

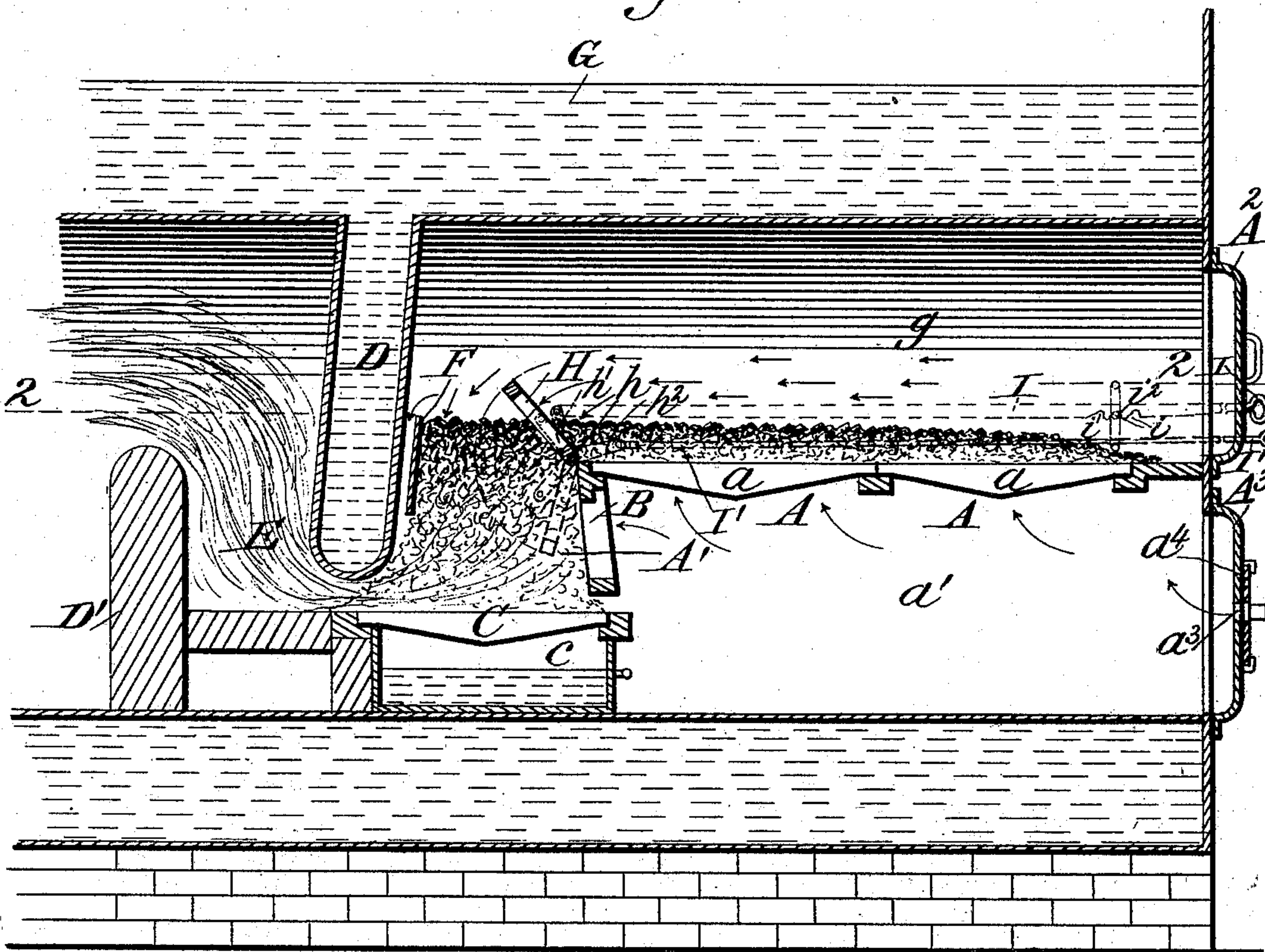
(No Model.)

