

No. 692,263.

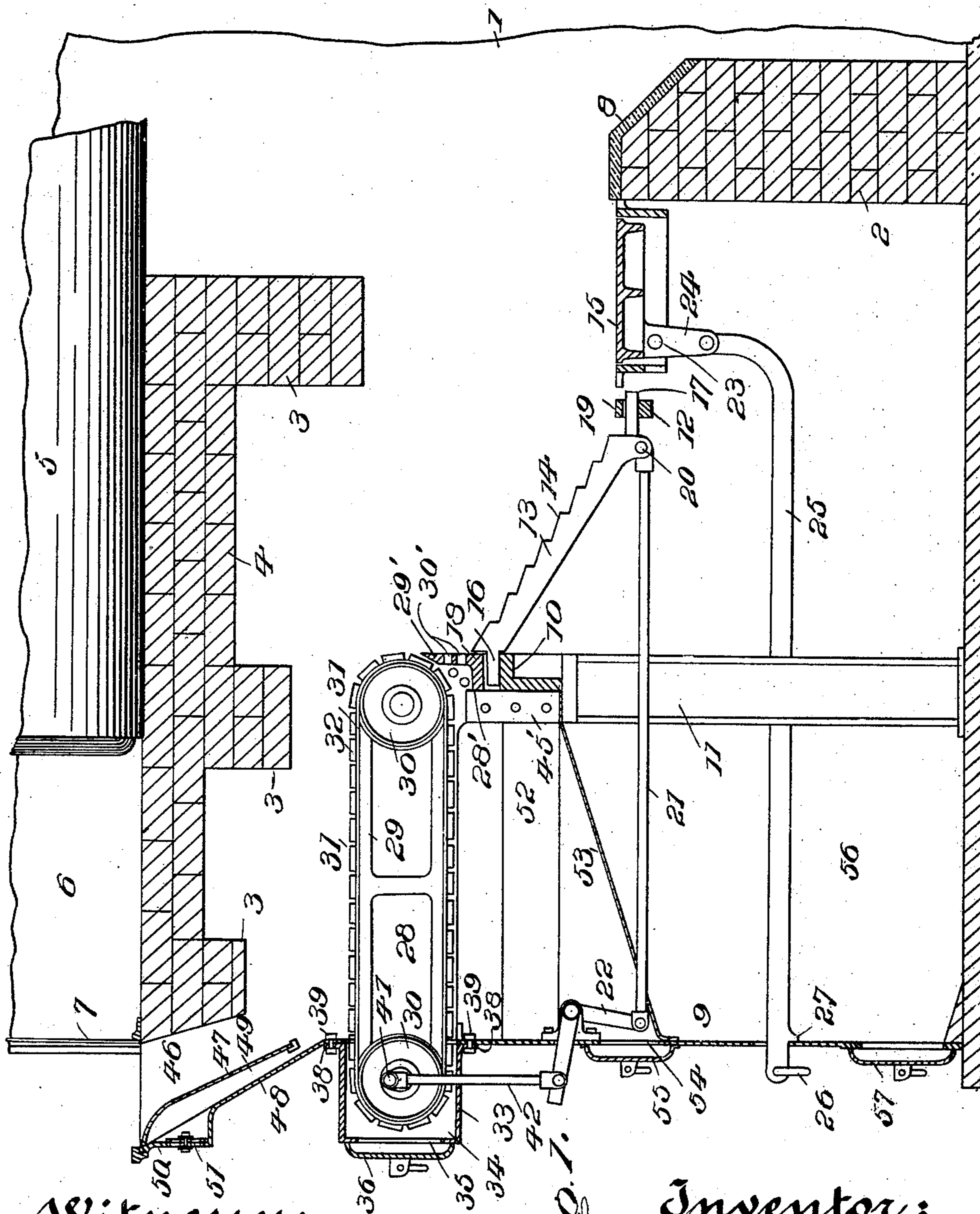
Patented Feb. 4, 1902.

