Aug. 23, 1938.

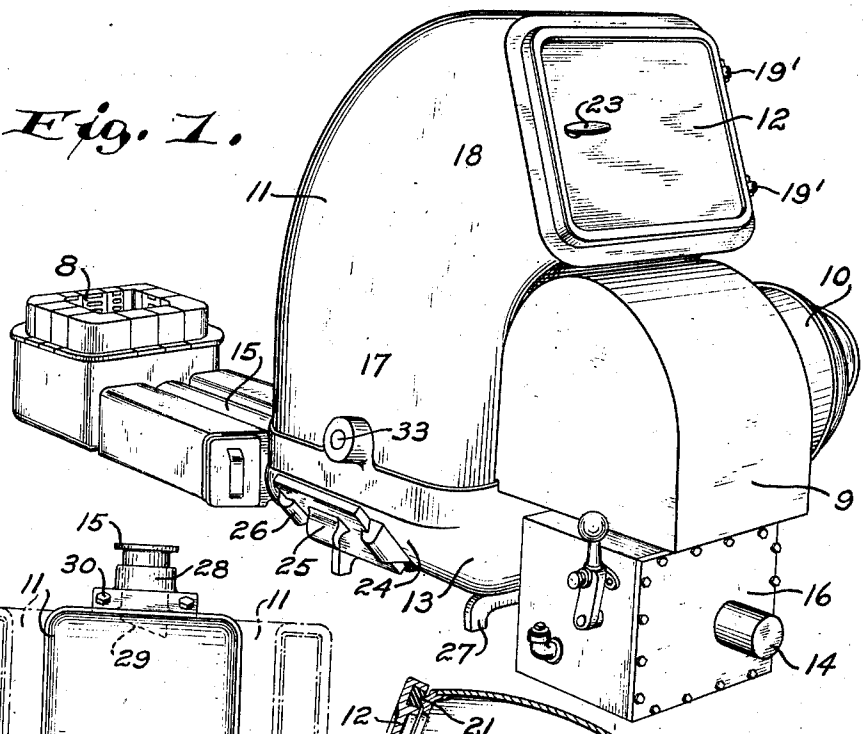
J. GOETZ

2,127,726

STOKER

Filed Oct. 3, 1936

Fig. 1.



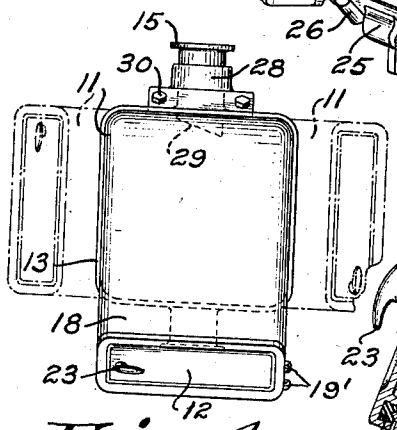




Fig. 4.

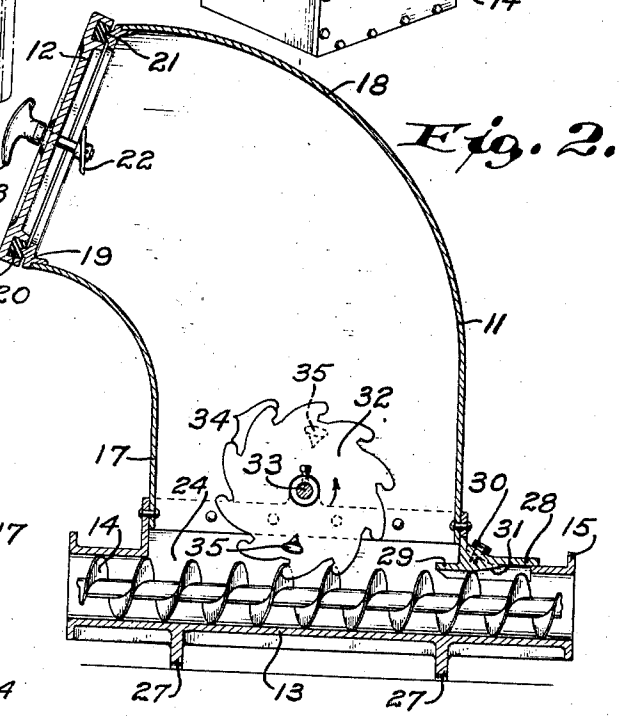
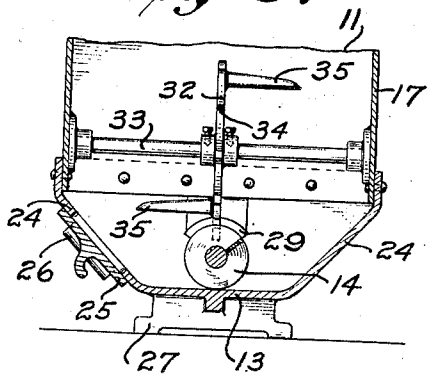



