

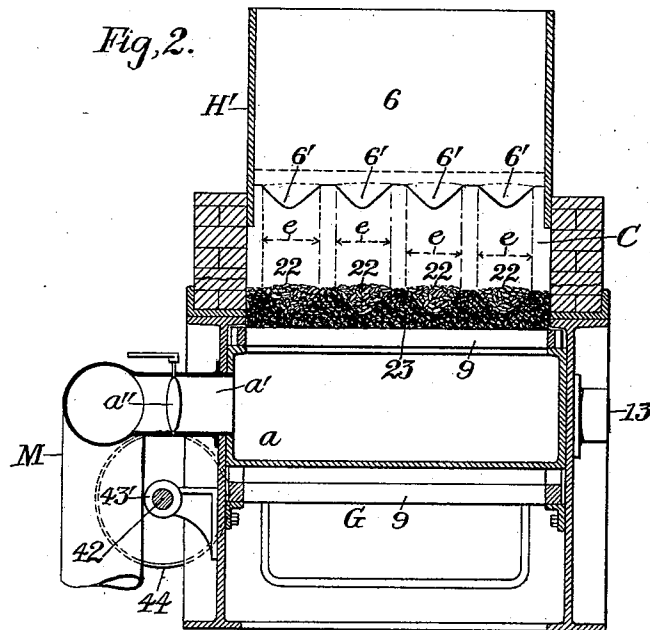
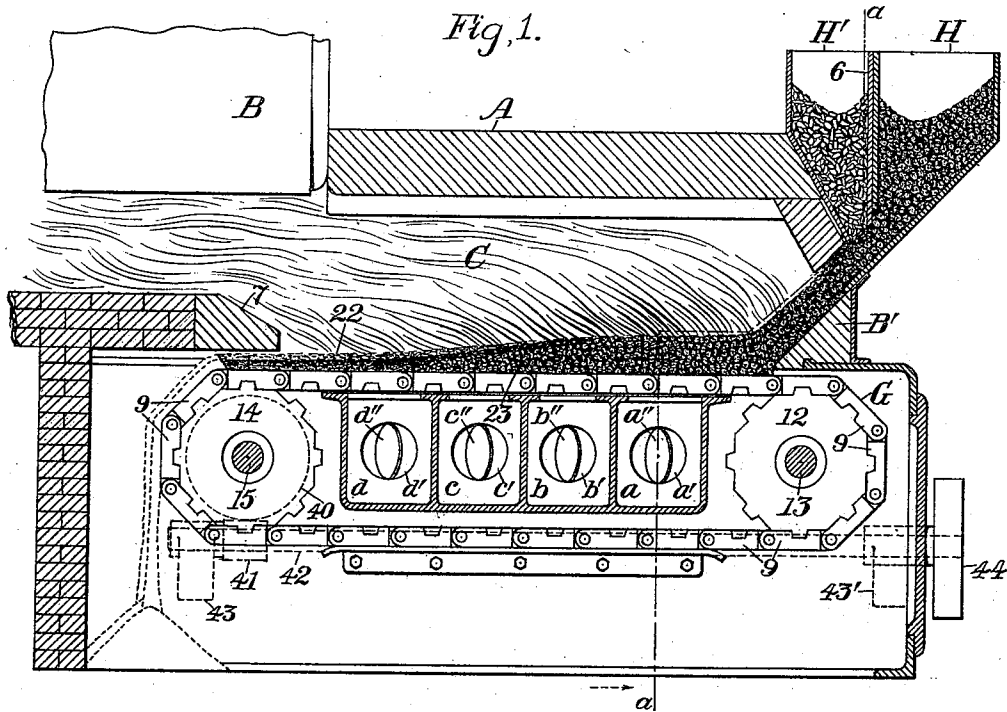
(No Model.)

F. H. RICHARDS.
FURNACE.

2 Sheets—Sheet 1.

No. 510,552.

Patented Dec. 12, 1893.



Witnesses:
John L. Edwards Jr.
Fred. J. Dole.

