No. 752,770. PATENTED FEB. 23, 1904.

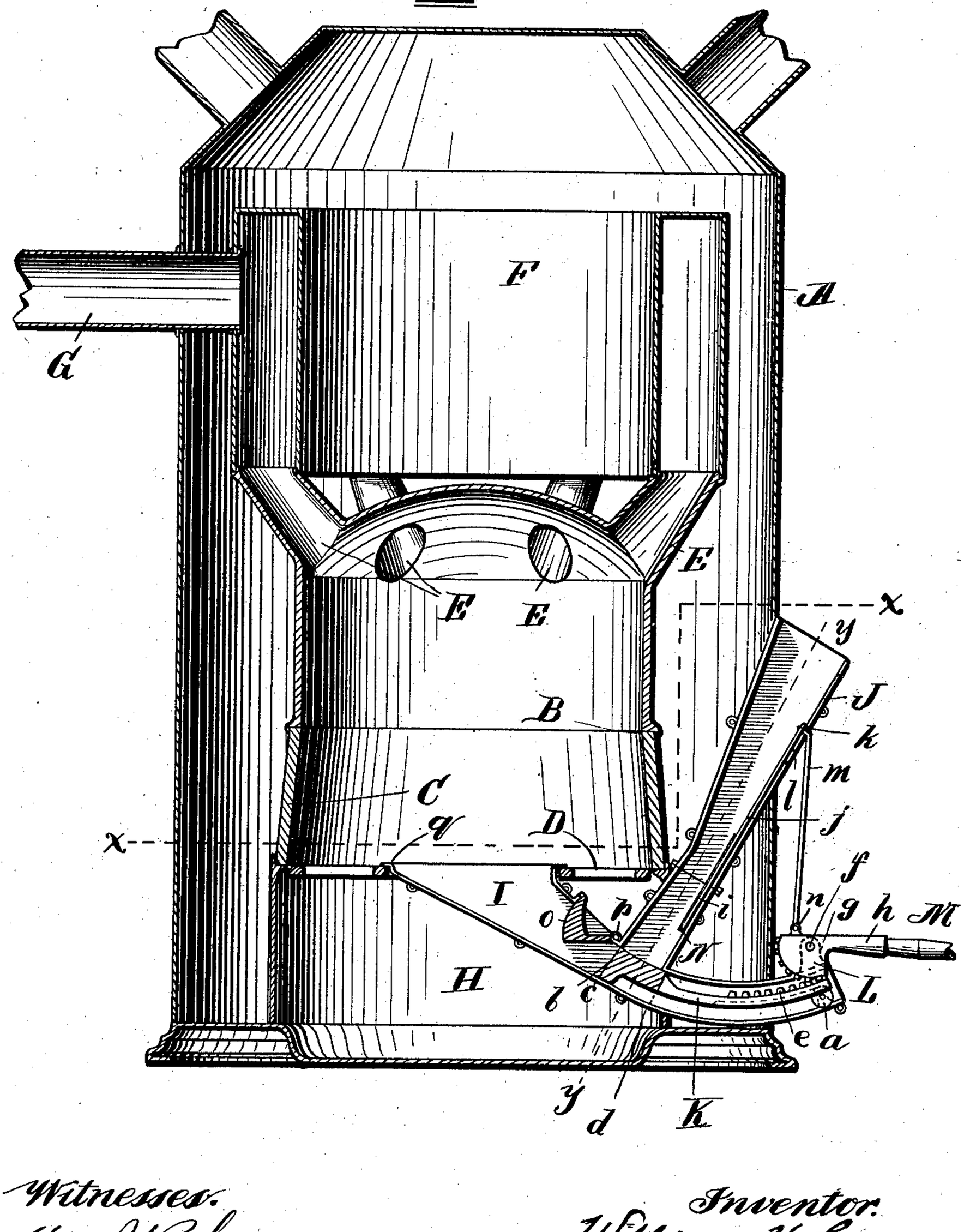
W. H. GREGG.

FURNACE.