Fig. 2.

Fig. 3.




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Patented Aug. 23, 1938 2,127,726

# UNITED STATES PATENT OFFICE

2,127,726

## STOKER

John Goetz, Wauwatosa, Wis.

Application October 3, 1936, Serial No. 103,880

11 Claims. (Cl. 198—64)

My present invention relates generally to improvements in the art of feeding pulverulent fuel into combustion chambers, and relates more specifically to improvements in stokers for delivering regulated quantities of coal or the like to furnaces or boilers.

Generally defined, an object of my present invention is to provide an improved stoker which is simple, compact and durable in construction, and which is moreover highly efficient in use.

Many types of stokers have heretofore been proposed and placed upon the market, but all of these prior devices are relatively objectionable either because of their unsightly appearance, or due to the inconvenience encountered in supplying fuel to the hopper, or on account of the inefficiency of the mechanical feed structure, or because of the escaping dust and fumes. Since stokers are rapidly becoming more popular for residential use, it is important that such devices present an attractive appearance and that they be readily accessible for the delivery of fuel thereto at least to the same extent as the furnace or boiler firing door was accessible. It is also desirable that these mechanical stokers be dependable in operation, and foolproof against excessive damage in case the feed mechanism becomes obstructed by tramp iron or other abnormal objects which may frequently appear in low grade fuel such as is ordinarily supplied to a stoker. It is moreover desirable to have the stoker bin and other casings effectively sealed against possible escape of gases and dust, and none of the prior commercial fuel stokers have embodied all of these important and desirable features.

It is therefore a more specific object of the present invention to provide an improved stoker assembly which obviates all of the objectionable features of the prior devices of this type, and which is dependable in operation in that the fuel supply is automatically and positively delivered from the hopper to the grate.

Another specific object of my present invention is the provision of a stoker unit which is extremely attractive in appearance, and wherein the fuel may be most conveniently supplied to a hopper which is adapted to be set for loading from the rear of the unit or from either side thereof.

A further specific object of this invention is to provide an improved hopper and feed screw assemblage wherein the fuel is effectively delivered by gravity to the zone of action of the screw, and the latter is adapted to most effectively withdraw the descending fuel charge from the bottom of the hopper.

Still another specific object of my present invention is the provision of improved instrumentalities for positively preventing choking of the fuel feed ducts of a stoker, and for protecting the apparatus against excessive damage due to abnormal conditions of operation.

An additional specific object of the invention is to provide improved closures for a stoker supply bin or hopper, which while permitting ready access to all portions of the normally concealed storage space and feed mechanism, will also effectively guard against possible escape of gases, soot and dust.

My present invention also contemplates provision of an improved stoker unit which can be manufactured and sold at moderate cost, which may be quickly installed, and which is extremely economical in normal operation.

The above as well as other specific objects and advantages of this invention will be apparent from the following detailed description.

A clear conception of embodiments of the several features constituting the present invention, and of the mode of constructing and of operating stoker units embodying these features, 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 combined rear and side perspective view of a complete stoker unit especially adapted for industrial or residential service;

Fig. 2 is an enlarged central vertical longitudinal section through the fuel supply structure, showing the improved hopper positioned for loading from the rear;

Fig. 3 is a similarly enlarged central vertical transverse section through the lower portion of the improved fuel supply assemblage; and

Fig. 4 is a somewhat diagrammatic top view of the hopper assemblage, showing the hopper in solid lines positioned for rear loading, and in dot-and-dash lines positioned for alternative side loading.

