

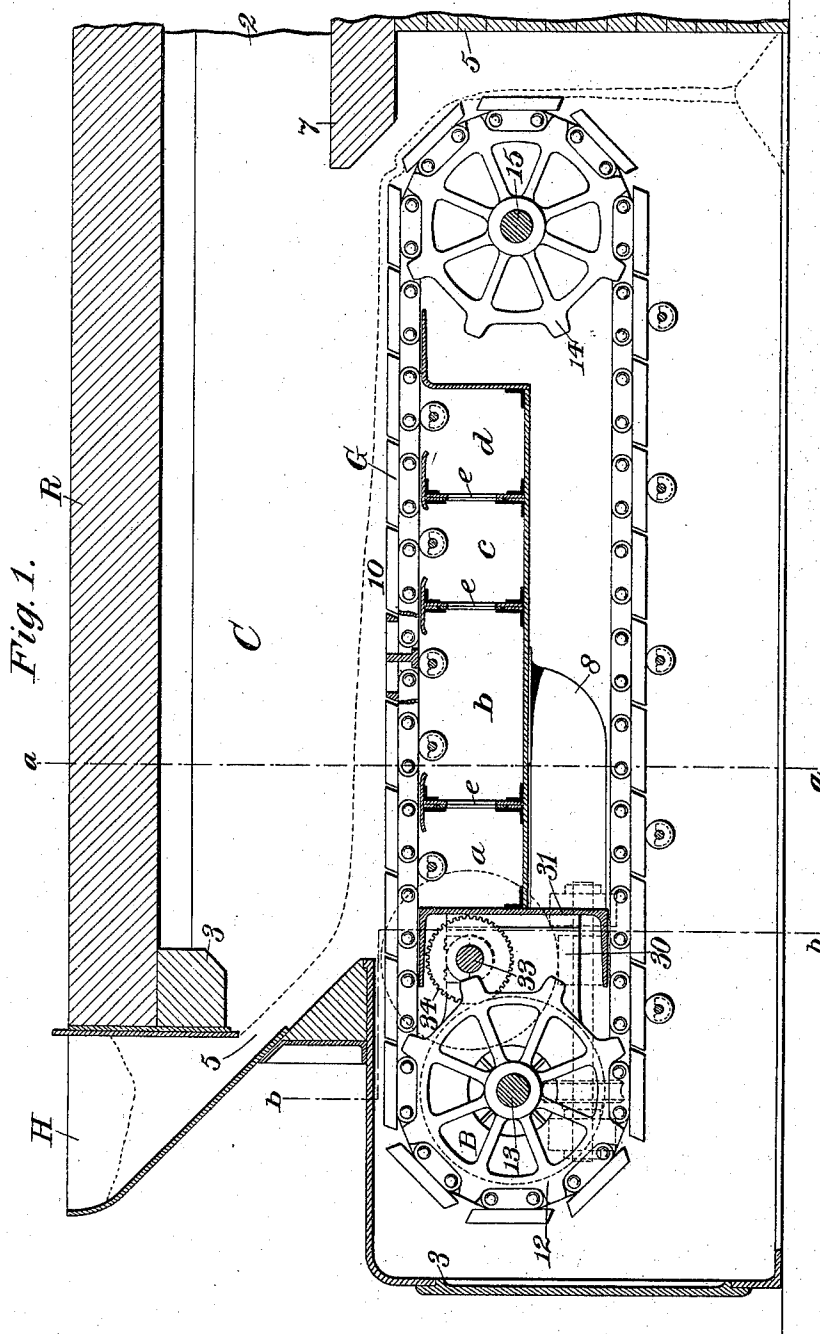
(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.
TRAVELING GRATE FURNACE.

No. 535,408.

Patented Mar. 12, 1895.