Inventor:
F. H. Richards

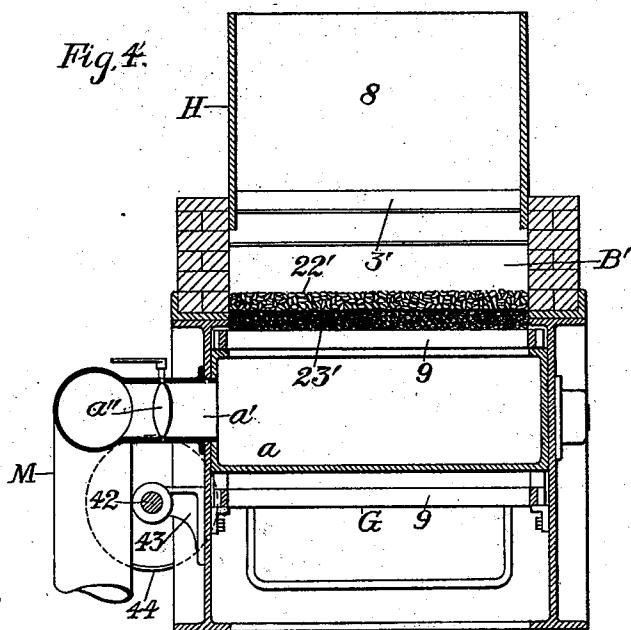
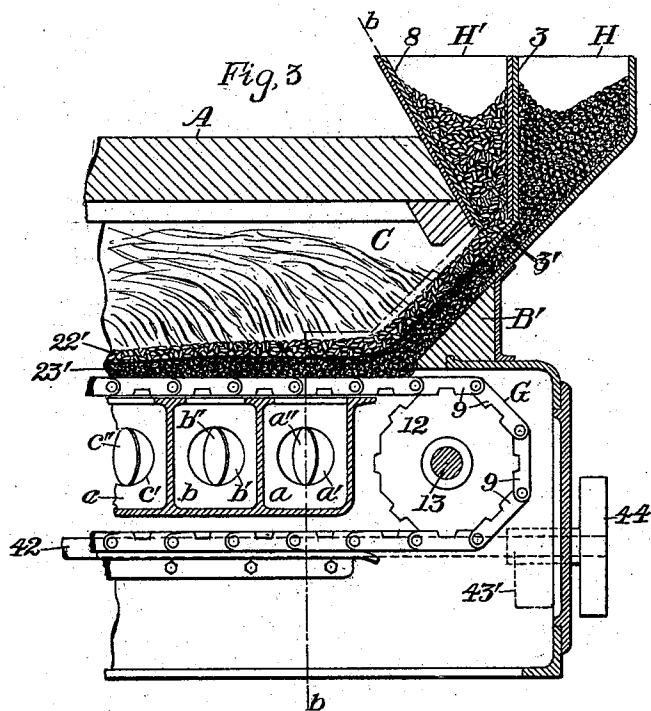
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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO ECKLEY
B. COXE, OF DRIFTON, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,552, dated December 12, 1893.

Application filed September 1, 1893. Serial No. 484,559. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to traveling-grate furnaces, and is in the nature of an improvement upon the furnace described in Letters Patent No. 499,716, granted to Eckley B. Coxé June 20, 1893.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation (as seen from the right-hand in Fig. 2) of a furnace of the class specified, constructed according to my present improvements. Fig. 2 is a sectional elevation of the furnace, on the line *a—a*, Fig. 1, showing the parts at the right-hand of said line as seen from a point at the left-hand thereof. Fig. 3 is a view similar to a portion of Fig. 1, showing a modification of the improvement. Fig. 4 is a sectional view similar to Fig. 2, but taken on the line *b—b*, Fig. 3, showing the parts at the right-hand of said line as seen from a point at the left-hand thereof.

Similar characters designate like parts in all of the figures.

In the furnace shown in the drawings, the furnace-chamber *C* is inclosed by the usual side-walls, and is covered by a roof, *A*, rearward of which is shown, in Fig. 1, a portion of a steam-boiler, *B*, which, in practice, may be replaced by any other thing to be heated. The furnace-chamber has at the rearward end thereof the usual bridge-wall, *7*, and at the forward end thereof is shown constructed with a wall having an opening therein through which to deliver the fuel to a traveling grate, designated in a general way by *G*. This grate is or may be of the same construction and mode of operation described in the aforesaid Letters Patent; as herein shown, it consists of a series of grate-bars, *9*, joined together to form an endless grate which is carried upon wheels, *12* and *14*, on the shafts, *13* and *15*, that are supported in suitable bearings in the framework of the furnace. As a means for actuating the traveling grate, one of said

shafts, *13* or *15*, is, in practice, provided with a worm-wheel, indicated by the dotted line, *40*, Fig. 1, which meshes with a worm, *41*, on a driving-shaft, *42*, that is supported in bearings, *43*, *43'*, on the furnace structure; said shaft *42* having a pulley, *44*, whereby it may be actuated by a belt (not shown) from some convenient source of power.