While my invention has been illustrated and described herein as being specifically applied to a relatively small stoker unit for coal especially adapted for domestic service, it is not the intent to thereby unnecessarily restrict the scope, since some of the improved features may obviously be more generally applied.

Referring especially to Fig. 1 of the drawing, the improved stoker unit shown therein comprises

in general a grate assemblage 8 which is normally disposed beneath the combustion chamber of a furnace or boiler; a fan or blower 10 rotatable by means of an electric motor 9 to deliver air to the combustion chamber through the grate assembly 8; a hopper 11 for receiving the fuel supply through a door 12 and having an upwardly open cup-shaped supporting base 13; a normally concealed feed screw 14 for delivering fuel forwardly from the hopper 11 to the grate assembly through a tubular casing 15; and a gear box 16 forming a housing for transmission gearing adapted to transmit rotary motion from the motor 9 to the fuel feed screw 14 in a well known manner.

The hopper 11 which is preferably formed of sheet metal, is of improved construction as shown in Figs. 2, 3 and 4, and comprises a downwardly directed substantially upright portion 17, the lower end of which is disposed within and is in open communication with the interior of the cup-shaped base 13; and an upwardly laterally directed and curved portion 18 of gradually diminishing cross sectional area terminating in a fuel supply opening disposed beyond the adjacent side wall of the hopper and with which the door 12 coacts. The lower portion of this hopper 11 is of equilateral polygonal cross-sectional shape, substantially square as shown in Fig. 4, and the confining wall for the lower hopper end is of like shape so that the hopper 11 may be interchangeably positioned with its upper inlet opening either rearwardly accessible as shown in solid lines in Fig. 4, or accessible from either side of the stoker as indicated in dot-and-dash lines. When the hopper 11 has been applied to the base 13 in the desired position, it may be riveted, welded or bolted to the base so as to rigidly interconnect these parts.

The rectangular peripheral frame 19 of the lateral upper inlet opening, is preferably located outwardly beyond the adjacent hopper side wall and lies in a plane which is slightly inclined toward the hopper axis as shown in Figs. 1 and 2, and the fuel supply opening is preferably disposed above the floor line at a height substantially equal to that of a standard furnace or boiler firing opening. The inlet closure door 12 is swingably suspended by means of hinges 19' from one side of the frame 19 and has a continuous seal 20 formed of flexible material such as rubber, which is adapted to be forced into sealing contact with the frame ridge 21 with the aid of a latch 22, see Fig. 2. The latch 22 and the door 12 are manipulable by means of a handle 23, and it will be noted that when the door 12 is located rearwardly over the motor 9 as illustrated in Fig. 1, the exposed portion of the stoker assemblage has an attractive and compact streamlined appearance.

The improved cup-shaped hopper base 13 may be formed in any suitable manner and has oppositely inclined side walls 24 connected at their lower ends with a flat bottom which extends beneath the fuel feed screw 14 as shown in Figs. 2 and 3, thereby exposing both the top and both sides of the screw 14 to the fuel descending from the hopper 11 upon the base. One or both of the inclined side walls 24 may be provided with an opening which is normally closed by means of a readily removable closure plate 25 coacting with guide lugs 26 as shown in Figs. 1 and 3, and the base 13 may also be provided with suitable supports 27. The tubular casing 15 within which the screw 14 is rotatable, may be formed in sections, one of which is formed integral with the base 13 as indicated in Figs. 2 and 4 and has an upper opening therein extending from the forward lower wall of the hopper 11 along the top of the screw 14. This upper opening is normally sealed by a special closure plate 28 shown in detail in Figs. 2 and 4, this plate having a rearwardly extending portion 29 projecting along the screw beneath the hopper wall and normally being held in position by cap screws 30. The rear end of the plate 28 has its edge disposed at an angle conforming substantially with the pitch of the screw 14, and the medial lower face 31 of the plate has a sloping shape so that when the cap screws 30 are removed or broken, the plate 29 will be automatically forced forwardly by the screw 14 and will be simultaneously lifted out of the opening to expose the adjacent portion of the feed screw.