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

Inventor:
F. H. Richards

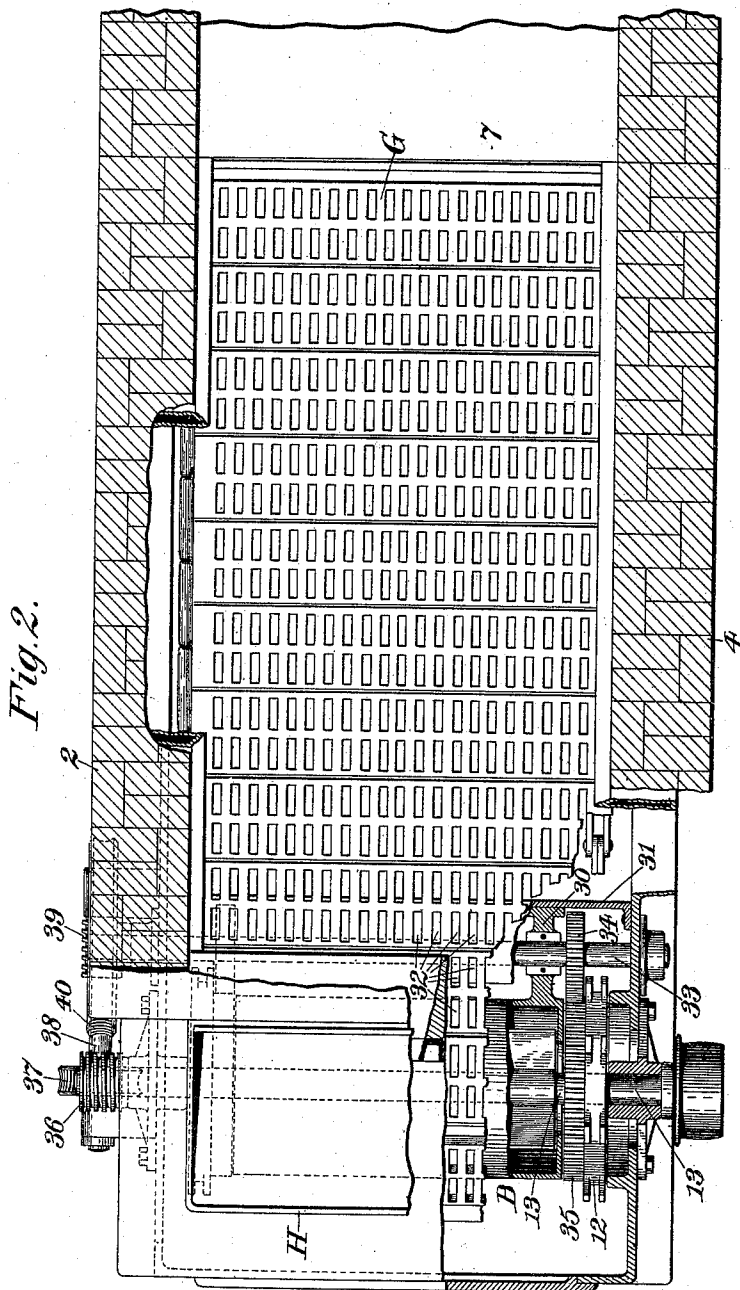
(No Model.)

3 Sheets—Sheet 2.

F. H. RICHARDS.
TRAVELING GRATE FURNACE.

No. 535,408.

Patented Mar. 12, 1895.



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

Inventor:
F. H. Richards

(No Model.)

3 Sheets—Sheet 3.

F. H. RICHARDS.
TRAVELING GRATE FURNACE.

No. 535,408.

Patented Mar. 12, 1895.

Fig. 5.

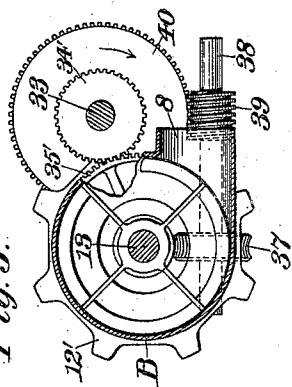


Fig. 4.

