(No Model.)

E. B. COXE.

TRAVELING GRATE FURNACE.

No. 510,565. Patented Dec. 12, 1893.

Fig. 1.

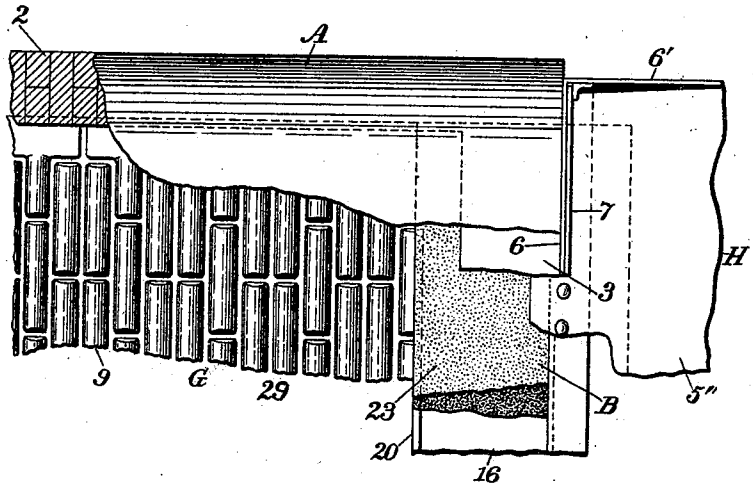
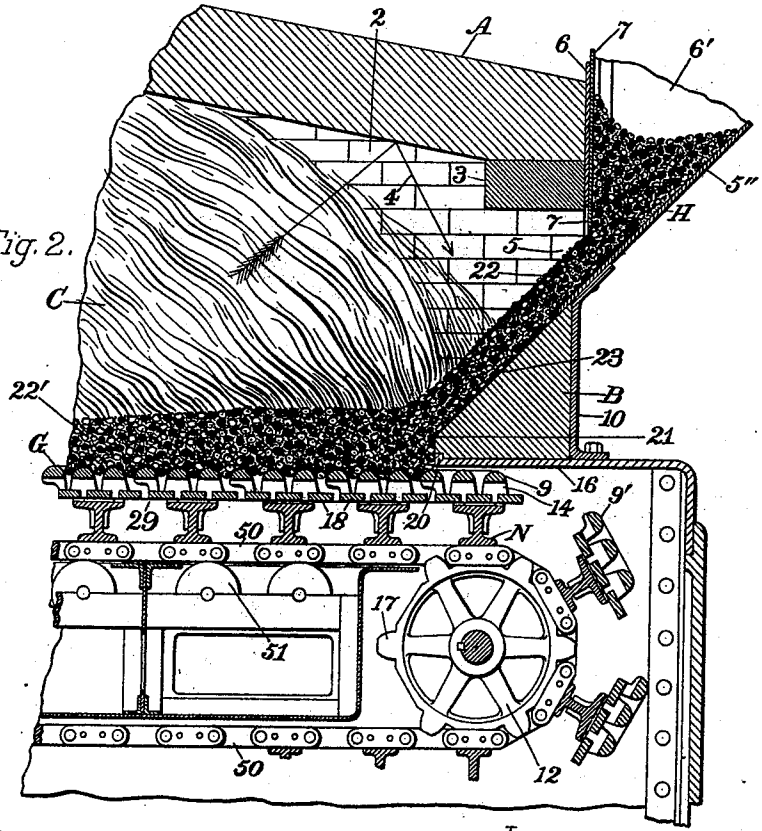


Fig. 2.



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TRAVELING-GRATE FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,565, dated December 12, 1893.

Application filed May 3, 1893. Serial No. 472,891. (No model.)

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, and has for its object to provide means for effectively igniting the fuel, especially when burning the finer sizes of coal, as the same is delivered upon the traveling-grate or furnace-floor.

My present improvements are shown applied to a furnace of the kind specified in my application, Serial No. 477,264, filed June 12, 1893; but in this application I have only shown a portion of said furnace, for illustrating the nature and mode of operation of my present invention.

My present invention is in the nature of an improvement on the corresponding portion of the improved furnace shown and described in Letters Patent of the United States No. 499,716, granted to me June 20, 1893.

In the drawings accompanying and forming a part of this specification,—Figure 1 is a plan view, partly in section, of a portion of a furnace of the class specified, furnished with my present improvement. Fig. 2 is a sectional elevation of the apparatus shown in Fig. 1.

Similar characters designate like parts in both figures.

