

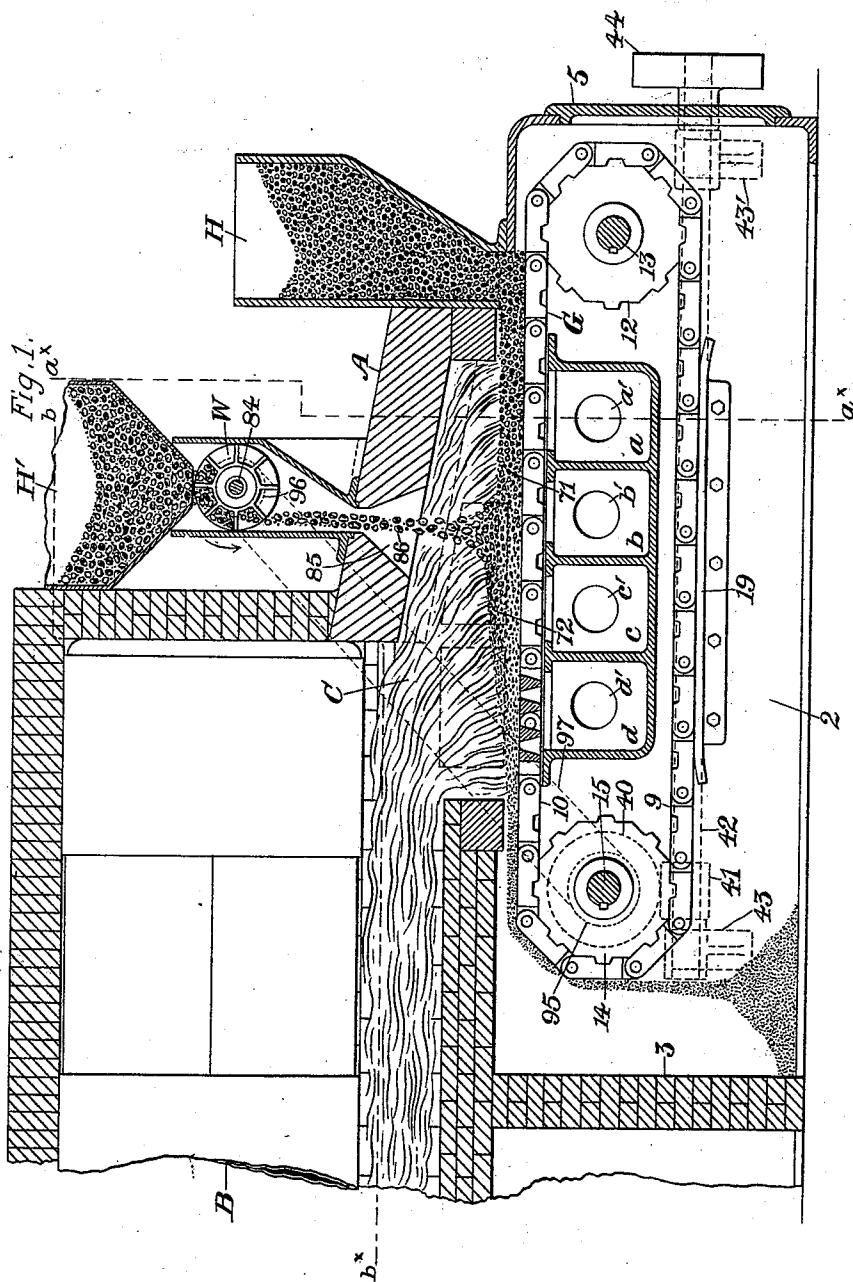
(No Model.)

4 Sheets—Sheet 1.

E. B. COXE.
FURNACE.

No. 510,572.

Patented Dec. 12, 1893.



Witnesses:

John L. Edwards Jr.

Fred. J. Dole,

Inventor:

Eckley B. Cox.

By his Attorney,

F. W. Richards,

(No Model.)