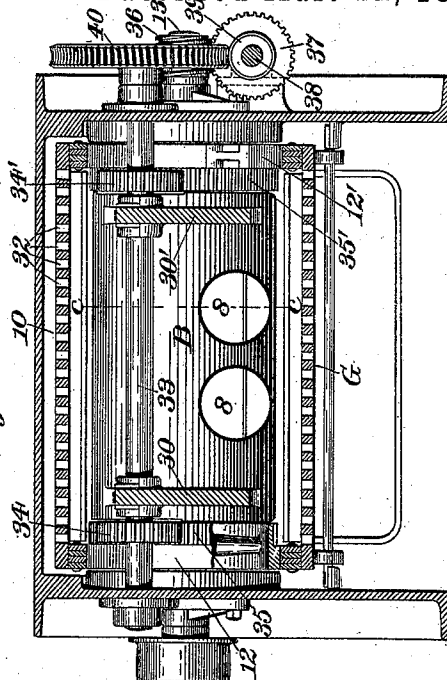
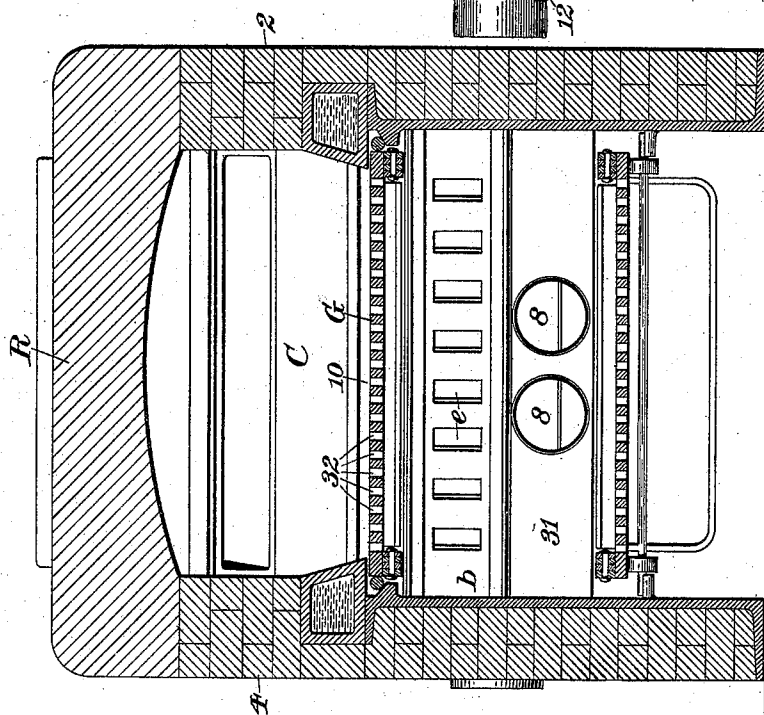


Fig. 3.



Witnesses.

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

Inventor:

F. H. Richards

UNITED STATES PATENT OFFICE.

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

TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 535,408, dated March 12, 1895.

Application filed October 10, 1894. Serial No. 525,514. (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 Traveling-Grate Furnaces, of which the following is a specification.

This invention relates to that class of furnaces in which the furnace is provided with an endless traveling-grate adapted for carrying the fuel forward in the furnace-chamber, and is provided with means for actuating said grate and with means for supplying fuel thereto, and in which an air-blast apparatus is provided for supplying air to the fuel at varying pressures at successive points in the length of the furnace-chamber, which air-blast apparatus comprises one or more air-supply chambers located below the fuel-carrying run of the grate and means (usually a blower) in connection with and adapted for furnishing air to said air-supply chamber or chambers, as described, for instance, in Letters Patent of the United States No. 499,716, dated June 20, 1893, and No. 510,589, dated December 12, 1893, granted to Eckley B. Coxe, and to which reference may be had.

My present invention relates more particularly to the construction and organization of the furnace-chamber grate-mechanism, including the air-blast-apparatus and connected mechanism.

Heretofore in furnaces of this class, and as shown and described in the patents referred to, it has been customary to provide a series of air-blast chambers with outlets contiguous to the fuel-carrying run of the grate and to supply these chambers with air by means of an apparatus located outside the inclosing walls of the furnace which apparatus usually consisted of a blower, a main air-supply pipe in connection with said blower (which main supply pipe was usually supported upon brackets secured to the outer face of one of the side-walls of the furnace) and a series of conduits or tributary pipes connecting the main air-supply pipe with the air-blast chambers which pipes extend through said side-wall of the furnace. In such construction it

will be readily seen that considerable space over and above the space actually required for the furnace proper, is necessary for the accommodation of the air-blast mechanism; and in steam plants where several boilers comprising a battery, are set side by side this matter of additional space necessary for the air-blast apparatus of each furnace is of considerable importance, as the aggregate space requisite for the air-blast apparatus of a series of furnaces would be of considerable magnitude. Therefore the primary object of my invention is to provide in connection with an endless traveling grate, in furnaces of the class specified, improved air-blast apparatus comprising air-blast chambers, a blower, and blower actuating mechanism, which shall as a whole be compact, simple and durable in construction and effective in operation and shall be of such disposition relatively to the endless grate that said air-blast apparatus, including the blower and the major portion of its actuating mechanism, will be inclosed by, and within the circuit of, the grate; and also to provide, in connection with the said blower and traveling grate, driving mechanism for simultaneously actuating the traveling grate and blower and of such construction and organization that the traveling grate and blower will have relative velocities of proportionate variations and any change in the velocity of one of these will be accompanied by a proportionate change in the velocity of the other.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of a portion of an endless traveling grate furnace embodying my improvements. Fig. 2 is a sectional plan view of the same, parts thereof being broken away to more clearly show certain of the details. Fig. 3 is a vertical transverse section of the furnace taken in line *a-a*, Fig. 1 looking toward the left hand in said figure. Fig. 4 is a vertical transverse section of the front end of the furnace taken in line *b-b*, Fig. 1 looking toward the left hand in said figure. Fig. 5 is a cross-sectional view taken in line *c-c*, Fig. 4 looking toward the right hand in said figure and showing simply the floor and a

portion of the actuating mechanism therefor and a portion of the grate actuating mechanism.

