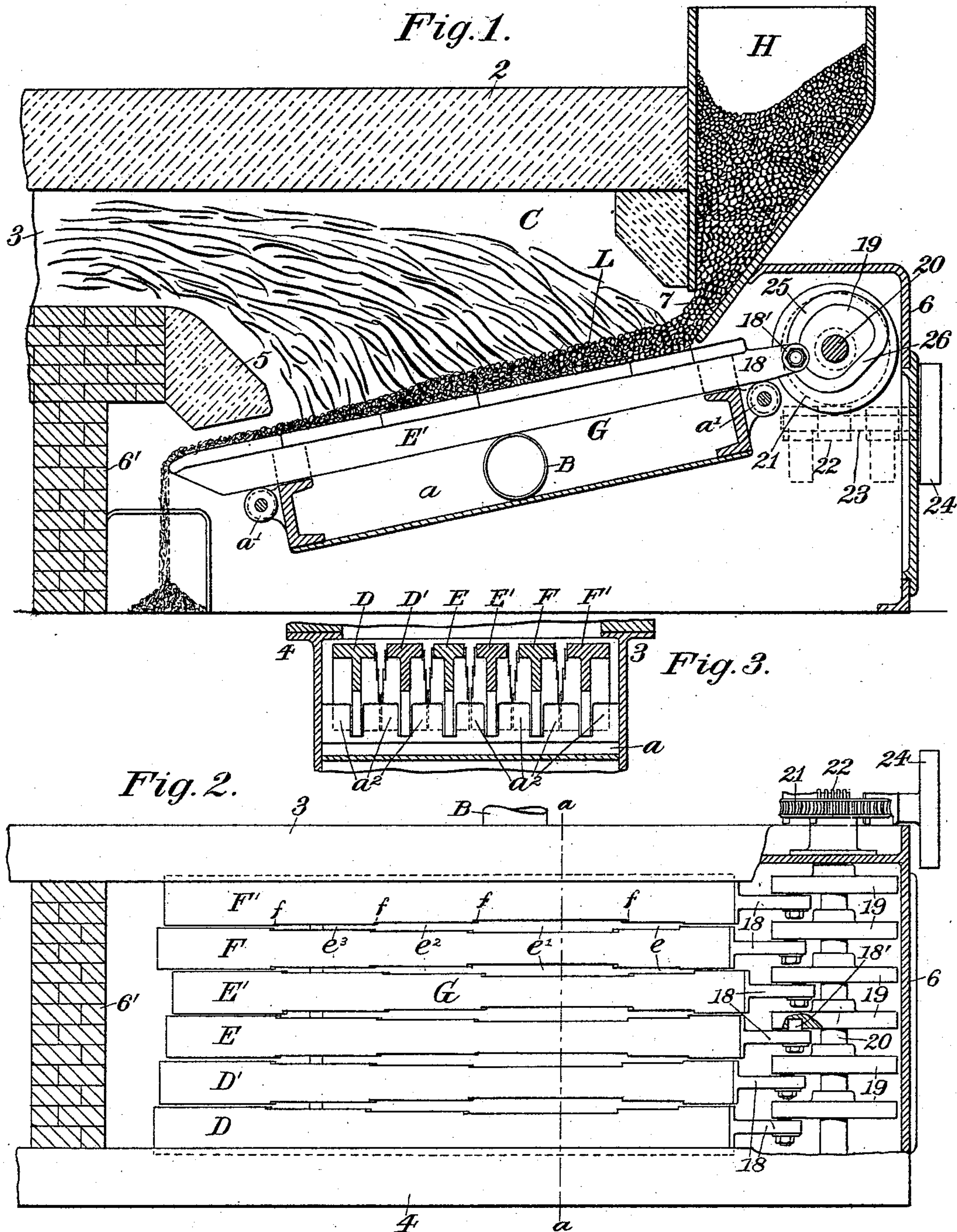


(No Model.)

E. B. COXE.  
TRAVELING GRATE FURNACE.

No. 527,593.

Patented Oct. 16, 1894.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 527,593, dated October 16, 1894.

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*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 Traveling-Grate Furnaces, of which the following is a specification.

This invention relates to traveling-grate furnaces, the object of the invention being to provide an improved furnace having a fuel-traveling grate comprising a series of independently movable grate-sections adapted for carrying a layer of fuel continuously along in the furnace after the manner of the endless chain grates used for that purpose, and adapted for supplying air to the fuel supported upon the grate at varying pressures at successive points in the length of the furnace-chamber.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of a furnace embodying my improvement. Fig. 2 is a sectional plan view of the same; and Fig. 3 is a cross-section of a portion of the furnace, taken in dotted line *a-a*, Fig. 3, looking toward the left hand in said figure.