J. K. THOMPSON.  
BOILER FURNACE.

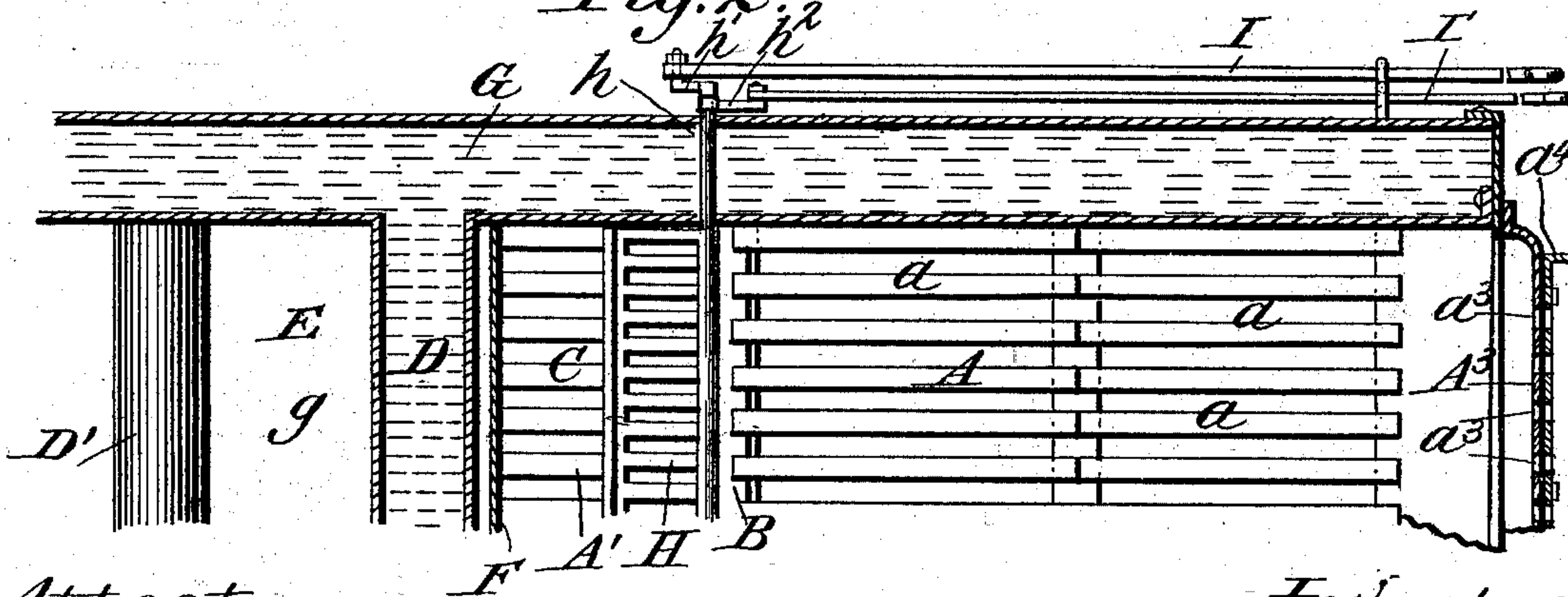
No. 505,144.

Patented Sept. 19, 1893.

*Fig. 1.*



*Fig. 2.*



Attest:

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# UNITED STATES PATENT OFFICE.

JAMES KNAPTON THOMPSON, OF LEEDS, ENGLAND, ASSIGNOR OF TWO-THIRDS TO CHARLES F. JAHN, OF PITTSBURG, PENNSYLVANIA.

## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 505,144, dated September 19, 1893.

Application filed May 31, 1893. Serial No. 476,050. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES KNAPTON THOMPSON, a subject of the Queen of Great Britain, residing at Leeds, in the county of York, England, have invented certain new and useful Improvements in Boiler-Furnaces; 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 furnaces for heating steam boilers and for other purposes, and its object is to subject the green fuel to a preliminary combustion or distilling process prior to stoking the same into the fire-box proper of the furnace where the final combustion takes place. By this means, the fuel and the gases, evolved therefrom during the distilling stage, are intimately and thoroughly mixed with air or oxygen, resulting in a perfect and smokeless combustion, especially when employing a fire-box of the character set forth in my application filed May 2, 1893, Serial No. 472,654.

To carry out this object, my invention, broadly considered, consists in a horizontal grate or fire-bed arranged in the front part of the furnace, upon which the fuel is deposited in a thin layer, in combination with a fire-box arranged in the rear part of the furnace and located at the end of the horizontal fire-bed, the fire-box being preferably located below the level of the fire-bed.

My invention also consists in a guard plate preferably adapted to be rocked or swung into various inclinations and arranged at the juncture of the horizontal fire-bed and the fire-box, the purpose of this guard plate being to prevent the accidental introduction of green fuel from the fire-bed into the fire-box.