APPLICATION FILED MAR. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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Inventor.
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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

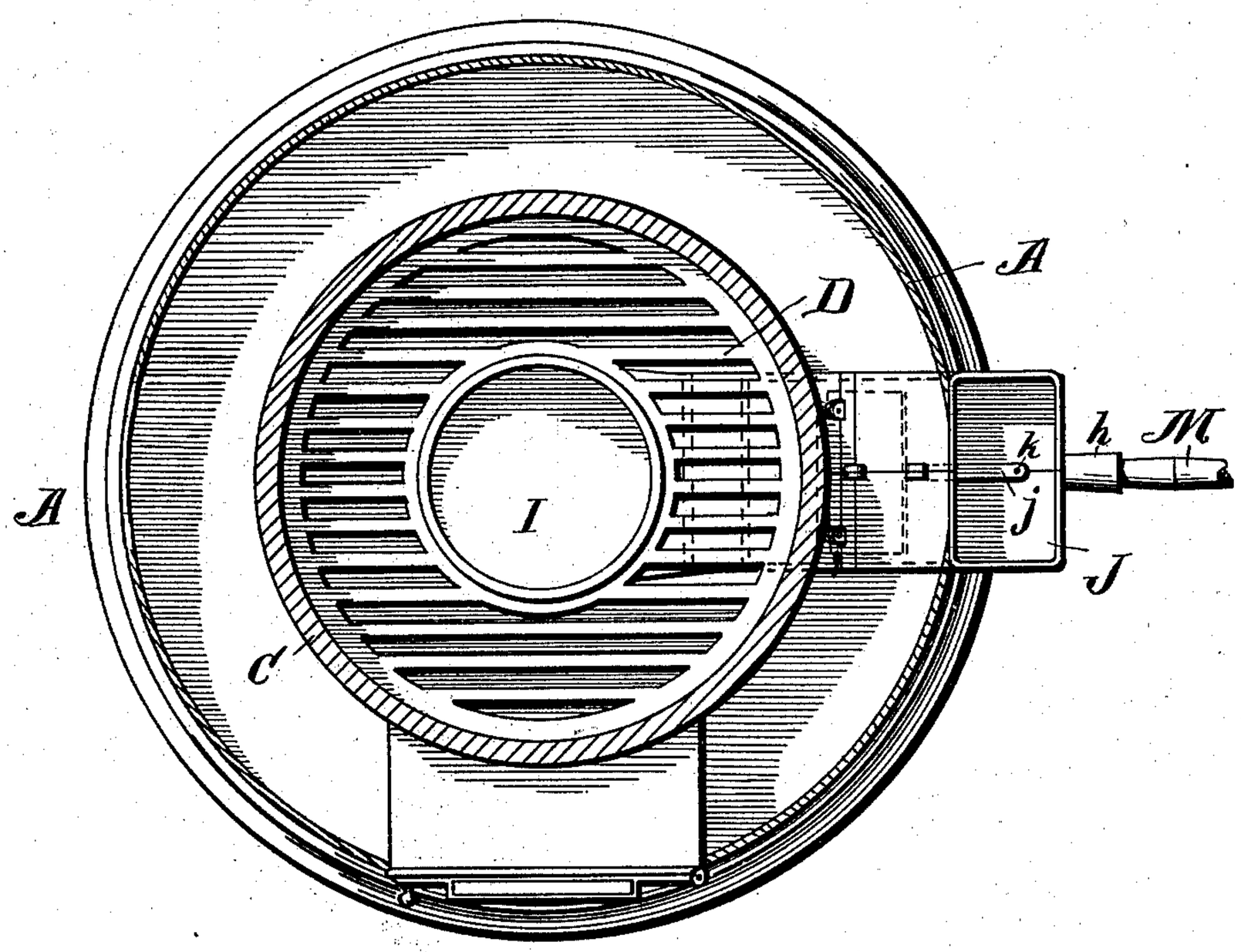
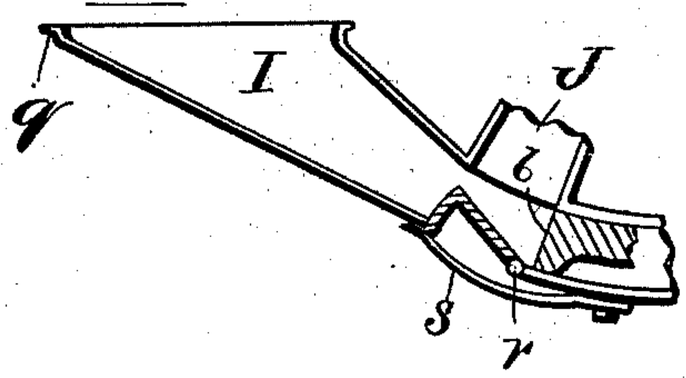