While the hopper 11 is formed downwardly diverging or enlarging in cross section in order to prevent bridging of the fuel over the conveying screw 14, I may additionally provide automatic bridging preventing mechanism such as disclosed in detail in Figs. 2 and 3. This improved mechanism comprises a central disk or wheel 32 supported for free rotation within the center of the lower hopper portion 17 by a horizontal shaft 33 which spans the hopper. The disk wheel 32 has a peripheral series of abutments 34 which are successively engageable with the constantly advancing forward face of the feed screw 14, to continuously revolve the wheel; and also has laterally projecting cutters or spurs 35 extending in opposite directions therefrom. It will be apparent that as the screw 14 is rotated, the spurs 35 will be revolved within the lower hopper portion 17 and will positively prevent bridging of fuel within the hopper 11 over the feed screw 14. The fuel feed screw 14 is of well known construction, preferably having different pitch as it approaches the grate assembly 8, and is adapted to be driven at variable speeds through speed change gearing of usual and well known construction confined within the gear box 16.

During normal operation of the improved stoker unit, the motor 9 is operable to actuate the blower 10 and to thereby supply air to the grate assembly 8, and is simultaneously functioning to rotate the fuel feed screw 14, whenever the motor is placed in operation. The hopper 11 may be charged with bulk fuel when the door 12 is opened, and the lateral inlet opening of the hopper 11 obviously enables original disposition of this door 12 so as to permit most convenient loading of the hopper from the fuel supply bin. The fuel admitted to the hopper 11 descends toward the cup-shaped base 13 and settles or slides along the inclined side walls 24 toward the exposed sides of the rotating screw 14. As the screw 14 rotates, the disk wheel 32 is simultaneously revolved about the axis of its supporting shaft 33, thereby causing the spurs 35 to travel through the mass of fuel within the lower portion of the hopper 11 and to prevent packing or bridging thereof. The fuel bed is thus caused to move downwardly and inwardly toward the screw 14 both from the top and sides, and this action enables the feed screw to constantly withdraw a full charge of fuel from the hopper so long as the latter is properly supplied. This operation of the fuel feeder is obviously entirely automatic and requires no attention except the maintenance of a sufficient supply of fuel to the hopper.

In case the admitted fuel contains a large piece of tramp iron or some other hard object which cannot be broken and fed by the screw 14, the object might damage the screw or casing if no pro-

vision were made to prevent such damage. Such an object will be fed by the screw 14 toward the conveyor tube or casing 15, and upon striking the inwardly projecting portion 29 of the plate 28, will ultimately produce sufficient pressure to break the cap screws 30. After these clamping screws are broken, the plate 28 will be pushed along the casing 15 and will be lifted clear of the adjacent opening, by the lower inclined surface 31. The obstructive hard object will subsequently escape through the upper opening in the casing 15, and the closure plate 28 may thereafter be reapplied to the opening with new cap screws 30.

The interiors of the hopper 11 and screw casing 15 besides being freely accessible through the door 12 and past the plate 28, are also accessible upon removal of the side closure plate 25. All portions of the fuel feed assemblage are thus conveniently accessible for inspection and repairs, and the mechanism is effectively protected against serious damage. Since the fuel supply door 12 is disposed similar to an ordinary firing door, the hopper 11 may be readily loaded, and the formation of the hopper with a symmetrical polygonal lower end which is interchangeably cooperable with the base 13 in different angular positions, permits location of the door at the most convenient place of access.

From the foregoing description it will be apparent that the present invention provides a stoker assembly which is highly dependable and automatic in operation when properly supplied with fuel, and which may be conveniently loaded. The unit besides being readily accessible, is compact and very attractive in appearance, and is also extremely durable in construction. The fuel is most effectively delivered to the feed screw by the inclined base walls and stirring device cooperating with the hopper formation, thus insuring most effective delivery of fuel to the grate. The apparatus is moreover protected against serious damage, and is also well guarded against possible escape of gases, soot and dust. The improved stoker unit may be manufactured, installed and operated at moderate cost and has proven highly efficient in actual commercial operation.

