

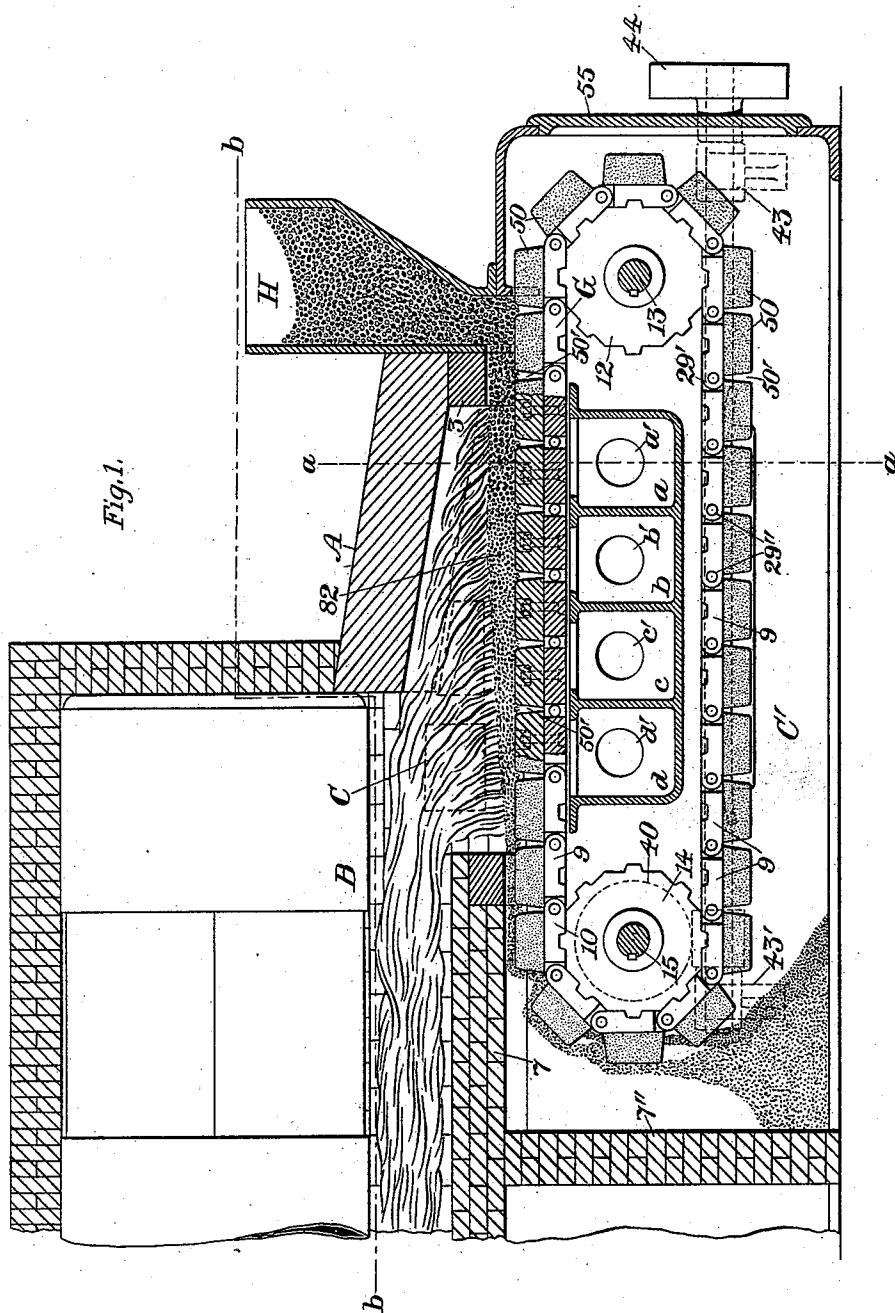
(No Model.)

4 Sheets—Sheet 1.

E. B. COXE.
FURNACE.

No. 510,581.

Patented Dec. 12, 1893.



Witnesses:

John L. Edwards Jr.

Fred. J. Dole.

Inventor:

Eckley B. Cox.

By his Attorney,

F. W. Richards.

(No Model.)