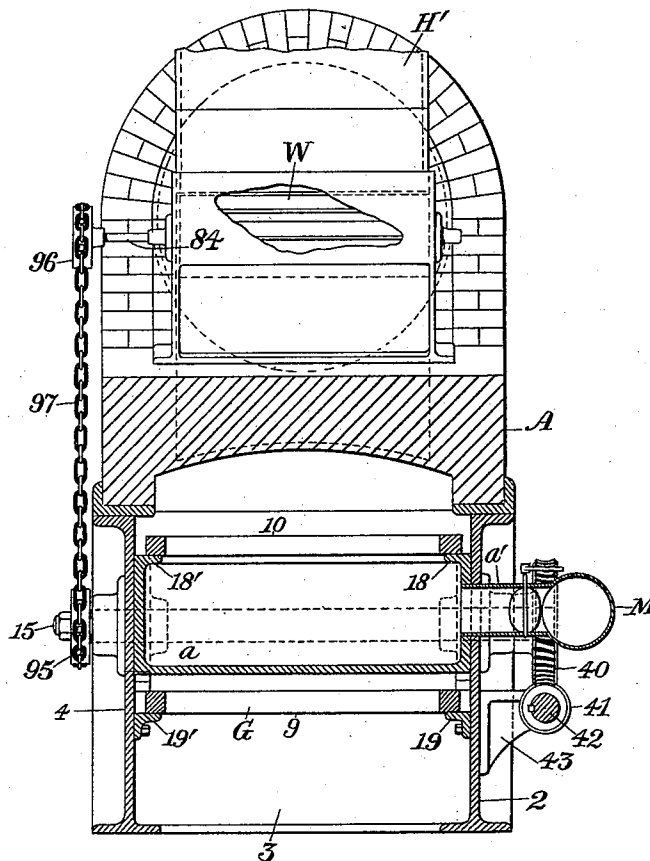
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Fig. 2.



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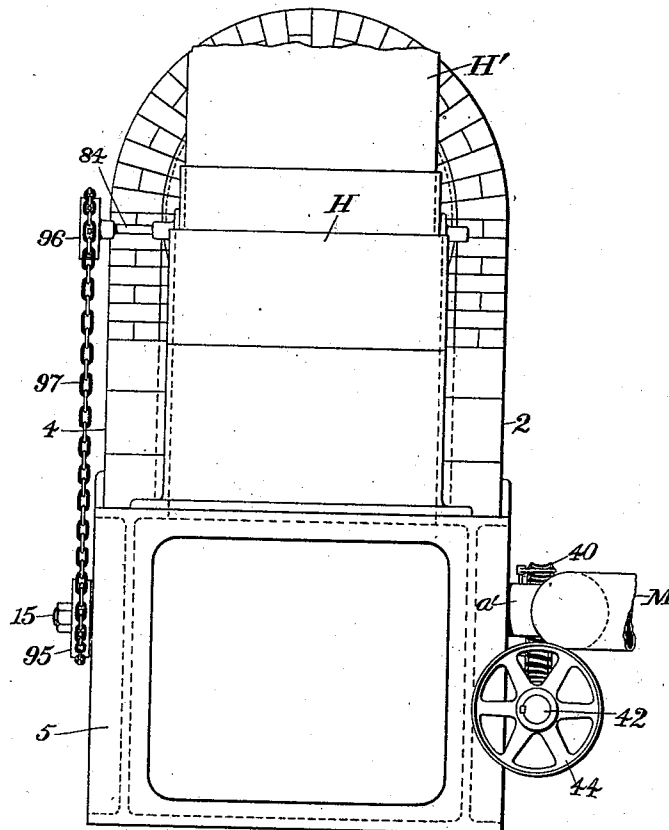
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Fig. 3.



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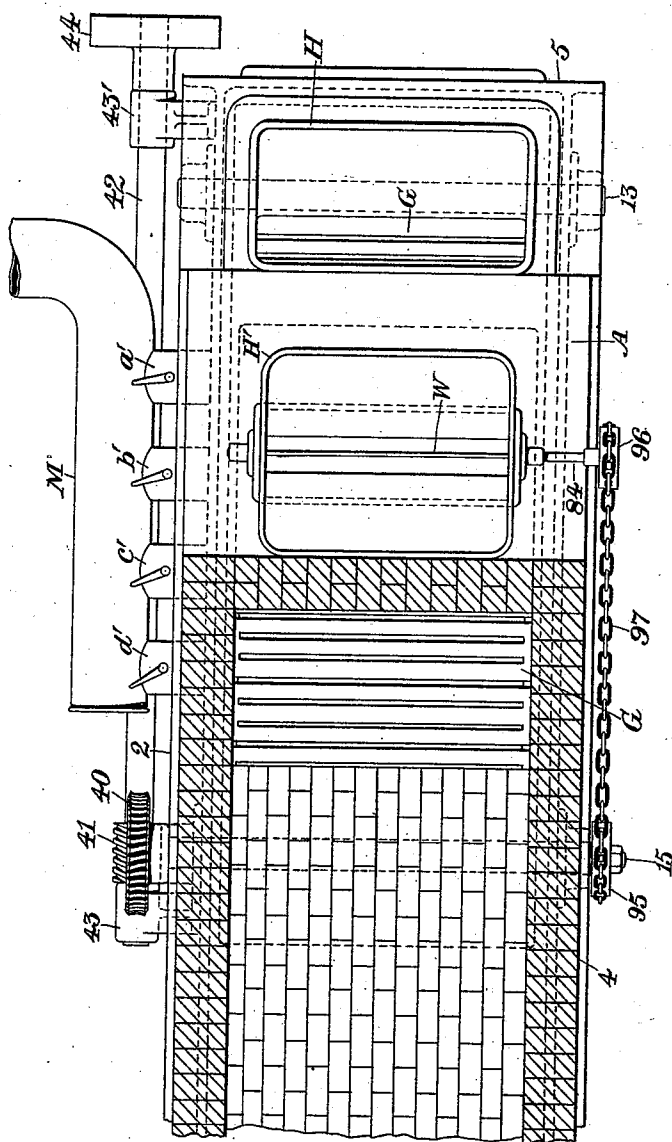
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Fig. 4