My invention finally consists in such other means, combinations of parts and features as will be hereinafter set forth and pointed out in the claims.

In the drawings hereunto annexed—Figure 1 represents a vertical longitudinal section of a boiler-furnace embodying my invention in its preferred form, and Fig. 2 is a horizontal section on line 2—2, Fig. 1.

By referring to the drawings, it will be noted that my furnace, in the present instance, is

employed in connection with a large-flue boiler, G, being introduced into one of the flues, *g*, thereof.

The two principal parts of my furnace are the horizontal fire-bed, A, arranged in the front part of the furnace, and the fire-box, A', arranged at the inner end of the horizontal fire-bed, A, and adjacent thereto. The horizontal fire-bed is constructed in any convenient and suitable manner and, in the present instance, is shown as consisting of the horizontal grate-bars, *a*, suitably supported and having an air-chamber, *a'*, below the same. The fire-box, A', is of the character and construction set forth in my application Serial No. 472,654, and consists, briefly considered, of a downwardly flaring front wall, B, having air-openings along its entire extent, a horizontal bottom grate, C, and a rear fire-back, D, continuous and unbroken throughout and extending to within a short distance of the bottom grate, so as to form a throat not only sufficient to permit the free escape of the products of combustion, but to prevent the escape of fuel into the flame-chamber, E, on the other side of the fire-back, preferably in the form of a water-bridge communicating with the body of the boiler, G. A pilot-plate, F, whose functions have been explained in my aforesaid application, is also arranged within the fire-box, and the ash-pit, *c*, below the grate, C, is closed air-tight, so as to prevent access of air thereto. Within this ash-pit, I preferably arrange a water-supply, as set forth in my aforesaid application. A fire-back, D', of suitable refractory material, extends upwardly from the bottom of the furnace in the rear of the fire-bridge and serves to properly direct the products of combustion.

Between the horizontal fire-bed, A, and the fire-box, I arrange a guard-plate, H, which, in the present instance, is in the form of an open grating, to permit the passage of air, distilled gases and products of combustion from the fuel on the fire-bed, and this guard plate is preferably pivoted at the upper front edge of the fire-box, as shown. The object of this guard-plate is to prevent the accidental discharge, into the fire-box, of the green fuel, before the same has been thoroughly distilled. The rock-shaft, *h*, of the guard-plate extends



out through the side of the boiler, as best shown in Fig. 2, where it is provided with means to raise, or drop, or to adjust the inclination of the said guard-plate. The means preferably consist in two cranks,  $h'$ ,  $h^2$ , keyed to the rock-shaft,  $h$ , which are connected with two pull-rods,  $I$ ,  $I'$ , extending to the front of the boiler. The two cranks,  $h'$ ,  $h^2$ , are arranged at such an angle that when one crank occupies a position below the dead center and it is desired to raise the guard-plate, the pull-rod connected with said crank may be pushed in sufficiently to raise the same over the dead center, so that by pulling the other pull-rod, the guard-plate may be raised to the desired angle, as indicated by full lines in Fig. 1. The pull-rod,  $I$ , as indicated, is provided near its forward end with notches,  $i$ , adapted to engage a detent,  $i'$ . By these notches, the angle of the guard-plate may be suitably varied. The lowermost position of the guard-plate is indicated in dotted lines in Fig. 1. Of course, other means for operating the guard-plate may be employed, the present device being shown merely as an illustration of such means.

The operation of my furnace is as follows: The fires being started, the green fuel is first stoked in a thin layer upon the horizontal fire-bed,  $A$ , through the furnace-door,  $A^2$ , and a suitable supply of air being admitted to the air-space,  $a'$ , the same passes upwardly between the grate-bars,  $a$ , to induce the preliminary combustion of distillation of the green fuel. The guard-plate, being in the position indicated in full lines in Fig. 1, prevents any accidental introduction of fuel into the fire-box,  $A'$ . The preliminary combustion of the fuel on the fire-bed having been completed, the same is pushed into the fire-box,  $A'$ , the guard-plate,  $H$ , having been first lowered into the position indicated in dotted lines in Fig. 1, by pushing the pull-rod,  $I$ , inwardly. Thereupon, the guard-plate,  $H$ , is again raised by first pushing in the pull-rod,  $I'$ , sufficiently to cause the crank,  $h'$ , to clear the dead-center, and then pulling the pull-rod,  $I$ , outwardly until the guard-plate again assumes the position indicated in full lines in Fig. 1. A fresh layer of green fuel is then again deposited upon the fire-bed. The air, passing from the air-space,  $a'$ , between the openings of the front wall,  $B$ , of the fire-box throughout the entire surface of the same, produces the necessary down-draft to effect the complete combustion of the fuel, which, by reason of the downwardly flaring shape of the fire-box, is deposited in loose layers allowing the intimate mixture of the air with the solid fuel, and also with the hydrocarbons, carbonic oxide and other gases distilled from the fuel on the fire-bed, which pass into the fire-box in the direction indicated by the arrows. If any gases should not as readily be taken up by the upper layers of the fuel in the fire-box, as necessary to complete the combustion, the

