

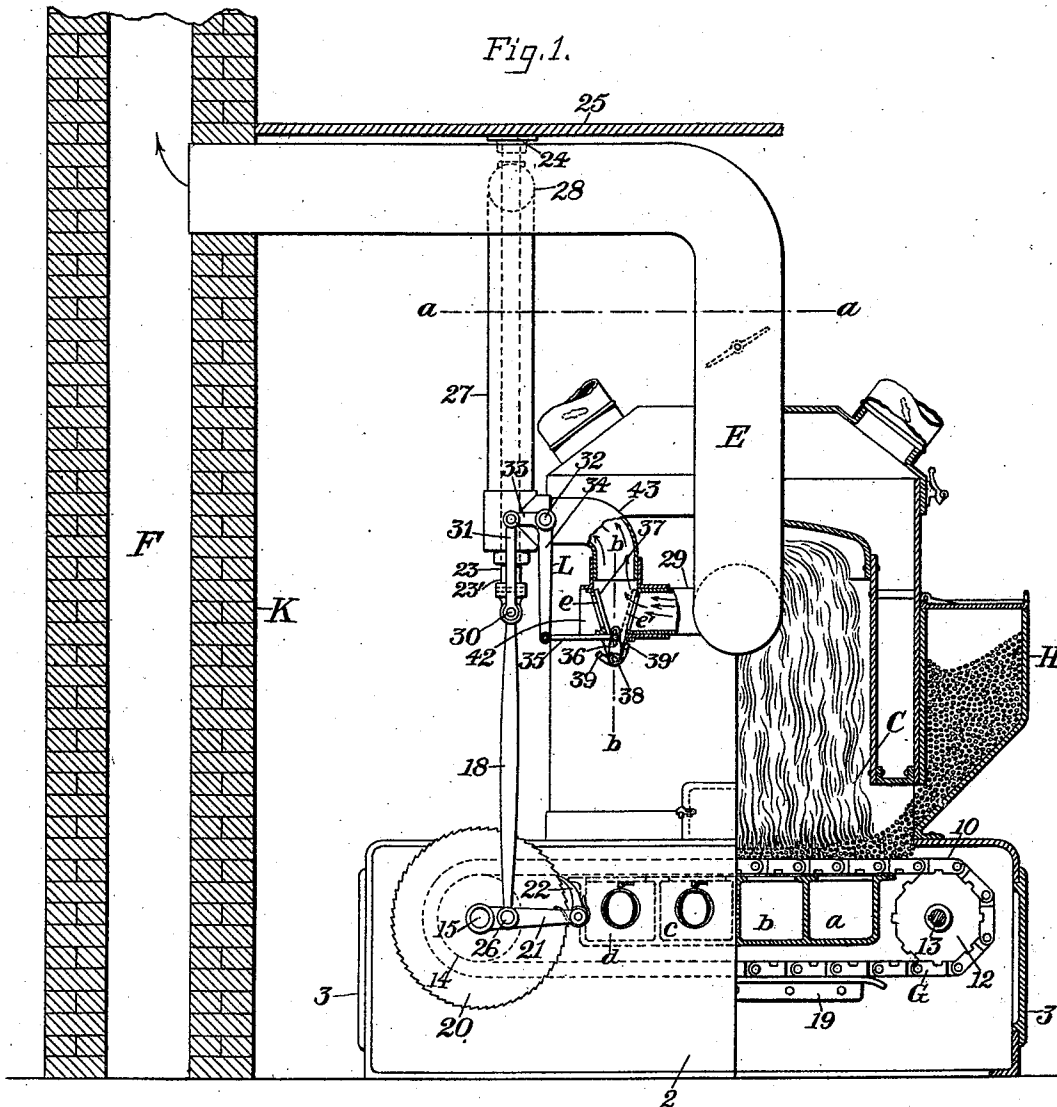
(No Model.)

2 Sheets—Sheet 1.

F. H. RICHARDS.
FURNACE.

No. 510,549.

Patented Dec. 12, 1893.



Witnesses:

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

Inventor:

Inventor:
F. W. Richards.

