

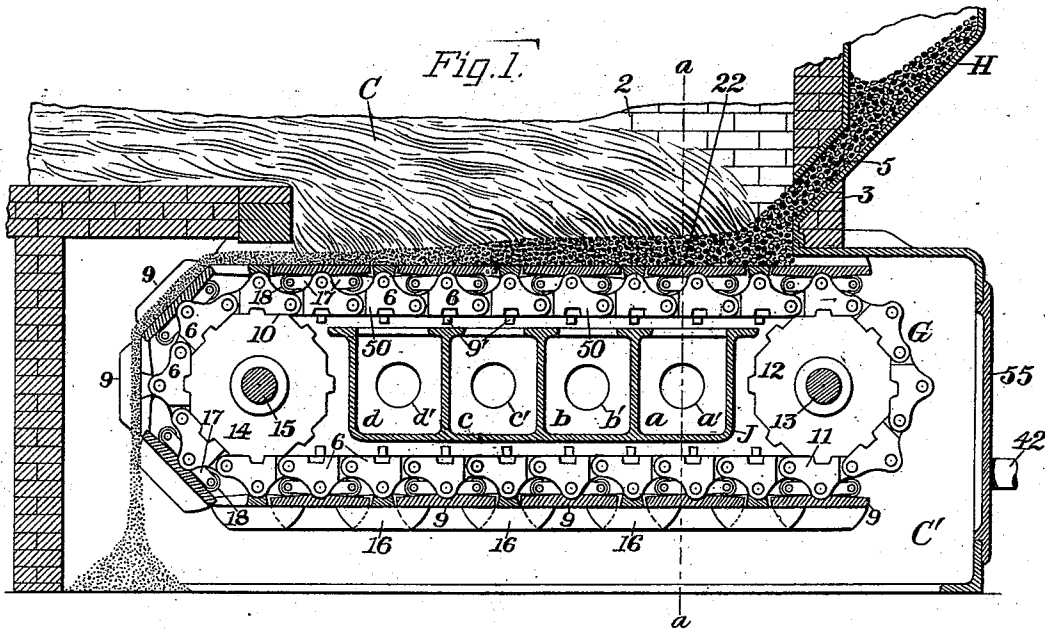
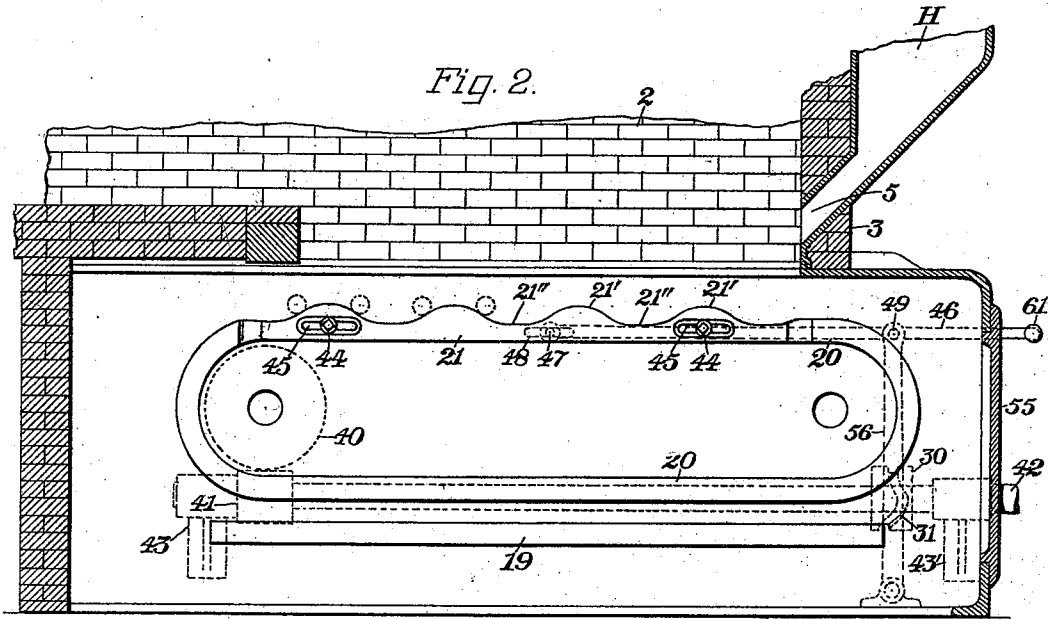
(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.
FURNACE.