F. GIRTANNER.
FURNACE GRATE AND STOKER.

(Application filed May 4, 1901.)

(No Model.)

4 Sheets—Sheet 1.



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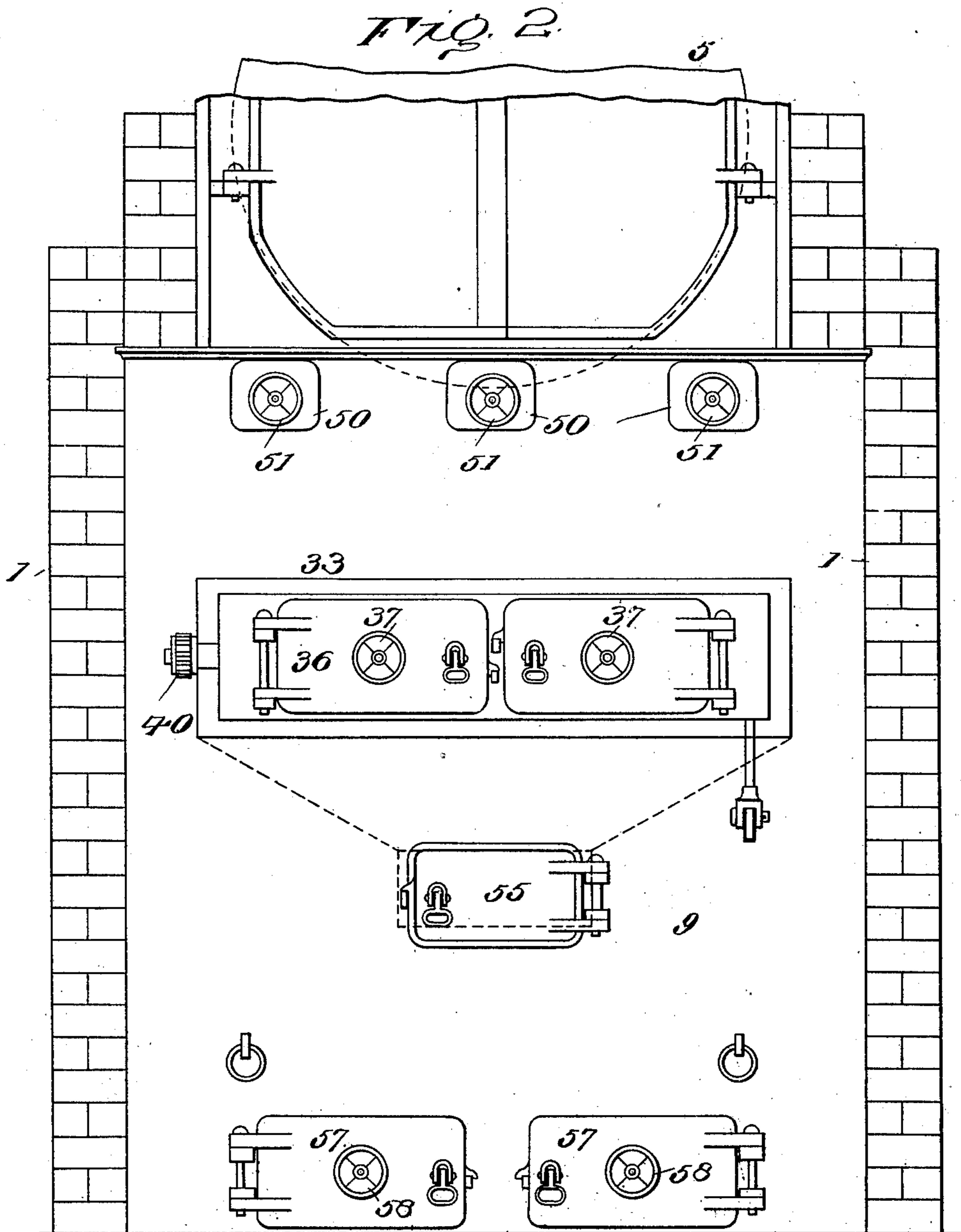
