

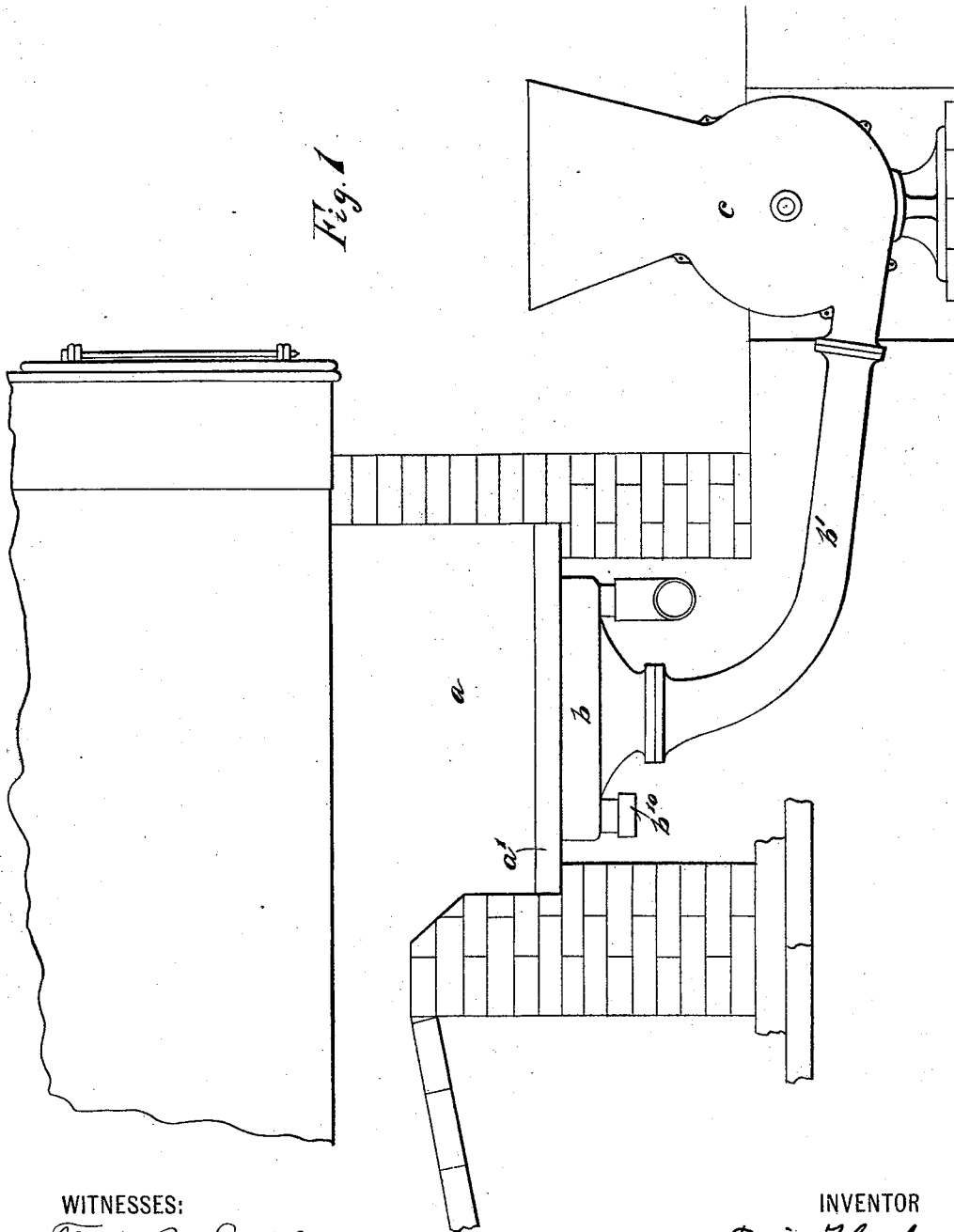
(No Model.)

3 Sheets--Sheet 1.

D. F. GRAHAM.
STOKER.

No. 534,743.

Patented Feb. 26, 1895.



