inclined gradually widening corrugations formed by these projections and recesses, will permit the fuel 12 to gradually spread and will divert the fuel away from the central axis of the chamber 11 and

uniformly distribute the same over the grates 15 and over the fuel bed, so as to constantly maintain a bed of approximately uniform thickness and consistency. The fresh air admitted from the duct 16 flows upwardly through the fuel bed, and thus insures uniform and complete combustion; and the hot gases of combustion leaving the bed are diverted outwardly by the upper end of the cone 25 toward the walls of the combustion chamber 11 which are in direct contact with the space 17, thus insuring most effective transfer of heat from the chamber 11 to the air flowing through the space 17. In this manner uniform distribution of the fuel, air and gases is insured at all times, and undesirable coking, clinkering and uneven delivery of fuel is positively avoided without in any manner interfering with the stoker operation.

From the foregoing detailed description, it will be apparent that my present invention provides an extremely simple, yet highly efficient appliance for insuring most effective distribution of fuel and gases in a stoker fed combustion chamber. The improvement is readily applicable, by virtue of the various adjustments provided, to various types of stoker fed furnaces and boilers, and the corrugations provided on the exterior of the downwardly converging body are important in order to prevent undesirable slippage of the fuel laterally along the surface of the body and to insure uniform distribution. The distributing body may be suspended in any suitable manner, preferably from above so as to eliminate undesirable obstruction to the flow of fuel delivered upwardly through the feed opening 14, and the body may be readily formed hollow and utilized as an auxiliary water heater as shown in Fig. 4. By forming the appliance of suitable heat resistant material, it will not be detrimentally affected by the intense heat, and this fact has been proven by extensive actual use of the improved device under severest operating conditions. The improved appliance may obviously be manufactured at moderate cost, and may be conveniently installed by a novice, and requires no special attention after proper initial installation thereof.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of operation, herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of a downwardly converging tapered body pointing into the burning fuel bed and centrally toward the fuel admission opening, the space below said body being devoid of permanent obstructions and the tapered walls thereof being provided with upwardly extending corrugations for positively guiding the rising fuel in segregated strips while directing the same outwardly.

2. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of a downwardly converging tapered body pointing into the fuel bed and having upwardly and outwardly directed fuel guiding corrugations.

3. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of a downwardly converging tapered body pointing into the fuel bed and having upwardly and outwardly directed fuel guiding corrugations, and means for suspending said body from above.

4. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of a downwardly converging tapered body pointing into the fuel bed and having upwardly and outwardly directed fuel guiding corrugations, means for suspending said body from above, and means for effecting adjustment of said body relatively to said fuel feeding means.

5. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of an inverted cone pointing into the fuel bed and having an annular series of ridges and intervening tapered grooves forming upwardly widening fuel spreading and guiding corrugations.

6. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of an inverted cone pointing into the fuel bed and having an annular series of ridges and intervening tapered grooves forming upwardly widening fuel spreading and guiding corrugations, and means for suspending said cone from above to avoid obstructions therebelow.

7. In combination with a combustion chamber having means for feeding fuel upwardly thereto, of an inverted cone pointing into the fuel bed and having an annular series of ridges and intervening tapered grooves forming upwardly widening fuel spreading and guiding corrugations, and adjustable means for suspending said cone above the fuel inlet, said suspension means being formed to permit both vertical and lateral adjustment of the cone.

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