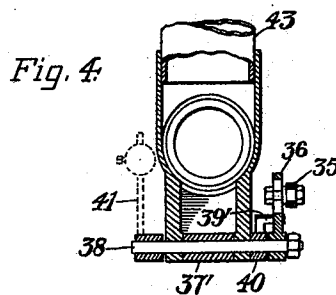
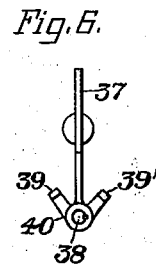
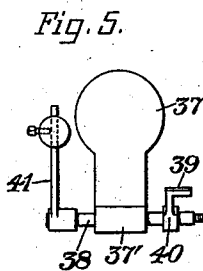
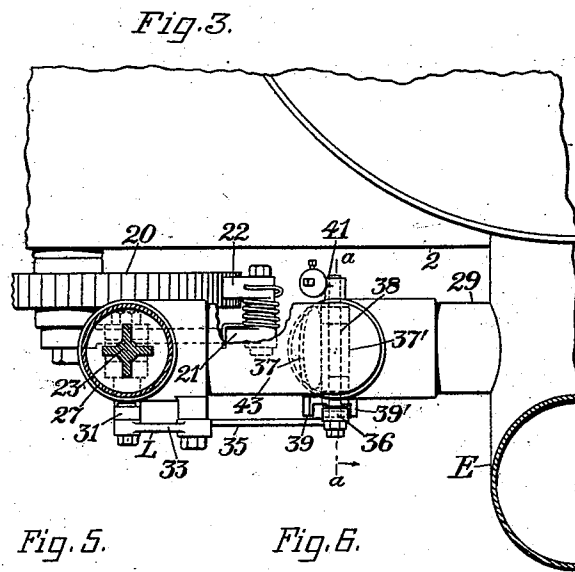
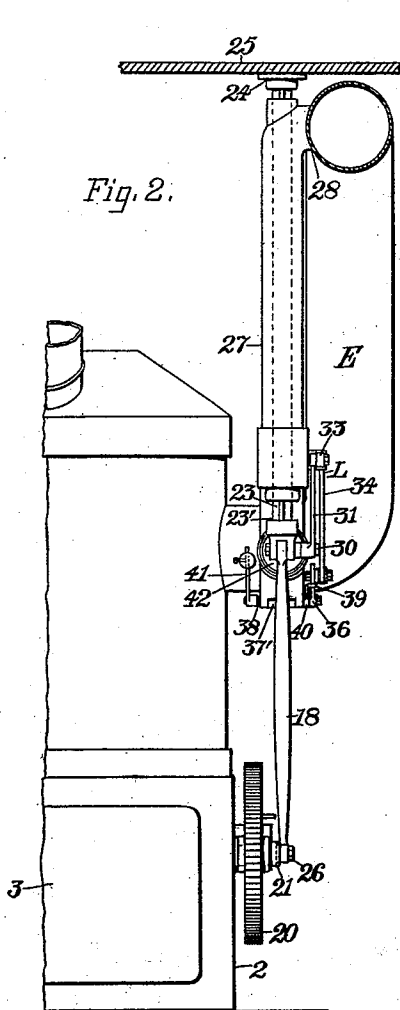
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F. H. RICHARDS.
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UNITED STATES PATENT OFFICE.

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

FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,549, dated December 12, 1893.

Application filed September 1, 1893. Serial No. 484,556. (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 motors therefor; the object being to furnish means for actuating the grate-mechanism of the furnace by utilizing the waste heat therefrom, and to do this by means of apparatus adapted for use in connection with the ordinary hot-air furnaces used for the heating of dwellings and other buildings.

My present improvements being intended for use in connection with the improved furnace described in Letters Patent No. 499,716, granted to Eckley B. Coxe, June 20, 1893, I have shown my present invention applied to a furnace of that kind, which furnace, however, is only partially shown and described in this application.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation, partially in section, of a hot-air furnace of the class specified, furnished with my present improvements. Fig. 2 is an elevation of a portion of the furnace, as seen from the left-hand in Fig. 1. Fig. 3 is an enlarged plan view of the motor mechanism, showing the parts below the line *a-a*, Fig. 1. Fig. 4 is a sectional view, in line *b-b*, Fig. 1, of the motor-valve apparatus. Fig. 5 is an enlarged view of the motor-valve removed from its casing, in a position corresponding to the position thereof in Fig. 2. Fig. 6 is an edge view of the motor-valve as seen from the right-hand in Figs. 2 and 5, corresponding to the position thereof as seen in Fig. 1.

Similar characters designate like parts in all the figures.

In the furnace shown in the drawings, the floor of the furnace-chamber C consists of the upper run, 10, of an endless traveling grate, G, which is or may be carried by the usual chain-wheels, 12 and 14, supported on shafts, 13 and 15, that are journaled in the framework of the furnace structure. Said framework may, as herein shown, comprise the walls, 2 and 3, inclosing the grate-mechanism.

The grate G is or may be supported, on the upper run thereof, by the upper side of the air-chambers, *a, b, c, d*, and the lower run thereof by guides, 19, after the manner described in the aforesaid patent.

For supplying fuel to the grate, the furnace is shown provided with an ordinary supply-hopper, H, set for discharging its fuel in a layer of a given thickness (which may be varied according to the requirements) to the traveling furnace-floor G at the forward side of the furnace, which is supposed to be at the right-hand in Fig. 1.

For operating the grate-mechanism, one of the shafts thereof, in the present instance the shaft 15, is shown provided with a ratchet-wheel, 20, fixed thereon, and with a ratchet-arm, 21, loosely mounted thereon, carrying an ordinary pawl, 22, engaging the teeth of said wheel. By imparting a reciprocatory movement to said ratchet-arm, the ratchet-wheel and shaft are turned forward to operate the traveling grate.