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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,572, dated December 12, 1893.

Application filed July 10, 1893. Serial No. 479,988. (No model.)

To all whom it may concern:

Be it known that I, ECKLEY B. COXE, a citizen of the United States, residing at Drifton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to traveling-grate furnaces; the object being to provide an improved furnace of that class adapted for burning two grades of fuel at the same time.

My present invention is in the nature of an improvement on the furnace described and claimed in Letters Patent No. 499,716, granted to me June 20, 1893, to which reference may be had for a more particular description than is contained herein of certain details of the furnace-mechanism not essential to these present improvements.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a traveling-grate furnace embodying my present improvements. Fig. 2 is a vertical transverse section on line $a^x a^x$, Fig. 1, showing the parts at the left-hand of said line as seen from a point at the right-hand thereof. Fig. 3 is an end elevation of the furnace as seen from the right-hand in Fig. 1. Fig. 4 is a plan view of the furnace, certain parts being broken away down to the broken line $b^x b^x$.

In Fig. 1 the furnace is shown supplied with fuel as when in operation.

Similar characters designate like parts in all the figures.

For illustrating the application and mode of operation of my present improvements, I have shown the same applied to the furnace which is described and claimed in my aforesaid Letters Patent No. 499,716. This furnace comprises a traveling grate and means for actuating the same, and has its furnace-chamber C, and also the grate-mechanism, inclosed by the usual side-walls 2 and 4, and end-walls 3 and 5. The endless grate, designated in a general way by G, comprises the upper and lower runs, 9 and 10, respectively; said upper run constituting the furnace-floor under which is located the series of air-blast chambers, a, b, c, d , these being supplied by the air-pipes a', b', c', d' , through a conduit, M, leading from a blower, air-compressor or

other air-supply, not shown. The upper and lower runs, respectively, of the endless grate are shown supported on guides, 18 and 18', and 19 and 19', respectively. For actuating the traveling grate G, this is shown carried by the chain-wheels 12 and 14, which are supported on the shafts 13 and 15, respectively; and for revolving the one of the shafts and thereby actuating the grate, said shaft, 15, is shown furnished with the worm-wheel 40, which meshes with a worm, 41, on a driving-shaft, 42, that is supported in bearings, 43, 43', and is driven by a driving-pulley, 44, from some suitable source of power, not shown. These several details belonging to the invention being described and claimed in my aforesaid Letters Patent, a further description of the same is deemed unnecessary.

For delivering the regular or first supply of fuel to the endless grate, the furnace is or may be provided with the supply-hopper H, whose mouth or discharge-opening delivers the fuel directly onto the grate, as illustrated in Fig. 1. Immediately rearward of said supply-hopper H, the furnace-chamber C is shown covered with a roof or arch, designated by A, in which an opening is made at 85 through which to supply the grate with an additional quantity of fuel, usually of another grade.

Rearward of the furnace-roof A, an ordinary steam-boiler, B, is shown in place for being heated by the gases from the furnace; but it will be understood that said gases may be conducted to a separate heat-using furnace, or that any other thing to be heated may be substituted for the boiler B, which for clearness of illustration is omitted in Fig. 4.