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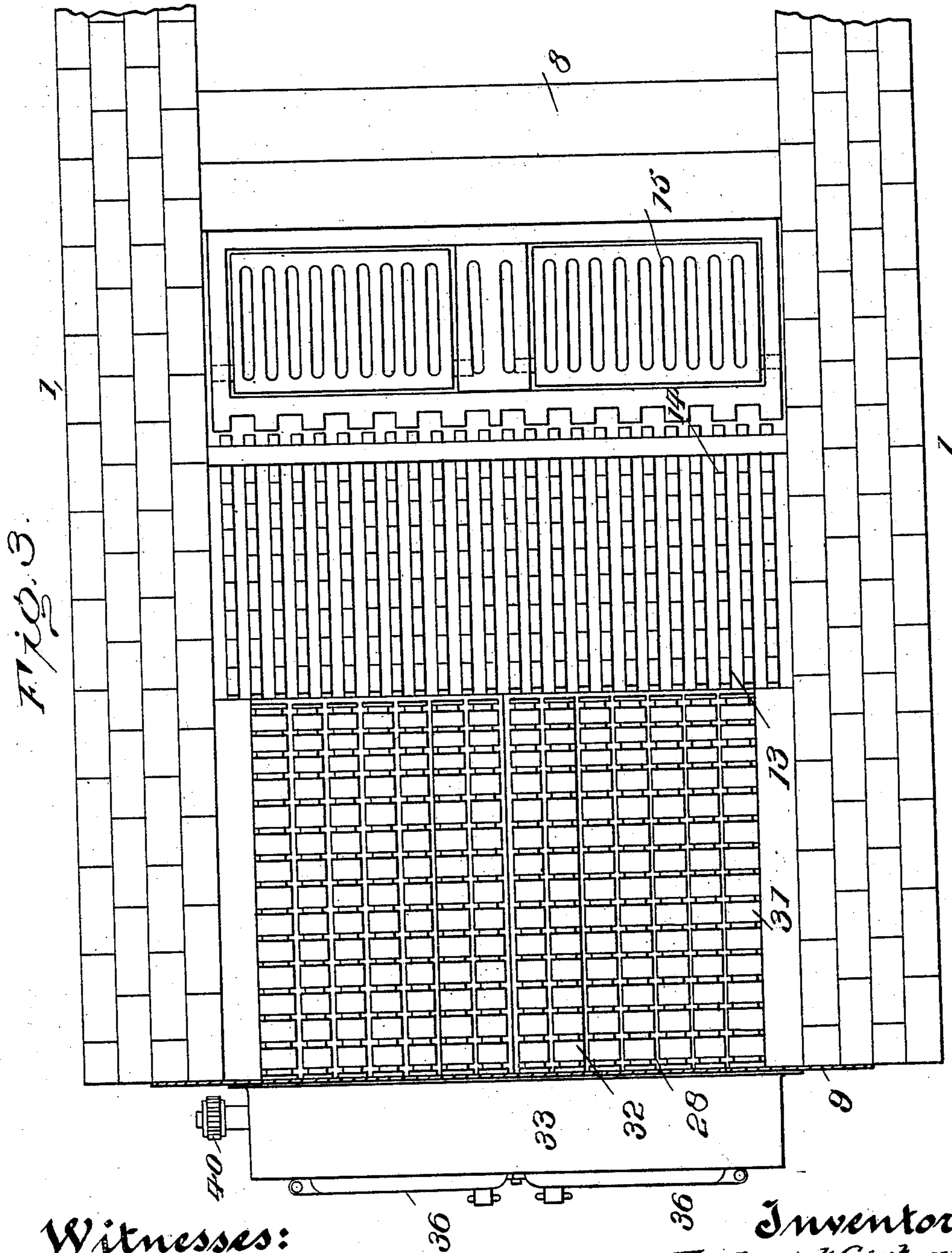
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4 Sheets—Sheet 3.