No. 510,556.

Patented Dec. 12, 1893.



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

Inventor:
F. H. Richards.

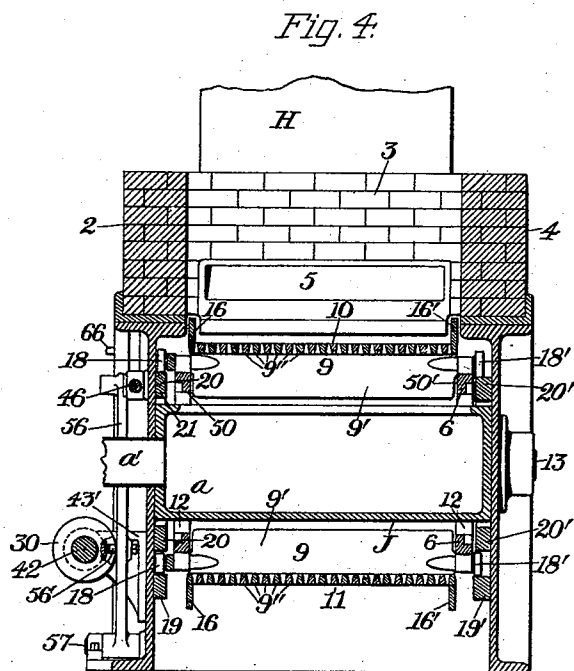
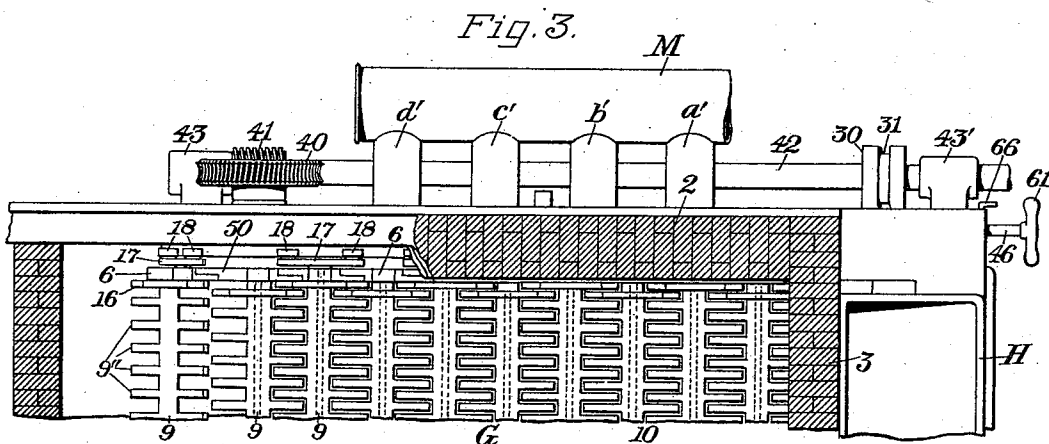
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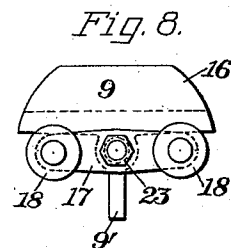
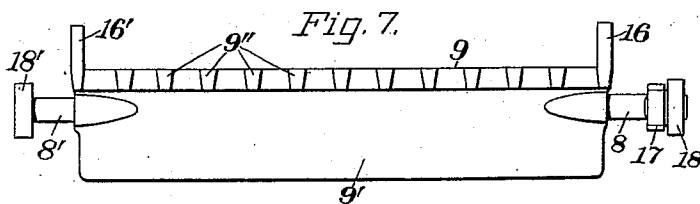
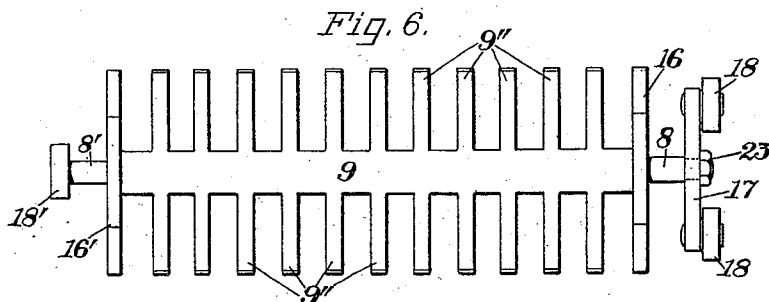
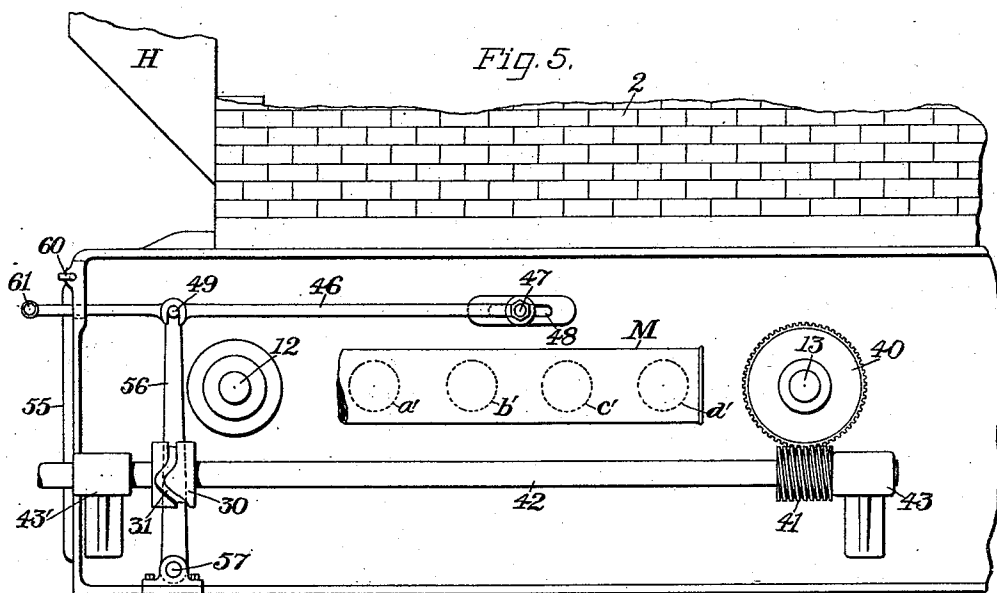
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3 Sheets—Sheet 3.