The motor for operating the ratchet-arm 21, consists in an expansible bar, 23, one end of which is attached, as, for instance, at 24, to some permanently fixed body, as for instance, the floor or beam, 25, which, in practice, will usually be the floor-beams of a building; a connection between the free end, 23', of said rod 23 and said ratchet-arm, this connection being pivotally connected to said arm at 26; and means for alternately applying heated gases and cold air to said rod for expanding and contracting the same and thereby imparting a reciprocating movement, through said connection, to the ratchet-arm, and through these an intermittent forward movement to the ratchet-wheel.

The waste gases from the furnace-chamber C are conducted through the principal flue or pipe, E, which, as shown in Fig. 1, may lead directly to the flue, F, of the chimney or stack. For the purpose of applying a portion of the heated gases to the motor-bar 23, this is surrounded by a tube or conduit, 27, constituting a heating-and-cooling chamber for said rod; at its upper end, said tube 27 connects at 28, (see Fig. 2) with the main pipe E, and at its lower end connects with said main pipe at a point near the side of the furnace-flue

elbow, 29, and the valve-casing, this casing connecting directly with said main pipe, as best shown in Fig. 1. At the lower end of said motor-bar chamber 27, this is provided with a bearing or guide for said bar, through which the bar extends to connect, by means of the pin, 30, with the aforesaid connecting-rod, 18. Said motor-bar also connects, through said pin 30, the link 31, the lever, L (which is supported on the stud, 32, and has the two arms, 33 and 34), and the rod, 35, with the actuating-lever, 36, of an oscillating motor-valve, 37, mounted on the shaft, 38, in the lower side of said valve-casing. The valve-actuating arm 36 is loosely mounted on said shaft 38, and engages between the two stops, 39, 39', of an arm, 40, fixed on said valve-shaft 38; said valve designated by 37 is also fixed on said shaft by means of its hub, 37'; and the shaft carries at its opposite end the weighted arm, 41, sometimes designated a "bob," for retaining said valve in either of the positions in which it may be placed. When the valve is set as shown at *e* by solid lines in Fig. 1, it closes the outward orifice, 42, of the valve-casing, so as to permit the heated gases to pass from the lower end of the main pipe E through said casing and the elbow, 43, and through the chamber 27 around the motor-bar into the main pipe again; by this means the motor-bar is gradually heated and thereby elongated, resulting in a downward movement of the connecting-rod 18 and the ratchet-arm 21. This downward movement, operating through the connecting-rod 31, the lever-arm L and the rod 35, swings the actuating-lever 36 over against the stop 39', and thereby, by aid of the weighted arm 41 soon carries the motor-valve over to its opposite position, indicated by dotted lines at *e'*, Fig. 1. This movement of the valve closes the described passage-way to the hot-gases, and opens the inlet 42 to the cold air, which, by the operation of the chimney, is drawn through said valve-casing and into the chamber 27 surrounding the motor-bar 23, resulting in a gradual cooling of said bar, which contracts or shrinks the same, and thereby, through the connecting-rod 18 and the described ratchet-mechanism, operates the grate-mechanism to move forward the same. When the motor-bar has, after the manner described, been sufficiently contracted, it operates, through the aforesaid connections, to shift the valve 37 back to its first position,

thereby closing the described passage-way to the cold air, and opening the same to the heated gases from the furnace. This again heats and expands the motor-bar, and results in a repetition of the movements just described.

By means of the motor-mechanism herein described, this having suitable valve-apparatus, substantially as set forth, the expansion and contraction of a bar of suitable metal is made to intermittently actuate the furnace-mechanism, without the aid of steam or of motive power from any extraneous mechanism such as a rotatory engine or shafting or like sources of power.

In some cases the bar 23 may be omitted and the connecting-rod 18 be connected to the lower end of the casing or pipe 27, which will be made of metal, and be alternately expanded and contracted by the heated gases and cold air admitted alternately within the same; but the use of a separate motor-bar is deemed preferable.

Having thus described my invention, I claim—

1. The improved furnace-motor herein described, consisting in the combination with a furnace and a traveling grate therefor, of a motor-bar substantially as described, connected for actuating the grate, a chamber inclosing the motor-bar and communicating with the furnace-chamber, and means for alternately closing and opening said communication from the expansive and contractive movements of said bar, substantially as described.

2. In a combined furnace and motor therefor, the combination with the traveling grate and its ratchet-and-pawl actuating device, of a motor-bar, substantially as described, rigidly supported at one end and connected at the other end with said ratchet-and-pawl device, a chamber surrounding said bar and communicating at each end thereof with a main pipe from the furnace to the chimney, and a valve operable by the motor and arranged to admit alternately the heated gases and cold air to said motor-bar chamber for reversing the action of said bar, substantially as described.

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Witnesses:

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