(No Model.)



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UNITED STATES PATENT OFFICE.

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FURNACE GRATE AND STOKER.

SPECIFICATION forming part of Letters Patent No. 692,263, dated February 4, 1902.

Application filed May 4, 1901. Serial No. 58,770. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK GIRTANNER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Furnace Grates and Stokers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to automatic stokers for furnaces, the object in view being to provide in connection with the furnace means for automatically transferring fuel from a receiving hopper or magazine to an inclined reciprocatory grate in the proper quantity to secure perfect and continuous combustion, the arrangement being such that the fuel during its passage to the reciprocatory grate is coked in readiness for ignition.

A further object of the invention is to provide in connection with such reciprocatory grate an endless traveling grate which operates to transfer the fuel from the initial hopper or magazine to the main reciprocatory grate, an underlying hopper being employed in connection with the traveling grate to receive and discharge the finer particles of fuel which gravitate through and from the traveling grate.

A further object of the invention is to provide in connection with the furnace an extension-casing in which a portion of the traveling grate is mounted, the said extension-casing, together with the traveling grate and its frame, being detachable, whereby the traveling grate may be removed through the front of the furnace.

Another object of the invention is to operatively connect the reciprocatory grate with the endless traveling grate in such manner that reciprocatory motion is imparted to the main grate by the traveling grate. The operating connections for the reciprocatory grate are so constructed and arranged that upon the removal of the traveling grate the reciprocatory grate may be actuated by hand.

A further object of the present invention is to provide the initial hopper or magazine with a division-plate by means of which one or

more air-ducts are formed in the lower portion of the magazine, which communicate with the space immediately above the traveling grate for supplying fresh air to the fuel on said grate and causing said air to commingle therewith, the said air duct or ducts being provided with dampers for regulating and controlling the supply of air which passes therethrough.

A further object of the invention is to construct the frame or casing of the furnace in such manner that an endless traveling grate or an ordinary stationary-bar grate may be interchangeably used or substituted one for the other, so that the furnace may be fed either automatically or by hand.

With the above and other objects in view, the nature of which will more fully hereinafter appear, the invention consists in the novel construction, combination, and arrangement of parts hereinafter fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through a furnace constructed in accordance with the present invention, showing the automatic stoking apparatus in operative relation thereto. Fig. 2 is a front elevation of the furnace. Fig. 3 is a plan view of the furnace with the upper masonry, boiler, &c., omitted to better illustrate the arrangement of the several grates. Fig. 4 is a longitudinal section similar to Fig. 1, showing an ordinary stationary grate substituted in place of the endless traveling grate and hand operating connections for shaking the main reciprocatory grate.

Like numerals of reference denote like parts in all figures of the drawings.

In the drawings I have illustrated a furnace which in the main is similar to the ordinary furnaces at present in common use, the same comprising the side walls 1, bridge-wall 2, arches 3, and roof or dome 4, constituting the usual masonry, the arches 3 and roof 4 being surmounted by the usual boiler 5, in front of which space is left for the uptake 6, closed at the front by means of doors 7, which give access to the uptake for the purposes of cleaning and repair. The bridge-wall 2 is capped with fire-brick in the usual manner, as illustrated at 8, and the front wall 9 of the fur-

nace may be either cast or formed of sheet-iron, according to preference.

Intermediate the front of the furnace and the bridge-wall 2 is arranged a supporting cross-bar 10, upheld by one or more supporting-posts 11 and forming the support for one end of the main reciprocatory grate and the adjacent end of the endless traveling grate, as will hereinafter more clearly appear. Parallel to the supporting-bar 10, but arranged at a lower level, is another supporting cross-bar 12, the opposite ends of which are preferably connected with the side walls of the furnace for their support, the said cross-bar forming a rest and guide for the opposite end of the main reciprocatory grate.