F. H. RICHARDS.
FURNACE.

No. 510,556.

Patented Dec. 12, 1893.



Witnesses:
John L. Edwards Jr.
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Inventor:
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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. 510,556, dated December 12, 1893.

Application filed September 4, 1893. Serial No. 484,703. (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; the object being to provide a furnace in which the grate-bars of the furnace-floor shall be operable independently of the traveling-movement of said floor, for the purpose of breaking up and agitating the fuel during the combustion of the same.

My present invention is in the nature of an improvement on the furnace described and claimed in my concurrent application, Serial No. 484,702, filed September 4, 1893.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a furnace embodying my present improvements. Fig. 2 is a view similar to Fig. 1, with the grate-mechanism and the air-blast apparatus removed. Fig. 3 is a partial plan view of the furnace. Fig. 4 is a transverse section in line *a-a* of Fig. 1, showing the parts at the right-hand of said line as seen from a point at the left-hand thereof. Fig. 5 is a side view of the furnace, as seen from above in Fig. 3 and from the left-hand in Fig. 4, for illustrating the apparatus shown for operating the movably-supported grate-bars. Fig. 6 is a plan view of one of the grate-bars. Fig. 7 is a side elevation of the same, as seen from below in Fig. 6. Fig. 8 is an end view of the grate-bar, as seen from the right-hand in Fig. 7.