WITNESSES:

Edw. B. Ernest
Chas. J. Melch

INVENTOR

David F. Graham

BY

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ATTORNEYS

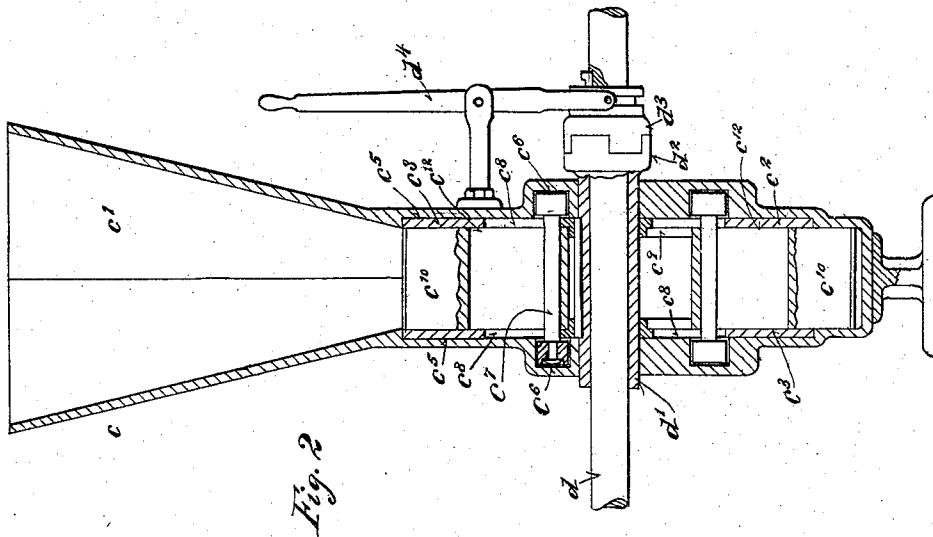
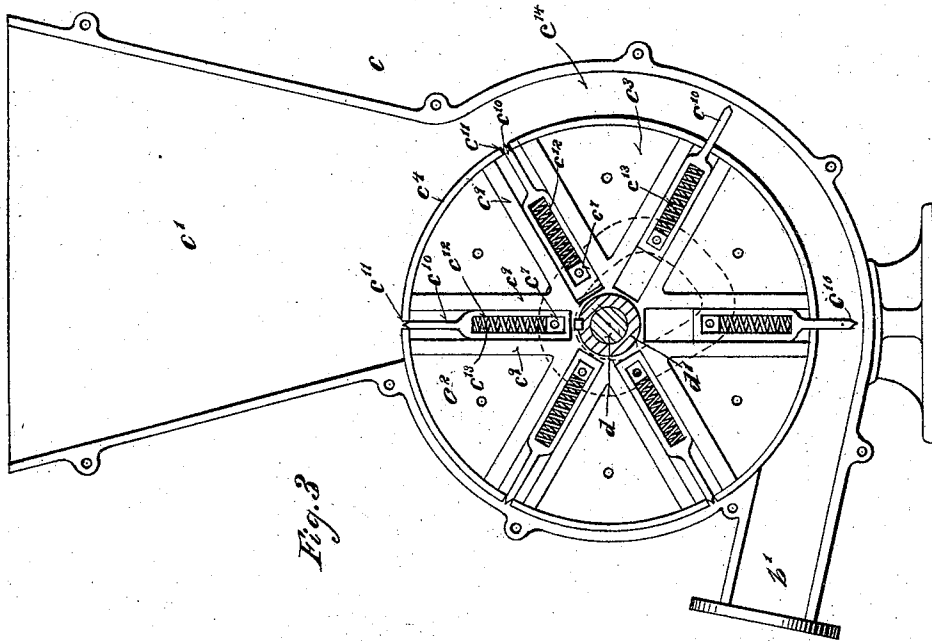
(No Model.)

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D. F. GRAHAM.
STOKER.

No. 534,743.

Patented Feb. 26, 1895.



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(No Model.)

D. F. GRAHAM.
STOKER.

3 Sheets—Sheet 3.

No. 534,743.