The main reciprocatory grate is mounted to move back and forth in a substantially horizontal plane under the influence of the operating devices hereinafter described, and is composed of a series of substantially parallel grate-bars 13, the upper fuel-receiving surfaces of which are stepped, as shown at 14, for the purpose of advancing the fuel as it is consumed and delivering the same, after being consumed, upon the usual dead grate 15, arranged in rear of the main grate and interposed between such main grate and the bridge-wall 2. Under the preferred embodiment of this invention each of the grate-bars 13 is provided at its opposite ends with terminal studs or pintles 16 and 17, the studs 16 being located at the upper forward ends of the grate-bars and slidingly mounted in a horizontal series of guide-openings 18 formed in the supporting-bar 10, above referred to. The grate-bars incline from the supporting-bar 10 downward rearwardly and are provided at their lower rear ends with terminal studs 17, which are slidingly received in bearing-openings 19 in the supporting-bar 12, adjacent to the dead grate 15. In this manner all of the grate-bars 13 are adapted to be reciprocated in a substantially horizontal plane, and they are coupled together for simultaneous movement by means of a connecting-rod 20, passing by preference through the lower ends of the several grate-bars. In order to reciprocate the main grate, an operating-rod 21 is connected at one end to the grate and preferably to the rod 20, while its opposite forward end is connected to one arm of a bell-crank lever 22, the other arm of which extends outward through the front of the furnace to connect with an operating device, by means of which the rod 21 may be moved endwise for imparting reciprocatory motion to the main grate. In this connection it may be stated that it is within the scope of this invention to employ more than one reciprocatory grate or, in other words, to construct such grate in sections, to which independent operating-rods 21 may be connected in the manner described and when combined with suitable operating means reciprocated in unison or simultaneously in opposite directions for imparting a rolling move-

ment to the particles of fuel resting upon the grate-sections.

By means of the construction just described it will be seen that as the main grate is moved back and forth the fuel deposited thereon is subjected to agitation and is thereby fed downward along the inclined grate toward the dead grate, being consumed during such movement, and after being consumed it is delivered upon the dead grate for final disposition. The dead grate is of ordinary construction, being pivotally mounted at 23 and provided with a projecting arm 24, to which is pivotally connected a grate-dumping connection 25, which extends through the front of the furnace, where it is provided with a suitable operating-handle 26 and a locking-shoulder 27, which ordinarily abuts against the furnace-casing and prevents the dead grate from being dumped accidentally.

Arranged near the front of the furnace and in a higher plane than the main reciprocatory grate is an endless traveling grate 28, comprising, essentially, a suitable frame 29, in the ends of which are journaled a pair of rolls 30, around which passes the traveling grate proper, which is shown to consist of one or more bands or chains 31, provided with fuel-supporting plates or blocks 32, which are connected to the bands or chains to travel therewith. In order that the fuel may be properly deposited upon the upper run of the traveling grate, I provide an extension-casing 33 to receive and partially house the front portion of the traveling grate, the said extension-casing being of sufficient length to receive the forward roll 30, while the ends 34 of such casing are provided with openings to receive the shaft or journal of the forward roll 30. The extension-casing 33 is provided in its outer side with one or more openings 35, covered by one or more doors 36, provided with draft-regulating dampers 37. The inner end of said extension-casing is provided with means for detachably connecting it with the front wall 9 of the furnace, the said means consisting by preference of one or more flanges 38, adapted to receive bolts or other suitable fasteners 39, passing through the front of the furnace. As the journals of the forward roller are mounted in the extension-casing and the frame of the traveling grate connected with said casing, such casing, together with the grate connected therewith, may be removed from the furnace by detaching the casing in a manner which will be readily understood without further description.