Similar characters designate like parts in all of the figures.

In the preferred embodiment thereof herein shown and described, my invention consists in part in the combination with the furnace-chamber, of an endless fuel-traveling grate supported for traveling movement within said furnace-chamber, an air-blast apparatus embodying a blower supported within the circuit of said grate adjacent to and adapted for supplying air to the upper run of said grate, means for imparting a circuitous traveling movement to said grate, and means for actuating said blower, all of which will be hereinafter more fully described.

For convenience my present improvements are shown and described in connection with a furnace similar to the ones described in the patents hereinbefore referred to. It will be understood, however, that my improvements are applicable to other furnaces than those shown in the patents referred to.

The furnace herein shown has the usual furnace-chamber, C, which is inclosed in the usual manner by the side-walls 2 and 4 and end-walls 3 and 5, said furnace-chamber being shown provided with a roof, R. At the forward end of the furnace this is shown provided with the usual fuel-supply hopper, H, from which fuel is admitted to the furnace-chamber through the inclined chute or opening, 5, in a well known manner, and at the rearward end of the furnace-chamber is shown the usual bridge-wall, 7. The term "furnace-chamber" as herein employed has reference to the entire area inclosed by the furnace walls.

The floor of the furnace consists of the upper run, 10, of an endless traveling grate, designated in a general way by G, which is carried upon suitable grate carrying wheels or chain wheels 12, 12', 14 and 14', that are supported on shafts 13 and 15 in the manner hereinbefore more fully described, which shafts are journaled in suitable bearings on the frame work or side-walls of the furnace structure. This endless grate may be of the same general construction as the endless grate described in either of the patents hereinbefore referred to, or may be of any other suitable construction.

As in the patents hereinbefore referred to, I have shown in the drawings (see Fig. 1), a series of air-blast chambers located below, and having outlets contiguous to, the fuel carrying run, or upper run, 10, of the endless grate. These air-blast chambers which are designated by *a*, *b*, *c* and *d*, respectively, preferably are in communication with one another through valve-regulated openings, *e*, in their separating partitions, and are supplied with air from a blower, designated in a general way by B, supported adjacent to the forward chamber, *a*, and having air-conduits,

8, in communication with one of said air-blast chambers.

In the organization thereof herein shown the blower, B, which is located within the circuit of the grate, is shown carried by brackets, 30 and 30', preferably formed integral with said casing of said blower and secured to a vertical transverse beam, 31, located between the upper and lower runs of the grate near the forward end of the circuit thereof, with its upper and lower flanged edges contiguous to the upper and lower runs, respectively, of the grate, said beam preferably constituting the end wall of the air-blast chamber *a*, and also constituting an air seal to prevent efflux of air at the extreme forward end of the circuit in advance of the ignition area of the furnace floor-openings 32, being formed through said beam near the lower edge thereof, and below the bottom walls of the air-blast chambers through which the blow-pipes or air-conduits 8 of the blower extend, said pipes being shown in communication with the second air-blast chamber, *b*, of the series, through the bottom wall thereof.

As a convenient means for simultaneously actuating the blower and grate, at proportionately varied velocities, and for maintaining a given ratio in velocity, I have provided an actuating mechanism therefor which, in the form thereof herein shown, comprises a driving-shaft, 13, in direct connection with and adapted for revolving the fan of the blower at a relatively high rate of speed, said shaft being provided with a driving pulley which may be driven from any suitable source of power (not shown); an intermediate shaft, 33, operatively connected with the grate carrying wheels, 12 and 12' of the grate, G, by means of pinions, 34 and 34' upon said shaft meshing with gear-wheels, 35 and 35', connected with said grate carrying wheels 12 and 12', respectively, and speed-reducing mechanism operatively connecting the driving-shaft 13 with the intermediate shaft 33, which speed-reducing mechanism, in the form thereof herein shown, consists of a worm, 36, secured to the shaft 13 and meshing with a worm-wheel, 37, carried upon a shaft 38, which shaft 38, is provided with a worm, 39, which meshes with a worm-wheel, 40, upon the intermediate shaft 33.