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

I claim:—

1. In a stoker, feed mechanism for delivering fuel to a place of utilization, a hopper for delivering fuel to said feed mechanism and having a laterally directed upper wall and a fuel inlet opening at one side thereof beneath said wall, and means for interchangeably positioning said hopper to permit injection of fuel through said inlet opening either longitudinally or laterally of the direction of fuel delivery from said hopper by said mechanism.

2. In a stoker, a feed screw for delivering fuel to a place of utilization, a hopper having a downwardly extending lower portion for depositing fuel into the zone of action of said screw and also having a laterally directed upper wall and a fuel inlet opening near the top and at one side thereof beneath said wall, and means for interchangeably supporting said hopper to permit injection of fuel through said opening in different directions.

3. In a stoker, fuel feed mechanism, a hopper for delivering fuel to said mechanism and comprising a downwardly directed lower portion and a laterally curved upper portion terminating in a substantially horizontally directed inlet opening at the upper end and at one side of the hopper, and a laterally opening closure door for said inlet opening.

4. In a stoker, fuel feed mechanism, a hopper for delivering fuel to said mechanism and comprising a downwardly directed lower portion and a laterally curved upper portion terminating in a substantially horizontally directed inlet opening at the upper end thereof, a laterally opening closure door for said inlet opening, and a support for said hopper formed to permit interchangeable positioning of said door in different locations.

5. In a stoker, a fuel feed screw, a base having fuel supporting surfaces inclined at slight angles laterally toward and a substantially horizontal surface connecting the adjacent ends of said inclined surfaces and extending beneath said screw, a hopper supported by said base and having a downwardly directed lower portion and a laterally directed converging upper portion provided at its end with a laterally directed side inlet opening, and a laterally swingable closure door for said opening.

6. In a stoker, a fuel feed screw, a base having fuel supporting surfaces inclined at slight angles laterally toward and extending horizontally beneath said screw, a hopper supported by said base and having a downwardly directed lower portion and a laterally directed converging upper portion provided at its end with a laterally directed side inlet opening, a laterally swingable closure door for said opening, and means for securing said lower hopper portion to said base in different fixed positions.

7. In a stoker, a fuel feed screw, a base having fuel supporting surfaces inclined at slight angles laterally toward and extending horizontally beneath said screw, a hopper supported by said base and having a downwardly directed lower portion and a laterally directed converging upper portion provided at its end beyond the side of the hopper with a laterally directed side inlet opening, and a laterally swingable closure door for said opening, the supporting end of said lower hopper portion and the hopper receiving portion of said base having equilaterally polygonal similar transverse cross-sections.

8. In a stoker, a fuel feed screw, a shallow wide base extending horizontally beneath said screw and laterally beyond the opposite sides thereof, the top and both entire sides of said screw being open to the interior of said base, and a hopper having a vertically directed lower portion in open communication with said base interior and also having an upper laterally curved portion provided at its end with a laterally directed side inlet opening located outwardly beyond the adjacent side wall of said vertical portion.

9. In a stoker, a fuel feeder, a sheet metal hopper having a downwardly directed lower portion for directing fuel in bulk toward said feeder and also having an integral laterally directed upper inlet portion provided with a substantially horizontally directed side inlet opening having an inclined bounding edge, and a laterally swingable door having a flexible continuous seal cooperable with said edge.

10. In a stoker, a fuel feeder, a hopper having a substantially vertical lower portion for directing fuel by gravity toward said feeder and also having a laterally directed upper inlet portion provided with a substantially horizontally directed

side inlet opening having substantially upright side bounding edges connected by horizontal upper and lower bounding edges, the upper and lower bounding walls of said hopper at said opening being gradually downwardly curved receding from the opening, and a laterally swingable door having a continuous flexible sealing strip cooperable with said opening edges.

11. In a stoker, a fuel feeder, a hopper having an upright lower portion for directing fuel toward said feeder and also having a laterally directed upper portion provided with curved upper and lower bounding walls merging into said lower portion and with a substantially horizontally directed inlet opening at the ends of said walls beyond a side of said lower portion, and a laterally swingable door for sealing said inlet opening.

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