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Fig. 4

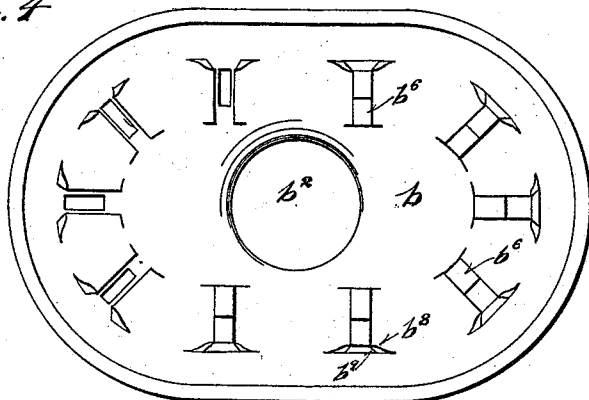


Fig. 5

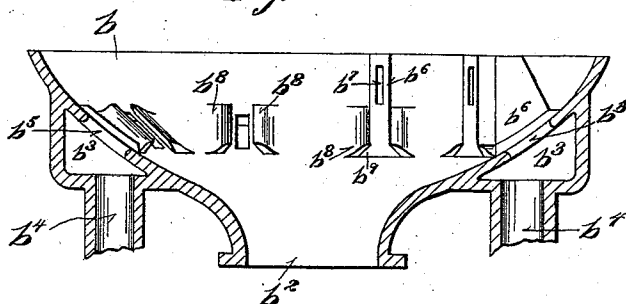


Fig. 6

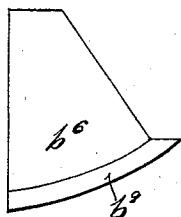


Fig. 7

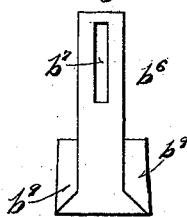
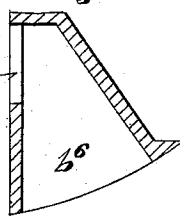


Fig. 8



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UNITED STATES PATENT OFFICE.

DAVID F. GRAHAM, OF SPRINGFIELD, OHIO, ASSIGNOR TO HUGH W. FULLERTON, OF SAME PLACE.

STOKER.

SPECIFICATION forming part of Letters Patent No. 534,743, dated February 26, 1895.

Application filed March 16, 1894. Serial No. 503,945. (No model.)

To all whom it may concern:

Be it known that I, DAVID F. GRAHAM, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Stokers, of which the following is a specification.

My invention relates to improvements in stokers for furnaces particularly adapted for furnishing fuel to the furnaces of steam boilers. It especially relates to what are known as underfeed stokers by which the fuel is forced into the furnace from the bottom and through the grate bars.

The object of my invention is to improve upon the construction heretofore used for this purpose.

A further object of my invention is to provide an improved form of feeding chamber and tuyere, the construction of which is such that the accumulation of clinkers about the tuyere openings is prevented.

A further object of my invention is to provide an improved feeding chamber and tuyere in which the portions are removable for cleaning or for repairs.

A further object of my invention is to provide improved means for forcing the fuel to the fuel chamber, having adjustable features which will readily adjust themselves to the fuel used and be capable of operation either by power or hand, as desired.

I attain these objects by the constructions shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a device embodying my invention shown attached to a boiler furnace, the furnace being shown in section. Figs. 2 and 3, respectively, are lateral and longitudinal sectional elevations of the feeding mechanism. Figs. 4 and 5 are respectively a plan and sectional elevation of the feeding chamber and tuyere. Figs. 6 to 8, inclusive, are details of the removable tuyere nozzles or openings.

Like parts are represented by similar letters of reference in the several views.

In the said drawings, *a* represents the furnace of an ordinary steam boiler and *a'* the grate bars therein.

b is a feeding chamber arranged in the grate

bars and connected by a suitable conduit or pipe *b'* to a feeding device *c*.