The inner end of the frame of the traveling grate 28 is provided with a cross-bar 28', which rests upon the cross-bar 10, heretofore described, and closes the upper portions of the bearing openings or notches 18, in which the sliding studs 16 of the grate-bars 13 are received. The cross-bar 28' is provided with an upstanding portion or flange 29', which is pierced by a series of openings 30' for the

purpose of supplying heated air and gases to the space beneath the bed of coals resting on the grate-bars 13, the air being supplied through the dampers 37, from which point it
 5 passes through and around the traveling grate, eventually finding its way after being heated and mixed with the gases through the openings 30', where it mingles with the fuel lying on the main grate and materially aiding
 10 combustion and the consumption of smoke.

The journal or shaft of the forward roll 30 is extended through one end of the extension-casing 33, where it is provided with a gear-wheel 40, by means of which said roll
 15 may be geared to an engine or suitable motor for the purpose of imparting continuous movement to the traveling grate. One end of the forward roll 30 is provided with a wrist-pin 41, to which is connected a pitman 42,
 20 which extends downward and connects with the outwardly-projecting arm of the bell-crank lever 22, which actuates the rod 21 for imparting motion to the reciprocatory grate hereinabove described. In this way motion
 25 is transmitted from the traveling grate to the main reciprocatory grate, thereby rendering the operation of the latter grate entirely automatic.

When the endless traveling grate is removed in the manner above described, an extension-casing 43, similar in all respects to that 33 above described, is connected to the front of the furnace, as illustrated in Fig. 4, and forms a support for the front of a stationary grate 44, which may be of any usual or preferred construction, the rear end of said grate being provided with a cross-bar 44', adapted to rest on the supporting cross-bar 10, hereinabove described, and to close the
 40 bearing notches or openings 18, the bar 44' taking the place of the bar 28' of the frame of the traveling grate. The spaces intervening between the rear ends of the bars which form the grate 44 take the place of the draft-openings 30' of the traveling-grate frame and supply air to the main reciprocatory grate for the purpose hereinabove explained. 45' designates one or more stops to assist in properly positioning and holding in place both the
 50 traveling and stationary grates. In dispensing with the traveling grate 28 it is of course necessary to detach the operating-pitman 42, and therefore in order to operate the main reciprocatory grate a handle 45 is connected
 55 to the outwardly-projecting arm of the elbow-lever 22, as shown in Fig. 4, which adapts the main grate to be reciprocated by hand whenever necessary.

Arranged above the traveling grate 28 is an initial fuel hopper or magazine 46, having its top open to receive the fuel, while its lower end is located in position to discharge fuel directly upon the traveling grate. Within the magazine 46 is arranged a division-plate
 60 47, which forms the lower outer wall of the space through which the fuel passes, the said division-plate being located a sufficient dis-

tance from the outer wall 48 of the furnace-casing at the point where the magazine is located to establish one or more air-ducts 49, 70 which terminate directly over the upper run of the traveling grate, so as to deliver cold air to the fuel at the same time that the latter is deposited upon the grate, such air commingling with the fuel and promoting combustion, while at the same time serving by the additional supply of oxygen to increase the combustion sufficiently to consume the smoke. The air-duct 49 leads inward and downward at an inclination, as shown in Figs. 80 1 and 4, while the upper portions of the outer wall 48 and division-plate 47 are so formed as to provide an enlarged upper end for the air-duct, such enlarged end being partially closed by a wall 50, provided with a damper 85 51 for regulating the supply of air which passes into and through the duct.

Located beneath the traveling grate 28 is a secondary hopper 52, which receives the fuel falling from the traveling grate, said hopper 90 being provided with an inclined bottom 53, which slopes forwardly and serves to direct the material falling thereon through a doorway 54 in the front of the furnace, which doorway is normally closed by means of a 95 door 55. The ash-pit 56 is provided with the usual doors 57 at the front of the furnace, and said doors are equipped with dampers 58 of any approved construction.