Fig. 4.



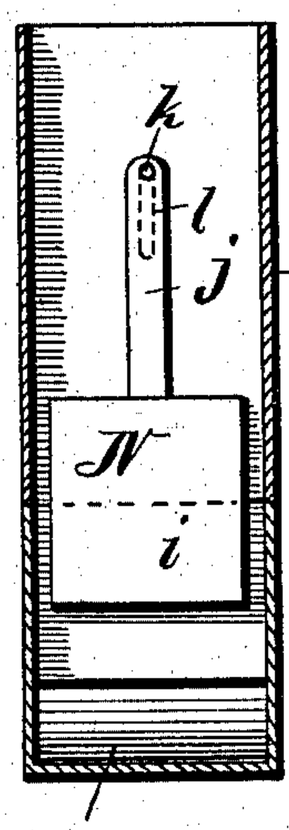


Fig. 3.

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No. 752,770. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 752,770, dated February 23, 1904.

Application filed March 6, 1903. Serial No. 146,449. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. GREGG, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention is designed especially for hot-air furnaces for buildings, though it is applicable to all kinds of heating apparatus where it is desired to provide an underfeed of the fuel to the fire-pot; and it has for its object the provision of a novel and simple stoking mechanism for feeding the fuel from a hopper or reservoir partly within and partly without the furnace-casing up through a funnel-shaped chute terminating at the surface of the grate and preferably at its middle or center, where the grate is round. Stoking mechanisms of this general character are well known to the art and may be said to consist of two classes, the one in which a conveyer-screw is employed to force the fuel up through the chute and onto the grate-surface beneath the fire and which in many instances has been found objectionable, owing to the fact that the screw would become choked at times and would not feed, and the other a mechanism employing, as in my present invention, a reciprocating plunger for forcing the fuel up through the chute, but in which the chute was so curved that it was very difficult to force the coal up, and even if such were not the case the coal or fuel would fall back upon the return stroke of the plunger, and the feeding operation would be greatly impaired, if not rendered entirely futile.

By my improved mechanism the foregoing objections are entirely overcome and the feeding up of the fuel is rendered easy and certain, and the novelty of my invention will be hereinafter more fully set forth, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1, Sheet 1, is a central sectional elevation of a furnace equipped with my improved apparatus. Fig. 2, Sheet 2, is a sectional plan view on the dotted line *x x* of Fig. 1. Fig. 3, Sheet 2, is a sectional elevation on the dotted line *y y* of Fig. 1 looking to the right. Fig. 4, Sheet 2, is a sectional detail elevation of the chute and appropriated parts, showing a modification in the construction.

The same letters of reference are used to indicate identical parts in all the figures.

A represents the outside jacket of a well-known form of hot-air furnace, within which is contained the casing B of the furnace proper. This casing is provided with the usual fire-pot C, with grate D and exits E from its dome into a heating-drum F above the furnace-chamber and communicating with the smoke-flue G. Below the grate D is the ash-chamber H, which contains the ash-pit, with its usual accessories, and the funnel-shaped fuel-feeding chute I, which, together with its associated parts, constitutes the essential feature of my invention. This chute I is funnel-shaped in form, with its large end extending through and opening into a circular opening at the middle of the grate. From a point at and below the feeding-in opening the chute is tubular and curved and of equal diameter. Opening into this chute just at or above its tubular curved portion is a fixed inclined hopper J, extending through the outer jacket A and through the side wall of the ash-chamber H. The upper end of this hopper is just outside of the jacket A and is conveniently arranged as to its height to enable the fuel to be shoveled into its upper open end, so that it may be constantly kept filled or supplied with fuel. It is shown as slightly contracted at its middle and from that point flaring outwardly to its entrance into the chute I.