Similar characters designate like parts in all the figures.

Inasmuch as my present improvements are more especially intended for use in connection with the furnace described in Letters Patent No. 499,716, granted to Eckley B. Coxé, June 20, 1893, I have herein shown these improvements applied to a furnace of the kind described and claimed in said patent; but my present improvements are applicable to other kinds of traveling-grate furnaces, being more particularly intended for use in burning bituminous or semi-bituminous coals.

The furnace shown in the drawings has its

furnace-chamber, C, inclosed, in practice, by the usual side-walls, as 2 and 4, and at the rearward end thereof has the usual bridge-wall, and at the forward end thereof has the wall 3, through which is a passage-way, 5, in which the fuel is supplied to the grate from an ordinary hopper, H, at the front end of the furnace. The grate-mechanism is inclosed in a mechanism-chamber, C', underneath the furnace-chamber, access to which is or may be obtained by means of the door 55 at the forward end of the furnace. Said mechanism-chamber is ordinarily so inclosed for the purpose of preventing or reducing the leakage of air by way of the edges of the traveling grate.

The traveling grate, which is designated in a general way by G, consists of grate-bars and carrying-chains therefor, which chains, designated by 50 and 50', are carried by chain-wheels 12 and 14, fixed on the driving-shafts 13 and 15, which are supported in suitable bearings in the furnace structure. For actuating the grate-mechanism, one of said shafts, 15, has on its projecting end a worm-wheel, 40, which meshes with a worm, 41, on a driving-shaft that is carried in bearings, 43 and 43', on the framework of the furnace. Said driving-shaft 42 may be actuated by means of a pulley (not shown) fixed thereon in the usual manner. The links 6 of the chains 50 and 50' have bearings for receiving the journals, 8 and 8', of the movably-supported grate-bars, 9, which, in the preferred form thereof shown in Figs. 6, 7 and 8, consist of a bar or vertical plate, 9', provided along the upper edge thereof with the grate-bars proper or fuel-supporting fingers, 9'', which, as shown in Fig. 3, intermesh the fingers of one pair with those of the next pair so as to form a continuous grated floor for the furnace-chamber. At the ends of the grate-bars 9, these are provided with the end-walls 16 and 16', which, as indicated in Fig. 4, form a continuous wall along the edge of the furnace-floor for properly holding up the edges of the layer of fuel on the grate. See Fig. 1.

The foregoing arrangement of the details of the grate-mechanism will be understood by comparison of the several figures of drawings, especially Figs. 1, 2, 3 and 4.

The upper run, 10, of the grate is shown

supported by means of the rollers 18 and 18', with which each grate-section or grate-bar is provided, and which run upon the tracks 20 and 20', respectively; the lower run, 11, of the grate is supported by means of said rollers running upon the guideways 19 and 19', which are fixed in proper position therefor.

For supplying air to the upper run 10 of the endless grate G, an air-blast chamber, J, is provided, which chamber, as described in the aforesaid Letters Patent No. 499,716, may consist of a series of separate air-blast chambers, *a, b, c* and *d*, supplied with air under varying pressures, through the pipes *a', b', c'* and *d'*, from the conduit M, or other source of air-supply, for the purposes stated in said Letters Patent.