From the foregoing description it will be 100 seen that the furnace is adapted to be fed automatically by means of the traveling grate and reciprocatory main grate, to which proper motion is imparted by any suitable motive power, or the furnace may be supplied and the 105 fuel fed along the grate by hand-power. The furnace is adapted to burn different grades of coal as well as different varieties of fuel. Whenever desired, the traveling grate may be removed from the furnace and replaced by 110 the ordinary stationary grate, and vice versa. The removal of the traveling grate is greatly facilitated by the construction described, in which the extension-casing forms one of the supports for the traveling grate and has the 115 means for holding such grate in its operative position. By simply detaching the extension-casing the traveling grate may be removed therewith. It will also be seen that motion imparted to the traveling grate will by means 120 of the connections described be transmitted to the main grate, to which reciprocatory motion will be imparted for the purpose specified. The reciprocatory grate or the sections thereof are so mounted and coupled to the 125 operative connections that upon the removal of the traveling grate the said operating connections for the reciprocatory grate may be actuated by hand. Furthermore, by providing the air-ducts in the initial hopper or magazine under the described arrangement fresh 130 air is supplied to the fuel on the traveling grate as such fuel is being coked preparatory to its delivery upon the main grate, and this

action is greatly enhanced by the additional supply of oxygen in the manner set forth.

One of the chief advantages of the improved furnace resides in the fact that it burns the poorest quality of bituminous coal and by complete combustion renders the same smokeless. Another important advantage resides in the fact that large and uneven lumps of coal fed through the hopper are caught upon the grate and completely consumed as effectively as the smaller lumps.

I do not desire to be limited to the details of construction and arrangement hereinabove set forth, and accordingly reserve the right to make such changes and modifications as properly fall within the scope of the appended claims.

Having described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In an automatic stoker, parallel supporting-bars arranged at different heights and having corresponding bearing-openings, inclined grate-bars provided at their upper and lower ends with studs relatively inclined thereto and arranged in upper and lower parallel planes and slidingly fitted in the said bearing-openings of the supporting-bars, and means for reciprocating the grate-bars.

2. In an automatic stoker, the combination with a furnace, of an endless traveling grate, a dead grate spaced apart therefrom, an inclined feed-grate interposed between the traveling and dead grates, and operative connections between the traveling and inclined grate for imparting a reciprocatory movement to the feed-grate.

3. In an automatic stoker, the combination with a furnace, of an endless traveling grate, a dead grate spaced apart therefrom, an inclined feed-grate interposed between the trav-

eling and dead grates, a wrist-pin on one of the rolls of the traveling grate, a bell-crank lever, and operative connections between the bell-crank lever, wrist-pin and feed-grate whereby reciprocatory motion is imparted to the feed-grate.

4. In a furnace, a supporting-bar having bearing openings or notches in its upper edge, grate-bars having an end resting in the said bearing-openings, and a grate having a cross-bar resting upon the aforesaid supporting-bar and closing the bearing-openings thereof, substantially as described.

5. In a furnace, a supporting-bar having bearing openings or notches in its upper edge, stops adjacent the supporting-bar, grate-bars having an end resting in the said bearing-openings, and a removable grate having a cross-bar resting upon the supporting-bar and closing the bearing-openings thereof and limited in its movement in one direction by the said stops, substantially as described.

6. In a furnace, a supporting-bar having bearing openings or notches in its upper edge, grate-bars having an end resting in the said bearing-openings, a grate removable through an opening in the front of the furnace and having a cross-bar at its rear end to rest upon the supporting-bar and close the bearing-openings thereof, and having its front portion projecting from the front of the furnace, and a casing inclosing the projecting portion of the grate and closing the opening in the front of the furnace through which the grate is inserted, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK GIRTANNER. [L. S.]

Witnesses:

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FRED FLETCHER.