The feeding device *c* consists essentially of a hopper *c'*, into which the fuel is placed in any desirable manner, and a revolving cylinder *c''* within the hopper provided with suitable blades or projections by which the fuel is transmitted from the hopper to the conduit *b'*. This cylinder *c''* is made sectional and is provided with inclosing sides *c'''* and an outer periphery *c''''*. The outer casing, of which the hopper *c'* is a part, is provided with suitable recessed cavities *c'''''* on each side adapted to receive the ends of the cylinder which revolves therein. This casing is further provided on each side with cam ways *c''''''* into which project the respective ends or bars *c'''''''*, which pass through the cylinder from end to end and through slotted openings *c''''''''* provided in the sides of the cylinder for this purpose. The respective sides of the cylinder are further provided with guides *c'''''''''* in which are adapted to slide movable blades *c''''''''''*. These movable blades *c''''''''''* are adapted to extend through openings *c'''''''''''* in the outer periphery *c''''''''''* of said cylinder. The blades are further provided with enlarged hollow portions *c''''''''''''*, open at each side and through which the bars *c'''''''''''* are adapted to extend. Within the openings thus formed are placed springs *c'''''''''''''*, which bear at one end against the blades and at the other against the transverse bars *c'''''''''''* so that as the bars are moved within the slotted openings in the blades a yielding pressure is exerted on the blades through the agency of the springs, tending to force said blades outwardly through the openings in the periphery of the cylinder. This is preferably accomplished through the agency of a shaft *d*, which extends through the cylinder and casing, and to which is secured a sleeve *d'*, forming a hub for said cylinder. This sleeve *d'* is preferably provided with a clutch collar *d''*, adapted to engage with a similar clutch collar *d'''*, having an actuating lever *d''''* by which the parts may be engaged or disengaged. The clutch collar *d''* is secured rigidly to the shaft, while the sleeve *d'* is mounted loosely thereon, means being thus provided by which the shaft *d* may be caused to rotate the cylinder or be disengaged therefrom and allow the cylinder

to remain stationary while the shaft revolves as desired. The shaft d may be revolved by any suitable means, either continuously by a connection to some suitable source of power, or it may be provided with a suitable ratchet and lever so as to be moved by hand. The cams c^6 are so constructed that as the cylinder is revolved the bars c^7 are caused to move outwardly and thus press the blades outwardly through the periphery of the cylinder; the blades being forced out by a yielding pressure which permits them to adjust themselves to the character of the fuel and prevents breakage in the event that any unyielding substance should come in contact with the outer ends of the blades.

The outer casing of the hopper is so arranged below the hopper as to form a throat or passage c^{14} in connection with the cylinder, which leads from said hopper to the conduit b' . As the cylinder is revolved the blades are moved outwardly into said throat, and engaging the material from the hopper carries the same positively downward and thence upward through the conduit b' ; the cam being of such a shape as to withdraw the blades after reaching a substantially vertical position at the bottom of the conduit.

My improved feeding chamber consists essentially of a bowl-shaped structure, preferably cast in one piece with a suitable flange or other means of connection to the conduit b' , and an opening b^2 in the bottom to form a continuation of said conduit. Around on the lower side of said chamber is constructed a passage b^3 , which extends entirely around the bowl-shaped chamber and is provided on each side with openings b^4 . At suitable intervals, openings b^5 are formed through the bottom of the feeding chamber into the passage b^3 , and extending from these openings b^5 are nozzles b^6 , which extend upwardly and outwardly from the inside of the feeding chamber. These nozzles are hollow and constructed at their outer ends with openings b^7 . If desired, these nozzles may be cast solid onto the inside of the chamber, but I have shown them removable, this being the preferable construction. For this purpose I form the inside of the chamber with guides or cleats b^8 , beveled on their insides and inclined slightly toward each other; the bottoms of the nozzles b^6 being formed with similar shaped flanges b^9 also tapered, so that as the nozzles are forced between said guides or cleats from the bottom they are wedged firmly between said guides or cleats and thus held in their positions; a pressure of the fuel upwardly through the chamber being adapted to press them more firmly in their positions. The passage b^3 is adapted to be connected through one of the openings b^4 to a suitable blast so as to force air through the chamber b^3 and the nozzles b^6 ; the air being discharged laterally across the chamber in various directions caused by the angularity of the different nozzles arranged around said chamber. The