Similar characters designate like parts in all the figures.

For the purpose of illustrating the operation of the elements and combinations comprising my present invention, I have shown the same in connection with a furnace of the class described in Letters Patent of the United States, No. 499,716, granted to me June 20, 1893, to which reference may be had for a more complete description of some of the details herein shown and only briefly described.

My present invention relates more particularly to means for supplying air to the fuel carried upon the grate during the traveling movement thereof at varying pressures at successive points in the length of the furnace-chamber.

The furnace-chamber, as shown in the drawings, has the usual inclosing walls at the sides and ends thereof and is shown provided with the ordinary roof. The side-walls are designated in a general way by 3 and 4, respectively, the roof by 2, the usual bridge-wall by 5, and the front- and back-walls by 6 and 6', respectively. At the forward end of the

furnace this is provided with a fuel-supply hopper, H, from which fuel is supplied to the grate in the furnace-chamber through the inclined chute or opening 7, in the well-known manner.

The furnace is shown provided with a fuel-traveling grate, designated in a general way by G, which, in this instance, comprises a series of longitudinally-disposed grate-sections, herein shown as six in number and designated by D, D'; E, E'; F and F', respectively. These grate-sections are adapted to have longitudinally-reciprocating movements imparted to them, as will be hereinafter described.

Underneath the grate G is placed an air-blast apparatus which, in the preferred form thereof herein shown, consists of an air-blast chamber, *a*, the end-walls of which chamber will be preferably provided with a series of rollers, *a'*, which constitute supports for the several grate-sections, as will be readily understood by reference to Fig. 1 of the drawings, said end-walls also having spacing-bars, *a*<sup>2</sup>, at their upper ends, which extend between, and prevent lateral movement of, said several grate-sections.

The chamber *a* will be supplied with air from an air-supply pipe B, which communicates therewith, and which, in turn, will be supplied with air from a blower or air-pump (not shown), in the usual manner. This air-chamber *a* is open at its upper end contiguous to the lower edge of the fuel-traveling furnace-floor and preferably extends over the entire fuel-supporting area of said floor, an air-pressure being maintained in the air-chamber to correspond to the aggregate pressures required for the fuel at successive stages in the combustion period thereof.

The grate-sections supported as before described are adapted to have a relatively slow forward movement serially, and to have separately or successively a relatively rapid backward movement. The series of grate-sections are carried forward with a relatively slow movement, toward the left hand in Fig. 1, by means of suitable actuating devices, as will be hereinafter described; and during said forward movement of the majority of the series, the grate-sections are, a portion of them at a time, retracted with a relatively rapid movement to their original positions.



During this retractive movement, the fuel, resting *en masse* spread in a layer upon the series of grate-sections, has a greater resistance upon the adjacent forwardly-moving grate-sections which constitute the majority of the series than it has adhesion upon the backwardly-moving which constitute the minority of the series of grate-sections. Therefore the layer or mass of fuel remains, in practice, unbroken by the retractive movement of the comparatively few sections. By means of this organization of mechanism, the layer L of fuel resting on the grate-sections is carried forward with a continuous uniform movement, after the same manner substantially as by the ordinary endless traveling grate.

In practice, the proper operation of mechanism will be facilitated by setting the grate somewhat inclined downwardly toward the delivering end of the furnace-chamber, as shown in the drawings, so that gravity will co-operate with the forwardly-moving sections to prevent retraction of the fuel by the backwardly-moving sections.

As a means for imparting the requisite movements to the grate-sections, I have provided in connection with each grate-section a driver, or cam, 19, which, in the form thereof herein shown, is in the nature of a wheel having a relatively long eccentric cam-face or track, 25, by means of which a relatively slow forward movement is imparted to the grate-section, and a relatively short let-off portion or return cam-face, 26, by means of which a relatively rapid return movement is imparted to the grate-section. These cam-faces may be formed by grooving the face of the driver, or in any manner known to the art.

The grate-sections are each shown having a longitudinal extension, 18, at the fuel-receiving end thereof, which extension is provided with a roller, or stud, 18', which is retained in operative engagement with the cam-faces of the grate-section-actuating cam, or driver, as will be seen by reference to Fig. 1 of the drawings. These cams, there being one for each grate-section, are shown mounted upon a shaft, 20, that is carried in bearings in the walls of the furnace. Said shaft is shown provided at one end with a worm-wheel, 21, which meshes with a worm, 22, on a driving-shaft, 23, supported in suitable bearings, and is provided with a driving-pulley, 24, whereby the entire mechanism may be actuated by means of a belt (not shown) driven from any suitable source of power.