Under the upper run of the traveling grate, there is a series of air-chambers, *a*, *b*, *c*, *d*, which are connected by corresponding pipes, *a'*, *b'*, *c'*, *d'*, with the air-supply pipe, *M*, that is supplied with air from some suitable apparatus, as, for instance, a blower or air-pump. In practice, said connecting-pipes, *a'*, *b'*, *c'*, and *d'*, are provided with regulating-valves, *a''*, *b''*, *c''*, and *d''*, after the manner described in the aforesaid Letters Patent, for the purpose of controlling combustion, according to the process described in the Letters Patent of said Coxé, No. 499,715, dated June 20, 1893.

The principal object of my present invention is to provide a furnace of the class specified adapted for burning simultaneously two grades of fuel, one relatively high in carbon and the other relatively low in carbon. Accordingly, two supply-hoppers, *H*, *H'*, are placed at the forward end of the furnace, the hopper *H* being forward of the hopper *H'* and its discharge-chute extending below the opening of said hopper *H'*. In Figs. 1 and 2, a regulator-plate, *6*, is shown in place between the two hoppers; and the lower edge of said plate (see Fig. 2) is formed with depending blades, *6'*, which causes the layer of fuel descending from the hopper onto the endless grate *G* to have channels therein, these channels being supplied with the lower-grade fuel from the hopper *H'*, as indicated by the lighter shading at *22*, Fig. 2. The discharge-outlets of the two hoppers are set contiguous to each other, so as to superimpose one supply of fuel upon the other and deliver these superimposed layers in one combined layer to the traveling grate at the forward end of the furnace-chamber.

For the purpose of illustration, the fuel upon the inclined surface *B'* is omitted, the width of the channels in the lower layer of fuel being indicated by the dotted dimension-lines, *e*.

The method of utilizing the low-grade fuel by filling this into separate channels formed in the lower layer of higher-grade fuel, constitutes a method or process hereinafter separately claimed.

In the operation of the furnace, when the traveling grate carries the fuel forward from the inclined chute B', the fuel from the hopper H passes down under the regulator-plate or gate 6, to form a channeled layer, as indicated by the darker shading at 23, Fig. 2; at the same time, the lower-grade fuel in the hopper H' fills up said channels, as indicated by the lighter shade at 22, Fig. 2; and the lower layer of fuel being ignited near the point where it falls upon the grate, and underlying the lower-grade fuel contained in said channels, serves to thoroughly heat and distill the lower-grade material to drive therefrom the carbon and consume the same. This operation is facilitated by the masses 22 of low-grade fuel being at some distance apart, so that the gases and flames from the lower layer of fuel are free to escape therefrom upwardly between said masses 22. This feature, in practice, prevents the fusing of the lower-grade material from checking the outlet for the gases from the lower layer of higher-grade fuel.

The foregoing description, both as to the construction and operation of the furnace, applies also to the modification shown in Figs. 3 and 4, with the exception that in this modification the depending blades 6' of the cut-off are omitted, and the two kinds of fuel are simply superimposed the one upon the other, as indicated by the dark and light-shaded streams 23' and 22' in Figs. 3 and 4. In this instance, the division-wall 3 of the two hoppers H and H' is shown with an inclined extension or plate, 3', for preventing the mixing of the two kinds of material; also, in Figs. 3 and 4, a regulator, 8, is shown at the forward side of the forward hopper H', for regulating the depth of the upper layer of fuel.

Having thus described my invention, I claim—

1. In a furnace, the combination with a traveling grate, of two fuel-hoppers set transversely of the furnace at the forward end thereof, one forward of the other and having contiguous discharge-outlets arranged, substantially as described, to superimpose one supply upon another, substantially as described and for the purpose specified.

2. In a furnace, the combination with a traveling grate, of two fuel-supply hoppers set one forward of the other and transversely of the furnace at the forward end thereof, and a regulator-plate intermediate to the fuel-hoppers for channeling the lower layer of fuel, and means for spreading the fuel from the second hopper in said channels, substantially as described and for the purpose specified.

3. The method herein described for simultaneously burning two kinds of fuel in the same furnace, which consists in spreading one kind of fuel in a channeled layer, and spreading the second supply of fuel in said channels in separated masses, substantially as described and for the purpose specified.

4. In a furnace, the combination with a traveling grate and with successive variable-pressure air-blast apparatuses underneath the grate, of two fuel-supply hoppers set for delivering to the grate two kinds of fuel in superimposed layers, substantially as described.

5. The process herein described of burning culm, or low-grade coal, which consists in spreading the same in a layer upon a layer of relatively clean higher-grade coal spread directly upon a traveling grate, igniting the combined layers, and subjecting the ignited layers to successive air-blasts of varying pressures, substantially as described.

FRANCIS H. RICHARDS.

Witnesses:

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