fuel is forced upwardly through said chamber and burns at the top, the combustion being facilitated by the air blast discharged into the same; the nozzles extending directly into the chamber. The fuel as it moves upward passes entirely around said nozzles and breaks up and carries upward any clinkers which may be formed about the same, and as the clinkers usually form about the orifices through which the blast is discharged, the formation of clinkers in the feeding chamber is practically obviated. If desired, the air supply pipe may be connected to both sides of the passage b^3 through the openings b^4 , though I preferably make only one such connection, in which case the passage opening is provided with a removable cover b^{10} . Means are thus furnished by which upon removing the cover any cinders, ashes or other foreign substance which should pass into the chamber b^3 may be blown out through the opposite opening b^4 by applying the blast to said passage.

By having the tuyere nozzles removable, as described, they may be readily removed for repairing or cleaning or replaced by new ones in the case of burning out or becoming damaged, thus obviating the necessity of providing an entirely new feeding chamber.

A device as thus described, it will be seen, is extremely simple and is equally efficient. The fuel being fed upwardly through the feeding chamber spreads out and around the tuyere nozzles and over the sides of the feeding chamber onto the grate bars. As the fuel is constantly supplied from the bottom and intimately mixed with the oxygen supplied by the incoming air through the nozzles, the combustion is practically perfect, all smoke and gases being consumed, since said gases are liberated from the incoming fuel and must pass through the live fire which is above the same.

It should be stated that the cams which operate the movable blades are so arranged that these blades remain within the periphery of the cylinder while passing through the hopper and begin to move outwardly as soon as the respective openings through which the blades operate pass into the throat or passage. This is quite an important feature. If the blades are extended while passing through the hopper the material in the hopper will tend to wedge at the mouth of the passage or throat and must be broken before the blades can pass into the passage, or the breaking of the blades or other portion of the machine might result. By withholding the blades until the openings through which they pass have entered the passage, they engage only such material as has already entered the passage and no wedge can result and breakage is avoided.

Having thus described my invention, I claim—

1. In a stoker, a feeding chamber having an open bottom and sloping or curved sides ex-

tending upwardly and outwardly, an air passage adjacent to said feeding chamber, and projecting nozzles extending from the sides of said feeding chamber and communicating
5 with said air passage, and means for forcing fuel into said feeding chamber from the open bottom to cause it to pass upwardly and outwardly between said nozzles, substantially as specified.

10 2. In a stoker, a feeding chamber consisting essentially of a bowl-shaped structure with an open bottom, and an air passage around said chamber, projecting tuyere nozzles arranged at intervals around the inside of said chamber, said nozzles being provided with lateral
15 openings and disposed around said chamber in such a manner as to form passages for the fuel between the same, and means, as described, for feeding the fuel into said chamber through the open bottom, substantially as
20 specified.

3. In a fuel feeding device, a feeding chamber having curved or inclined sides with detachable nozzles extending therefrom, an air
25 passage communicating with said nozzles, an opening in the bottom of said feeding chamber, and means for feeding fuel thereto through said opening, substantially as specified.

30 4. A feeding chamber having an air passage

around the same, stationary cleats or guides on the inside of said feeding chamber, and detachable nozzles having suitable flanges or projections to fit in said cleats, an air passage communicating with said nozzles, and a
35 fuel passage communicating with the bottom of said feeding chamber, and means for forcing the fuel into said chamber, substantially as specified.

5. The combination with a feeding chamber having inclined sides and projecting nozzles, as described, of a conduit leading from the bottom of said chamber to a hopper connected to said conduit, an air passage around
40 said feeding chamber communicating with said nozzles, said nozzles being disposed within said feeding chamber so as to form passages between the same, and moving mechanism between said hopper and feeding chamber to
45 force the fuel from said hopper through said conduit to said feeding chamber and cause it to be distributed between said nozzles, substantially as specified.
50

In testimony whereof I have hereunto set my hand this 12th day of March, A. D. 1894. 55

DAVID F. GRAHAM.

Witnesses:

A. L. SHELLABARGER,
OLIVER H. MILLER.