Within the curved part of the chute I is an arc-shaped plunger K, guided at its outer end on a friction guide-roller *a*, Fig. 1, and having a head *b* just fitting the chute beneath the delivery end of the hopper J and having an extent of travel up and down from the upper edge of the lower end of the hopper to its lower edge—that is to say, from the points *c* to *d*. The upper side of the outwardly-pro-

jecting end of the plunger K is provided with a segment-rack *e*, with which engages a socketed segment-rack L, pivoted, as at *f*, in lugs *g*, carried upon the outer end of the chute, and within the socketed end *h* of the segment-rack L may be fitted an operating-handle M, by which the segment-rack L may be vibrated and the plunger K be given its reciprocating movement across the lower end or discharging-mouth of the hopper J.

Within the hopper J is an agitator N, resting upon its outer inclined surface and shown in this instance to be a spade-shaped blade *i*, with an upwardly-projecting handle or rod *j*, connected, as at *k*, through a slot *l*, Fig. 3, in the hopper, to a rod or link *m*, pivoted at its lower end, as at *n*, Fig. 1, to the segment-rack L in such manner that the vibration of the segment-rack L in moving the plunger K in and out will cause an up-and-down reciprocation to the agitator N within the hopper J to loosen the fuel and insure its proper feeding down.

From the foregoing description it will be readily understood that the head *b* of the plunger K in passing back from the upper edge of the hopper J permits a charge of fuel to be dropped into the chute I and that the return movement of said plunger carries and forces said charge of fuel up through the chute I, and assuming that this chute is already filled with fuel and that the furnace is in operation the new and successive charges thus fed in are gradually forced up through the chute I, through the opening in the grate, and beneath the fire, thus supplying to the fire the requisite amount of fuel needed and at a point where the freshly-fed fuel will not be immediately consumed to produce smoke, but will become gradually heated and coked and thence brought to the incandescent part of the fire, where it will be consumed.

Furnaces of this character are not only economizers of fuel, but they are preventers of smoke, because the fed-in fuel has its gases distilled from it and it is thoroughly coked before it is forced into the fire where it is finally consumed, and thereby a greater amount of heat is obtained from a given amount of fuel, because all of the heat units are consumed within the fire-pot without the production of smoke, and only a clean ash free of clinkers falling into the ash-pit is the residuum of the combustion.

I here wish to call especial attention to the fact that the bottom wall of the chute I from its point where the fuel is delivered into it to the surface of the grate is not curved, but is a straight and gradual incline, thus preventing any choking of the fuel in its passage up through the chute.

Another and very essential feature of my invention consists in the provision of what I call "throttling" mechanism within the chute just above the delivery end of the plunger K to prevent the falling back of the upwardly-projected fuel when the plunger K is retracted. This throttling mechanism may be constructed in a variety of ways, and in Fig. 1 I have shown it as a trap O, occupying an opening in the upper wall of the chute and pivoted, as at *p*, at its lower edge in said opening. This trap or trap-valve falls downward by gravity within the chute to contract its opening, as seen by the solid lines in Fig. 1, but will be pressed upward and back by the passage of a charge of coal when the plunger K is forced upward, as will be readily understood. Instead of locating this trap-valve as in Fig. 1 it may be located as seen in Fig. 4, where it is pivoted at its lower edge, as at *r*, in an opening in the lower side of the chute I directly beneath the discharge end of the hopper J and is provided with an exterior spring *s* to cause it to project into and practically close the chute, except when the head *b* of the plunger passes and forces it out when forcing up a charge of fuel into the chute. In fact, both of these trap-valves might be employed, or any other equivalent mechanism which would permit the upward delivery of the fuel through the chute I and which would prevent its falling back after such delivery.