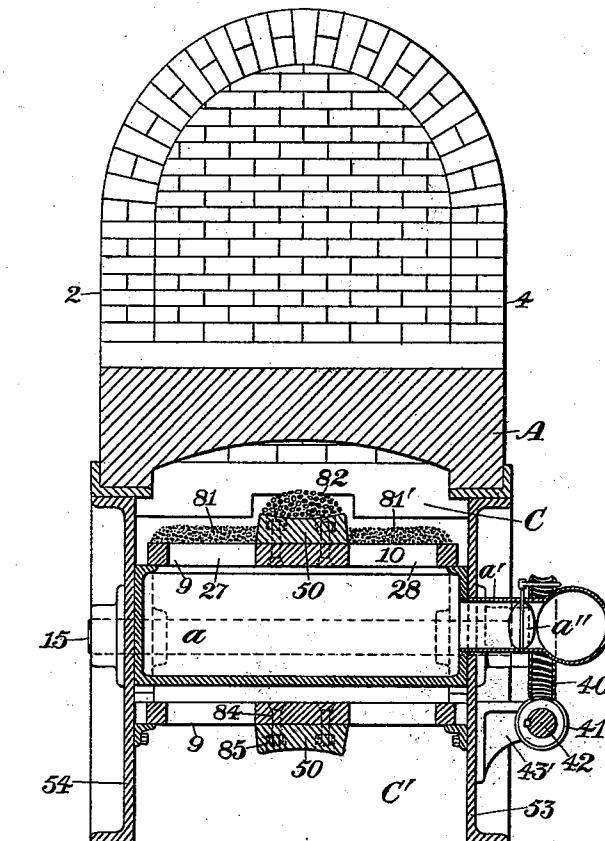
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Fig. 2.



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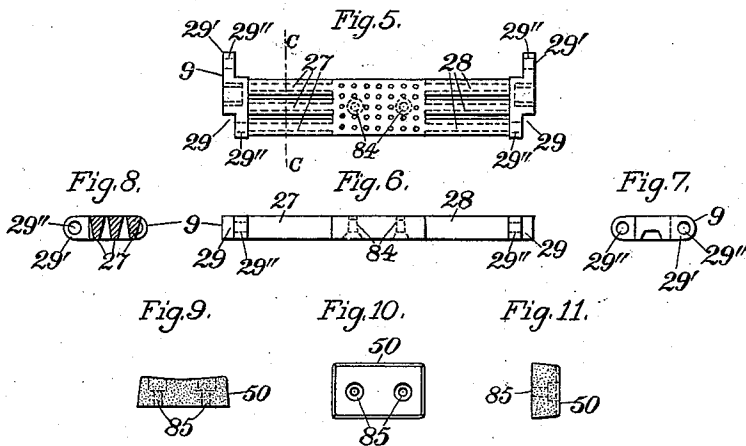
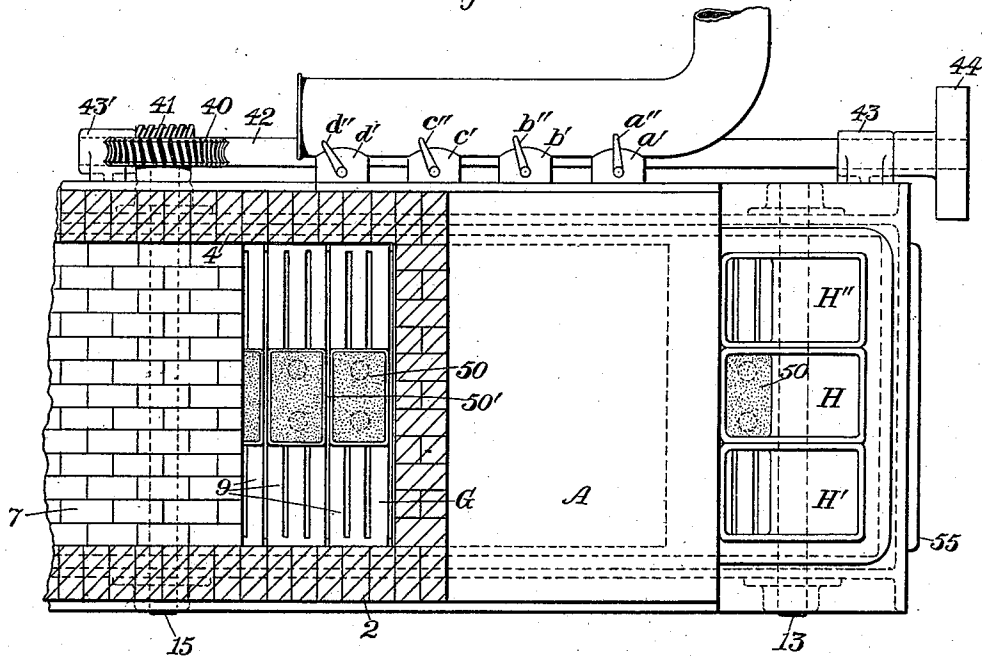
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Fig. 3.