As a means for regularly delivering the additional fuel-supply to the furnace-chamber through the aforesaid opening 85, a feed-apparatus is shown set above said opening, and comprises a hopper, H', suitably supported, and a feed-wheel or bucket-wheel, W, set underneath said hopper in position for receiving the fuel therefrom and delivering the same in a falling stream, 86, into the furnace-chamber, as fully illustrated in Fig. 1. For actuating said feed-wheel, the shaft 84 of said wheel is shown furnished with a pulley or chain-wheel, 96, which is connected by a driving-band or chain, 97, with a chain-wheel,

95, fixed on the shaft 15. By making the wheels 95 and 96 of proper relative dimensions, any required speed may be imparted to said feed-wheel, for delivering to the furnace any required proportion of the secondary fuel.

The operation of the furnace, except as to the secondary fuel-supply, is substantially the same as illustrated and described in my aforesaid Letters Patent No. 499,716. The fuel in the hopper H is delivered directly to the grate, on which it is spread in a layer, and during the regular operation of the furnace is ignited at a point adjacent to or over the first air-blast chamber *a*, which chamber is, in practice, supplied with air at a moderate pressure. The air-blast chamber *b* is ordinarily supplied with air at a considerably higher pressure, for the purpose of increasing the combustion and raising the burning mass to a high temperature. During or immediately following the thorough ignition of the layer 71 of fuel, the secondary supply of fuel is delivered to the furnace-chamber, being deposited in a layer, 72, superimposed upon said ignited layer 71 of fuel from the hopper H. In practice, said secondary supply is intended to be of a relatively low grade, such, for instance, as carbonaceous slates and minerals found in connection with veins of pure coal. The secondary fuel being delivered into the hot furnace-chamber upon a bed of fuel already brought to a high state of combustion, the carbon is rapidly distilled therefrom and mingled with the furnace-gases, to be consumed in the rearward portions of the furnace-chamber; the refuse mineral being finally carried off with the ashes and cinder from the higher grade of fuel forming the first layer upon the furnace-floor.

By means of the improved furnace herein described, carbonaceous minerals having a very low proportion of carbon may be advantageously utilized in connection with the ordinary grades of coal, even when such minerals may not be capable by themselves of supporting combustion.

It will be remembered that in the furnace herein shown, when operated as described in my aforesaid Patent No. 499,716, the air-pressures in the chambers *c* and *d* will (usually) be normally less than in the air-blast chamber *b*; but in the present instance, owing to the increased depth of the mass of fuel beyond the point where the secondary supply is delivered to the grate, the air-pressures will ordinarily require to be increased in one or more of said chambers, for forcing the air through the primary and secondary layers of fuel. In this connection it will be understood that the number and width of the suc-

cessive air-blast chambers will be regulated according to the duty required of the furnace.

The improved process herein described of utilizing carbonaceous minerals by distributing and burning the same upon a bed of higher-grade fuel previously ignited, is reserved to constitute the subject-matter of a separate application, Serial No. 481,526, filed July 26, 1893.

Having thus described my invention, I claim—

1. In a furnace, the combination with a traveling grate and a fuel-supply therefor, and with means for supplying air to the grate, of a second fuel-supply in position for delivering fuel to the grate at a point beyond the normal ignition-line of the fuel first supplied, substantially as and for the purposes set forth.

2. In a furnace, the combination with a traveling grate and the first fuel-supply therefor, of the second fuel-supply located above the grate in advance of the first fuel-supply, a feed-wheel for delivering the second supply of fuel to the furnace, and means for actuating the feed-wheel and the traveling grate, substantially as described.

3. In a furnace, the combination with a traveling grate, of a primary and a secondary fuel-supply set one in advance of the other for delivering primary and secondary layers of fuel upon the grate, and a series of variable-pressure air-blast apparatuses underneath the grate, the first of which is located between said fuel-supplies, and others of which are located in position for blowing the combined primary and secondary layers of fuel, substantially as described.

4. In a furnace, the combination with a traveling grate, means for delivering a first fuel-supply to the grate at one point in the length thereof, one air-supply apparatus located in advance of said first fuel-supply for operating on the first supply of fuel, means for delivering a second fuel-supply to the grate at a point beyond said first air-supply apparatus, and a second air-supply apparatus located in advance of said second fuel-supply for operating on the combined supplies of fuel, substantially as described.

5. In a furnace, the combination with a traveling grate, and with means for supplying air to the grate, of a multiplicity of fuel-supply apparatuses in position and arranged for delivering successive supplies of fuel to the grate at successive points in the length thereof.

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Witnesses:

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ELLIOTT A. OBERRENDER.