As shown in Fig. 1, the top of the chute I is provided with an outwardly-projecting flange *q*, which extends entirely around the opening in the chute I and rests upon the upper surface of the grate D. This flange has a double function. It prevents small particles of fuel from falling down into the ash-pit H between the chute I and grate D when the fuel is being forced upward into the fire-chamber. It also prevents the coking of the fuel in the mouth of the chute I by excluding the air from the fuel near the mouth of the chute by reason of its lapping over onto the grate. If the fuel were allowed to coke in the mouth of the chute, it would be very hard to force any new fuel into the fire, as will be readily understood.

By reference to Fig. 1 it will be seen that the discharge end of the hopper J is placed within the ash-pit of the furnace and as near as practicable to the discharge end of the chute I. This is done in order that there may be as little fuel as possible in the chute I, for it will be readily understood that the greater the amount of fuel in the chute the greater amount of force will be necessary to be applied to the fuel in order to move the same. Hence it follows that by decreasing the amount of fuel in the chute it takes much less power to force the fuel up into the fire and that by placing the discharge end of the hopper within the ash-pit of the furnace I am enabled thereby to shorten the distance between the grate-surface and the hopper, and thereby to greatly decrease the amount of fuel within the chute I.

I prefer to form the chute I as shown in Figs. 1, 2, and 3, and this form, it will be observed, is that of a parallelogram, as shown

at *t*, Fig. 3, having its width approximately twice its height. My object in constructing the chute in this manner and in curving the lower end of the same is to permit the plunger K to work as nearly as possible beneath the center of the grate and to have its line of movement so as to force the coal directly to the center of the grate, for it will be readily understood that if the chute were made higher or were not curved at its lower end the discharge end of the chute would be to a large extent choked by the changing of the angle of the lower straight surface of the upper discharge portion of the chute, and it is to a large extent owing to the peculiar shape of the chute that I am enabled to place the discharge end of the hopper within the ash-pit of the furnace.

Having thus fully described my invention, I claim—

1. In fuel-feeding mechanism for furnaces, the combination of a feeding-chute substantially contained within the exterior wall of the furnace and having its lower outer end in the arc of a circle from which point it extends upward with gradually-increasing area to the grate-surface upon which it opens, a reciprocating plunger within the arc-shaped portion of said chute, a feeding-hopper substantially within the wall of the furnace and opening into said chute in the path of said plunger and a pivoted cut-off within said chute just above the end of the plunger which when retracted will permit the passage of the plunger upward in feeding up the fuel and which, when the plunger is retracted will drop back into the chute to serve as a stop to prevent the fed-up fuel from falling back, substantially as described.

2. In fuel-feeding mechanism for furnaces, the combination of a hopper, a chute below the grate-surface communicating with said hopper and extending up through an opening in the grate with a gradually-enlarged area having no curve on its under side, a reciprocating plunger for forcing the fuel from said hopper up through said chute, contractile mechanism within said chute to prevent the falling back of the upwardly-delivered fuel, means for reciprocating said plunger, an agitator within said hopper, and a connection between said agitator and the plunger-reciprocating mechanism, substantially as described.

3. In fuel-feeding mechanism for furnaces, the combination of a chute extending below and having an enlarged opening at the grate-surface, means for forcing fuel up through said chute, a hopper opening into said chute, and an agitator within said hopper connected with the means for forcing the fuel up through said chute, substantially as described.

4. In fuel-feeding mechanism for furnaces, the combination of the grate D, chute I, hopper J, reciprocating plunger K traversing the delivery end of said hopper within the chute, and contractile valve O within the chute to prevent the falling back of the fed-up fuel. substantially as described.

5. In fuel-feeding mechanism for furnaces, the combination of the grate D, chute I, hopper J, reciprocating plunger K traversing the delivery end of the hopper within the chute, operating-lever L coacting with the plunger K for reciprocating the same, agitator N within the hopper and connected to the lever L and contractile valve O within the chute to prevent the falling back of the fed up fuel, substantially as described.

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