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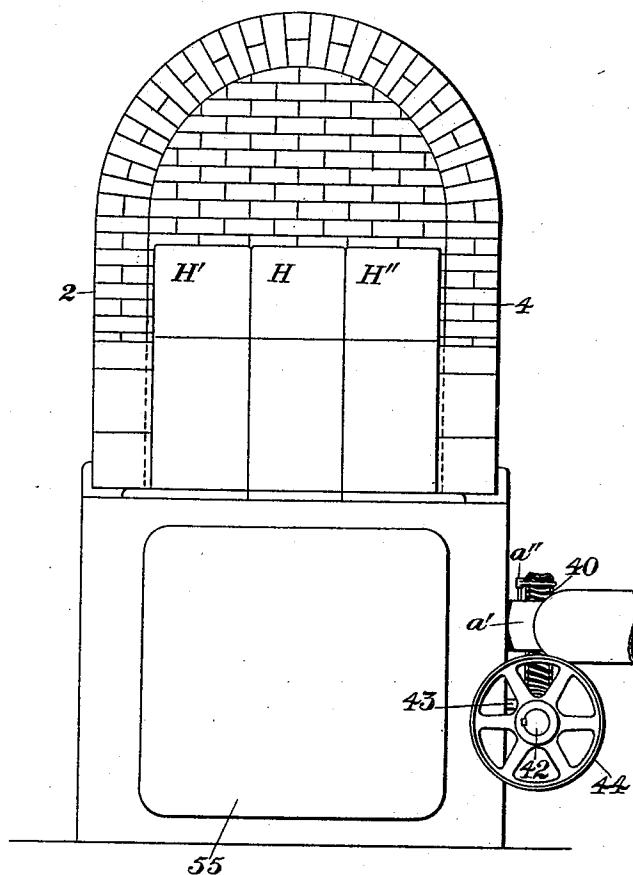
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Fig. 4.



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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,581, dated December 12, 1893.

Application filed October 16, 1893. Serial No. 488,271. (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 adapted for burning carbonaceous minerals in connection with the lower grades of anthracite coal.

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 complete description of the general features of the furnace-mechanism which are herein only briefly described.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of a furnace embodying my present invention. Fig. 2 is a vertical transverse section, taken on the line *a-a* of Fig. 1. Fig. 3 is a plan view taken on the line *b-b* of Fig. 1, showing the boiler and its coverings removed. Fig. 4 is an end view as seen from a point at the right-hand of Fig. 1, looking toward the left-hand thereof. Fig. 5 is a plan view of one of the grate-sections, or grate-bars. Fig. 6 is a side or edge view of the grate-bar drawn in projection with Fig. 5. Fig. 7 is an end view of the grate-bar, as seen from the right-hand in Fig. 6. Fig. 8 is a sectional view taken on the line *c-c*, Fig. 5. Fig. 9 is a side or edge view of the mineral-floor, which is usually of fire-brick and is attached to the center portion of the grate-section over the small holes shown in Fig. 5. Fig. 10 is a plan view of said plate or fire-brick, and Fig. 11 an end view of the same.

Similar characters designate like parts in all of the figures.

The furnace illustrated in the drawings is of similar construction, in a general way, to the furnace described in my aforesaid Letters Patent.

The furnace-chamber C is inclosed within the usual side-walls 2 and 4, and extends from the bridge-wall 7 forwardly to the front-wall 3, (usually in the form of an arch,) and

is shown covered, for a part of its length, by the reverberatory arch A, hereinafter again referred to. Over the rearward portion of the furnace-chamber C is shown a steam-boiler, B, which may be of any well-known type, or which may be replaced, in practice, by any other thing to be heated.

The floor of the furnace consists of the upper run, 10, of an endless traveling grate, designated in a general way by G, and which is carried upon suitable grate-carrying wheels, or chain-wheels, 12 and 14, that are supported on shafts, 13 and 15, journaled in suitable bearings on the framework of the furnace-structure. As a means for actuating said shafts and wheels for imparting the required traveling movement to the furnace-floor, the shaft 15 is shown furnished with a worm-wheel, 40, that meshes with a worm, 41, on a driving-shaft, 42, journaled in bearings, 43, 43', on the framework of the furnace. Said shaft 42 is shown provided with a pulley, 44, whereby it may be operated by power.

The grate-mechanism, except the minor features just described, is inclosed within the furnace structure by means of side-walls 53 and 54, the rearward wall 7'', and the front end-wall 55, which, in practice, may be removably fixed in place so as to serve as a door for access to the grate-mechanism chamber C'.

The endless grate G consists, in the form thereof herein shown, of a series of sections, or grate-bars, 9, shown in detail in Figs. 5 to 8, inclusive; these sections are shown provided with corresponding notches, 29, and projecting ears, 29', whereby the same are connected together in the form of an endless chain, or traveling grate, by means of suitable pivot-pins at 29'', in a well-known manner. Said grate-sections consist, at the end portions thereof, of a series of grate-bars 27 and 28; and in the middle portions thereof are shown (see Fig. 5) having a number of small perforations whose purpose is to assist in keeping cool the middle portion of the grate and thereby prevent undue warping of the same, and to furnish fresh air to the interstices of the mineral-floor plates, which are shown in detail in Figs. 9, 10 and 11, and are shown in Figs. 1, 2, and 3 fixed in place on said grate-bars. In the present instance, said

floor-plates 50 are placed about midway of the length of the grate-bars, and are about one-third of the length of said bars. The plates 50 are held in place by suitable attaching devices, as, for instance, ordinary bolts through the holes 84 in the grate-bar and 85 in the plate.