The gearing comprising the speed-reducing mechanism, will, it will be understood, be so proportioned and timed in their movements as to secure the requisite reduction in the velocity of the shaft 33 relatively to that of the shaft 13, and the gears connecting the shaft 33 with the driving-wheel of the grate will be so proportioned as to secure a proper variation or reduction in the velocity of the grate proper, relatively to the velocity of the shaft 33.

In the drawings, the driving wheels 12 and 12' for the grate are shown concentric to the driving-shaft, 13, which is directly connected with the fan of the blower. In this case said

driving-wheel 12 and 12' will be loosely mounted upon said shaft, said shaft simply constituting a bearing upon which the driving-wheels rotate. In practice, it is desirable that the driving-wheels be mounted independent of the driving-shaft 13, for obvious reasons. Therefore I do not desire to limit my invention to the particular organization of actuating-mechanism shown in the drawings as this may be materially modified and still be within the domain of my invention.

By inclosing the blower, and the air-blast conduits thereof within the circuit of the endless chain I secure a compactness in the structure of furnace grate mechanism which is highly desirable and of material advantage in furnaces of this class, rendering the grate; air-blast chambers, and the blower therefor, practically, a unitary organization.

Having thus described my invention, I claim—

1. In a furnace-mechanism, an endless fuel-traveling grate supported for circuitous movement, in combination with a blower and suitable air-conduits supported within the circuit of said grate adjacent to the fuel-carrying run thereof, and means for actuating said blower and grate, substantially as described and for the purpose set forth.

2. In a furnace, in combination a grate-mechanism comprising an endless fuel-traveling grate, supported for circuitous movement in the furnace, means for actuating said grate to impart a traveling movement to the fuel thereon, a blower supported within the circuit of said grate and having suitable air-conduits adjacent to the fuel-carrying run of said grate, and means for actuating said blower, substantially as described and for the purpose set forth.

3. The herein described grate-mechanism for furnaces, it comprising an endless fuel-traveling grate, supported for circuitous movement, an air-blast apparatus including a blower and supported within the circuit of said grate and adapted for supplying air to the fuel-carrying run thereof, and a grate-actuator and a blower-actuator operatively connected together, so as to secure proportionate variations in the relative velocities of said grate and blower, substantially as described and for the purpose set forth.

4. The herein described grate-mechanism for furnaces, it comprising an endless fuel-traveling grate, revoluble carriers supporting said grate, grate-actuating mechanism in operative-connection with one or more of said carriers a blower having air-blast conduits and supported within the circuit of and between the upper and lower runs of said grate and adapted for supplying air to the fuel-carrying run thereof, and blower-actuating mechanism

in operative connection with the grate-actuating mechanism, substantially as described and for the purpose set forth.

5. In a furnace, the combination with the furnace-chamber and its inclosing walls, of an endless grate supported for traveling movement in said furnace-chamber, an air-blast apparatus comprising one or more air-blast chambers having an outlet or outlets contiguous to the fuel-carrying run of said grate, and a blower supported within the circuit of said grate between the upper and lower runs thereof and communicating with said air-blast chamber or chambers, and means for actuating said blower and grate, substantially as described and for the purpose set forth.

6. The herein described grate-mechanism for furnaces, it comprising an endless fuel-traveling grate supported for circuitous movement, a blower supported within the circuit of the grate and having air-conduits adjacent to and adapted for supplying air to the fuel-traveling runs of said grate, a blower-actuator, a grate-actuator, and a speed reducing mechanism connecting said blower-actuator with the grate-actuator, substantially as described and for the purpose set forth.

7. In a furnace, the combination with the furnace-chamber and its inclosing walls, of the endless fuel-traveling grate supported for said circuitous movement within said furnace-chamber, a transverse blower-supporting beam fixed between the upper and lower runs of the traveling-grate near the forward end of the circuit, a blower carried by said beam within the circuit of the grate and having air-conduits adapted for supplying air to the fuel-carrying run of the grate, means for actuating said grate, and means for actuating the blower, substantially as described and for the purpose set forth.

8. The herein described grate-mechanism for furnaces, it comprising an endless traveling-grate supported for circuitous movement, a series of air-supply chambers supported within the circuit of and having outlets contiguous to the fuel-carrying run of said grate, and having at the forward end thereof a transverse partition or beam whose upper and lower edges are contiguous, or in close proximity, to the inner faces of the upper and lower runs, respectively, of the grate, a blower carried by, and located in advance of, said beam and having air-conduits in communication with the air-blast chambers, and grate-actuating mechanism and blower-actuating mechanism operatively connected together, substantially as described and for the purpose set forth.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,
FREDERICK A. BOLAND.