For the purpose of operating the grate-bars to break up the fuel, the grate-bars are shown provided at one end with lever-arms, 17, which are secured to the journals 8 by means of nuts, 23, screwed upon the ends of said journals. The lever-arms 17 are provided at each end with rollers, 18, which run on the track 20, which track corresponds in form to the traveling movement of the grate-bars. The upper middle portion of said track is formed of a separate grate-operating bar, 21, having an upper surface which is composed of alternately curved elevations and depressions, 21' and 21'', respectively, Fig. 2, said bar being held in place by means of bolts, 44, which pass through slots, 45, formed therein, said slots permitting said bar to have a reciprocatory movement. This bar 21 is operated by means of a rod, 46, which is pivotally secured thereto by means of a bolt, 47, which passes through a slot, 48, formed in the side of the furnace-casing, said rod 46 being removably connected near its outer end with a stud 49, secured to a lever-arm, 56, which lever-arm is pivoted near its lower end at 57, and is provided near its middle portion with a stud, 51', (Fig. 4) which enters a groove, 31, formed in a cam 30, secured to the aforesaid driving-shaft 42. When said operating-bar is longitudinally reciprocated, the grate-bars, whose lever-arms are in engagement with said bar, are thereby oscillated on their journals 8 and 8' in the carrying-chains. By lifting the rod 46 out of engagement with the stud 49, the operation of the grate-bar-actuating-mechanism may be stopped, said rod being held out of engagement therewith by means of a pin, 60. In practice, a suitable handle, as 61, will be fixed upon the outer end of the rod 46, whereby the same may be operated by hand.

By reason of the construction hereinbefore described, the grate-bars, as these are carried along in the furnace, and by reason of the engagement of the two rollers of the grate-bar with the undulating upper surface of said actuating-bar 21, are given an oscillating movement of a relatively low velocity, which serves to gradually break up the mass of fuel during the combustion period, so as to pre-

vent such packing or solidification of the same as will materially interfere with the proper combustion thereof. By imparting a suitable reciprocatory movement to said actuating-bar 21, the grate-bar may be operated more or less rapidly as may be required, a relatively slow oscillation of the grate-bars being kept up by the traveling movement of the grate after the operation of said bar 21 has ceased. In practice, as hereinbefore set forth, the actuating-bar may be operated by hand, especially when the furnace is a small one; or, it may be operated by means of the cam-and-lever device, as hereinbefore described, especially when the furnace is of relatively large size, requiring a considerable amount of power for operating the grate-bars.

The operation of the endless grate, and the mechanism for operating the same, will be readily understood from the preceding description in connection with the drawings and the aforesaid Letters Patent. The operation of the grate-bars by means of the actuating devices described therefor will only be required when the same fuel upon an ordinary grate would require the use of a "slicing-bar;" and at such times the grate-bars may be operated for breaking up the coked fuel, either by hand or by means of the automatic apparatus described therefor.

Having thus described my invention, I claim—

1. In a furnace, the combination with oscillating grate-bars and means for carrying the same along the furnace-floor, of a reciprocatory grate-bar actuator located alongside of the furnace-floor in engagement with the grate-bars thereof, and means for imparting a longitudinally-reciprocating movement to said actuator, substantially as described.

2. In a furnace, the combination with rocking grate-bars and means for carrying the same along the furnace-floor, of a reciprocatory operating-bar located alongside of the furnace-floor and engaging the grate-bars thereof, driving-mechanism, substantially as described, in operative connection with the grate-bars and with the operating-bar for imparting simultaneous movement to the grate-bar and the operating-bar longitudinally of the furnace-floor, substantially as set forth.

3. In a furnace, the combination with a series of rocking grate-bars, and with apparatus for carrying the said bars laterally thereof, of a longitudinally-reciprocatory operating-bar engaging said grate-bars and having an undulatory or cam surface, and means for actuating said operating-bar whereby the undulations or cams thereon impart a rocking movement to the grate-bars, substantially as described.

4. In a grate-mechanism of the class specified, the combination with the carrying-chains, of a series of intermeshing grate-bars journaled on said chains, a longitudinally-reciprocatory operating-bar engaging the grate-bars for rocking the same, a driving-shaft

connected for carrying forward the chains and grate-bars, and a cam on said shaft in operative connection with the operating-bar, substantially as described.

grate-bar actuator having undulations or cams engaging said lever-arms for operating the grate-bar, substantially as described.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,

JOHN L. EDWARDS, Jr.

5 5. In a grate-mechanism of the class specified, the combination with an oscillating grate-bar having oppositely-disposed lever-arms as set forth, of the longitudinally-reciprocating