The air-supply for the grate consists of a series of chambers, *a, b, c, d*, located at successive points of the length of the furnace-chamber, immediately under the fuel-carrying run 10 of the endless grate. Said chambers are supplied with air by means of the respective pipes *a', b', c', and d'*, which are usually provided with regulating-valves, or gates, as *a'', b'', c'', d''*, respectively, for the purpose of independently regulating the air-pressure in the successive chambers, for the purpose of effecting the combustion of the fuel according to the process described and claimed in the Letters Patent No. 499,715, granted to me June 20, 1893.

The fuel is fed to the grate at the forward end of the furnace-chamber, at a point adjacent to the first air-supply chamber *a*, by means of a multiplicity of fuel-supplying hoppers, of which three are shown in the present instance and are designated by *H, H'* and *H''*. The hoppers *H'* and *H''* are located at the ends of the series of hoppers for supplying the relatively high-grade fuel to the edge portions of the traveling-grate, these portions comprising the spaces at the sides of the aforesaid mineral floor. The hopper *H* is shown located centrally of the width of the furnace, immediately over the described mineral floor, for the purpose of supplying the carbonaceous mineral to said floor, the mineral being massed or heaped upon the floor, as indicated at 82, Figs. 1 and 2.

The travel of the furnace-floor or endless grate *G* carries the fuel in said portions of the grate forward over the air-chamber *a*, where it is ignited, and afterward brought to a high state of combustion over the chamber *b*, and is finally burned out over the succeeding chambers *c* and *d*; the cinder being finally carried under the bridge-wall 7 and deposited in a pile at the rearward end of the grate-mechanism, as indicated in Fig. 1. The carbonaceous mineral upon the fire-brick mineral-floor being carried along simultaneously with the fuel, is subjected to the heated gases of the furnace-chamber, and also, at the edges of the mass, to the direct action of the flames from the fuel; and the heat-rays within the furnace are directed by the reverberatory arch *A*, which for this purpose is curved as indicated in Fig. 2, upon the layer of mineral, which thereby has the carbon distilled out of it to mingle with the other gases within the furnace-chamber and to be consumed therewith.

The furnace herein described is adapted for treating the lowest grades of carbonaceous slates and like minerals which are found con-

tiguous to the coal-veins, the mineral being reduced to relatively small size before being fed to the furnace.

The fire-brick floor-plates 50 are shown, in Fig. 1, set upon the traveling grate, with spaces, 50', between said plates; this is for the purpose of directing some portion of the heated gases and flame from the fuel-layers 81 and 81' underneath the mineral-layer 82 so as to assist in the effective distillation of the same.

Having thus described my invention, I claim—

1. In a furnace, the combination with the traveling grate, of a series of fuel-supply hoppers set side by side in position to discharge directly onto the upper run of the grate, means for actuating the grate, and means for supplying air thereto, substantially as described.

2. In a furnace, the combination with the traveling grate having a mineral-floor substantially as described about midway of the width of the grate, of a supply-hopper for supplying mineral to said floor, and separate supply-hoppers for supplying fuel to the grate at the sides of said floor, and means for supplying said fuel-layers, substantially as described.

3. In a furnace, the combination with the traveling furnace-floor comprising grate-portions and a mineral-floor substantially as described, of means for supplying fuel to said grate-portions and for supplying mineral to said mineral-floor, a reverberatory arch extending over the furnace-floor, and means for supplying air to the grate, substantially as described and for the purpose specified.

4. In a furnace, the combination with a traveling furnace-floor consisting of grate-bars connected together to form an endless traveling grate, of a series of floor-plates substantially as described, carried by said grate-bars and constituting a mineral-floor, substantially as described.

5. In a furnace, the combination, in the traveling furnace-floor, of a series of grate-bars connected together and having means for actuating the same, and the fire-brick floor-plates removably secured to said bars and having spaces between the successive floor-plates, substantially as described.

6. In a furnace, the combination with a traveling furnace-floor comprising grate-portions and a mineral-floor portion substantially as described, of means for supplying fuel to said grate-portions and mineral to said mineral-floor, means for actuating the traveling furnace-floor, and successive variable-pressure air-supply apparatus for successive portions of the furnace-chamber below the furnace-floor, substantially as described and for the purpose specified.

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