In practice, the grate-bar-drivers will be secured to the shaft 20 in slightly varying positions, and will be so timed in their movements as to move forward the majority of the grate-sections with a relatively slow movement and to move others of said grate-sections backward with a relatively rapid movement.

As a means for regulating the supply of air to the fuel supported upon the grate-sections

to secure varying pressures at successive points in the length of the furnace-chamber as required for facilitating combustion, the several grate-sections are so constructed and organized as to form air-supply spaces between successive grate-sections, which air-spaces are continuous and extend from end to end of the fuel-supporting portions of said sections respectively, and will be of varying areas at successive points in the length thereof. As a convenient means of forming the air-spaces between adjacent grate-sections each air-space of which is continuous and extends from end to end of said section, and each of which is of varying areas at successive points in the length thereof, the adjacent sides of adjacent grate-sections will be progressively and oppositely stepped as at *f* from end to end, to thereby practically form a series of communicating recesses or air-spaces, as *e*, *e'*, *e<sup>2</sup>* and *e<sup>3</sup>*, between said sections which vary in respective areas. The air-spaces *e* at the receiving end of the grate will be of sufficiently reduced areas to permit the passage of a relatively small volume of air to the fuel supported upon this portion of the grate; the next series of air-spaces, *e'*, intermediate to the several grate-sections being of considerably increased areas to permit the passage of a relatively large volume of air to the fuel supported upon this portion of the grate, and, the series of air-spaces *e<sup>2</sup>* and *e<sup>3</sup>* being of gradually reduced areas, respectively, to gradually reduce the volume of air supplied to the fuel at these points in the length of the grate.

As will be seen by reference to Fig. 2 of the drawings, the recesses or steps at the adjacent side-edges of the several grate-sections are of different depths transversely of the grate-section at successive points in the length of the grate-sections, thus not only forming air-spaces of different widths intermediate to said sections, but forming offsets or shoulders, *f*, at the junctions of the successive recessed portions, which, during the serial reciprocatory movements of the several grate-sections will act upon and break or dislodge any fragments of fuel or cinder which may lodge between the air-spaces, thereby, in a great measure, keeping the air-spaces free from obstruction. By this construction and arrangement of grate-section I am enabled to control and regulate the supply of air to the fuel at successive points in the length of the furnace-chamber irrespective of the traveling movement of said section, and at the same time secure the benefits derived by the employment of successive air-supply chambers located beneath the grate as in the Patent No. 499,716, hereinbefore referred to, and also dispense with a series of valve-regulated air-supply pipes for securing the proper regulation in the air-supply.

The operation of the mechanical means for reciprocating the grate-sections will be readily understood by reference to Figs. 1 and



2 of the drawings. The results in the combustion of the fuel are substantially the same as the results obtained in the furnace described in the Patent No. 499,716, hereinbefore referred to; and therefore it is deemed unnecessary to enter into a detailed description of the operation of, and the results produced by, the mechanism herein shown and described.

10 Having thus described my invention, I claim—

1. In a grate for furnaces of the class specified, two adjacent grate-sections progressively stepped from end to end at adjacent sides thereof to form a continuous air-space between grate-sections of varying relative areas at successive points in the length thereof, substantially as described and for the purpose set forth.

20 2. In a grate for furnaces of the class specified, two adjacent grate-sections having their adjacent sides progressively stepped in relative opposition from end to end to form a continuous air-space between said grate-sections of varying relative areas at successive points in the length thereof, substantially as described and for the purpose set forth.

3. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of a series of grate-sections supported for reciprocatory movement and having their adjacent sides progressively stepped from end to end to form a continuous air-space between every two adjacent sections, means for supplying air through said

air-spaces, and means for reciprocating said grate-sections, substantially as described and for the purpose set forth.

4. The herein-described grate-section for grates for furnaces of the class specified, it consisting of an oblong bar having one or both sides thereof inwardly stepped progressively from both ends toward the center to form fuel-supporting portions of varying areas at successive points in the length of said bar and to form a continuous air-space or shouldered recess each side of said bar within the extreme side lines of said bar, substantially as described and for the purpose set forth.

5. In a furnace of the class specified, the combination with the furnace-chamber and its inclosing walls, of an air-supply chamber supported in said furnace-chamber and having rollers at opposite ends thereof, a series of longitudinally-reciprocating grate-sections supported upon said rollers and having air-spaces intermediate thereto of varying areas at successive points in the length thereof, and grate-section-actuating mechanism in connection with, and adapted for imparting a relatively slow advancing movement to, certain of said grate-sections, and a relatively rapid retractive movement to others of said sections, substantially as described and for the purpose set forth.

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