same will pass down the space between the pilot-plate,  $F$ , and the fire-bridge,  $D$ , and into the incandescent fuel at the bottom of the fire-box. This complete combustion is considerably assisted by the watery-vapors rising from the water-supply in the ash-pan,  $c$ , below the bottom grate, which also serve to preserve the said grate against the destructive action of the intense heat of the incandescent fuel resting thereon.

The admission of air to the air-chamber may be effected in any desired or suitable manner, for example, by providing the door,  $A^3$ , with a series of air-openings,  $a^3$ , whose size is controlled by a damper or register,  $a^4$ , or in any other suitable way.

I do not herein claim the particular arrangement and construction, *per se*, of the fire-box,  $A'$ , and its various parts, inasmuch as the same constitute the subject-matter of the application hereinbefore referred to.

Although I consider the arrangement and construction of parts herein shown and described in illustration of my invention the best way of carrying the same into effect, still it is manifest that the same may be variously modified without departing from the spirit of my said invention. I do not, therefore, desire to be confined to the same, but

What I claim, and desire to secure by Letters Patent, is--

1. In a furnace for heating boilers and for other purposes, a front fire-bed, and a rear fire-box extending below the level of the fire-bed, in combination with a guard-plate arranged between the fire-bed and the fire-box, substantially as set forth.

2. In a furnace for heating boilers and for other purposes, a front fire-bed, and a rear fire-box extending below the level of the fire-bed, in combination with a pivoted guard-plate arranged between the fire-bed and the fire-box, and means for adjusting the angle of the guard-plate, substantially as set forth.

3. In a furnace for heating boilers and for other purposes, a front fire-bed, and a rear fire-box extending below the level of the fire-bed, in combination with a perforated guard-plate arranged between the fire-bed and the fire-box, substantially as set forth.

4. In a furnace for heating boilers and for other purposes, a horizontal, front fire-bed, in combination with a fire-box arranged below the level of the fire-bed and comprising a perforated front wall, a bottom-grate, an air-tight chamber below the grate and a rear, unbroken fire-bridge extending downwardly from the top of the furnace-chamber to near the bottom-grate, substantially as set forth.

5. In a furnace for heating boilers and for other purposes, a horizontal, front fire-bed, in combination with a downwardly-flaring fire-box arranged below the level of the fire-bed and comprising a perforated front wall, a bottom-grate, an air-tight chamber below the grate and a rear, unbroken fire-bridge



extending downwardly from the top of the furnace-chamber to near the bottom-grate, substantially as set forth.

5 6. In a furnace for heating boilers and for other purposes, a horizontal, front fire-bed, in combination with a fire-box arranged below the level of the fire-bed and comprising a perforated front wall, a bottom-grate, a rear, unbroken fire-bridge extending downwardly  
10 from the top of the furnace-chamber to near the bottom grate, and a pilot-plate arranged within the fire-box, substantially as set forth.

15 7. A steam boiler, in combination with a furnace arranged within the flue of the boiler and comprising the following parts: a horizontal front fire-bed and a rear downwardly-extending fire-box consisting of an open front wall, a bottom grate, an air-tight chamber below the grate and a fire-bridge extending

from the top of the furnace-chamber to near 20 the bottom-grate, substantially as set forth.

8. A steam boiler, in combination with a furnace arranged within the flue of the same and comprising the following parts: a horizontal, front fire-bed and a rear downwardly- 25 extending fire-box consisting of an open, front wall, a bottom-grate an air-tight chamber below the grate and a downwardly-extending water-back communicating with the boiler and reaching to near the bottom-grate, and 30 an upwardly-extending fire-back arranged behind the fire-box, substantially as set forth.

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

JAMES KNAPTON THOMPSON.

Witnesses:

JOHN S. KENNEDY,  
E. L. PLANT.