The furnace partially shown in the drawings has the usual side-walls, (the one shown herein being designated by 2,) and the furnace-chamber, indicated by C in Fig. 2, and shown covered by the roof or arch A. The furnace-floor consists of the traveling-grate, designated in a general way by G, which is shown formed of successive floor-sections or grate-bars 9 and 9′, carried by suitable beams, as N, upon a chain 50. Said chain is or may be driven by suitable feed-mechanism, and has its advancing movement toward the left hand on the upper run thereof. Said upper run 29 of the floor-carrying chain 50 is shown supported on a series of rollers, 51, which are journaled on a roller-beam 52, that is supported in a fixed position in the furnace structure. As a means for operating the traveling furnace-floor, the carrying chain or chains therefor are or may be driven by a sprocket-wheel, 12, having teeth, as 17, for engaging in said chain. The grate-mechanism is supposed to be inclosed by walls after the manner described in my aforesaid application, and in my said prior Letters Patent; but as these features are not a part of my present invention, the same do not require particular description herein.

The particular kind of grate-bars, 9, shown in the drawings, have their upper bars of a segmental or oval form and set over the spaces between the flat bars 18; this arrangement allows a free exit of air from beneath and prevents the fine coal falling through. The upper bars 9, are supported by connections with the lower bars by intermediate supports 14, thereby forming an integral grate-section. This grate-bar, or furnace-floor, constitutes the subject-matter of a separate application, Serial No. 481,527, filed July 26, 1893.

As a convenient means for storing a supply of fuel adjacent to the furnace, this is shown provided with a fuel-hopper, designated in a general way by H, which hopper is only partially shown in this application. Said hopper consists of the inclined lower wall 5″, the forward wall 6, and the usual end-walls, one of which 6′, is herein shown. The hopper is also provided with a sliding gate 7, for regulating the discharge of fuel from the hopper.

Between the hopper H and the furnace-floor I place a block, B, designated as the ignition-block, over which the fuel passes in its descent from the supply-hopper H to the furnace-grate. The ignition-block B has its inclined surface set facing the furnace-chamber, and is preferably constructed of refractory material of low conductivity, such as fire-brick, fire-clay, or other furnace-building materials of similar character. Said block is supported on a suitable plate, or beam, as 16, for the furnace structure, being held in place forward of the wall 10 by a lip or rib, 20, on said supporting wall 16. The ignition-block is set in close proximity to the grate and with its inclined face 23 in substantial alignment with the normal "angle-of-repose" of the fuel, so that the stream of fuel descending over said block will be subjected in a layer

of substantially uniform thickness throughout its length to special treatment by heating without aeration preparatory to ignition. The ignition-block is designated as "non-aerating" for the reason that it is made of close texture or material, so as to protect the fuel during the preparatory heating from the admission thereto of air from below; this would tend to prematurely ignite the fuel, and would also cool the said block and thereby prevent the proper under-heating of the fuel.

In practice the block B must be heated to a high temperature, ordinarily to a full red heat, and I have been unable to accomplish this result except by means of the described ignition-block and this combined with the traveling grate in the manner substantially as herein set forth.

At its inner side the block B is shown terminating abruptly at 21 in a wall, which is designated the "falling wall;" this wall extends downwardly close to the grate, and through this upright surface the block B receives a considerable proportion of its heat; for, by means of my present improvements, the fuel is fully ignited close to said wall, thereby effectively heating the same. In order to be effective for its intended purpose, this falling-wall should have a height substantially equal to the thickness of the fuel-stream upon the ignition-block, so as to thoroughly reform the relatively thin layer of fuel as this falls over said wall, into a relatively thick layer upon the grate. The preheated fuel having been thus mixed and reformed contiguous to the falling-wall, it is there subjected to an air-blast through the grate and suddenly and fully ignited.

The furnace-chamber C is shown covered by a reverberatory arch, designated by A, which is set to reflect a portion of the heat-waves of the furnace backward and downward upon the ignition-block, as indicated by the bent arrow 4. This combination has the effect of increasing the efficiency of the apparatus for the heating of the stream of fuel descending over said block. The descending column of fuel flows down from the supply-hopper H over the inclined ignition-block B, and falls upon the grate or furnace-floor G at a point contiguous to said ignition-block. The column 22 of granular fuel naturally partakes of the usual movements of a stream and has within itself variable rates of movement; so that during the descent of the fuel over the inclined surface of the block B the particles of the fuel are more or less shifted and intermingled and thereby more fully exposed to the action of the heated gases within the furnace-chamber.

The construction and organization of the several parts is such that the thickness of the inclined fuel-column 22 is naturally less than that of the mass 22′ spread upon the furnace-floor; and the inclination of the surface 23 of said ignition-block being raised but little above the angle of repose of the fuel, the thickness of the descending stream 22 of the fuel is reduced to a minimum, thereby permitting a considerable amount of heat to pass through said stream of fuel and be absorbed by the ignition-block; this heated block being below said fuel-stream, operates to heat this from the under side as soon as the fuel comes upon said block B. For it will be understood that the direct action of the furnace-gases requires some time for permeating through the descending stream of fuel, and will also be most effective for the direct ignition of the fuel over the lower portion of the inclined surface 23 of said ignition-block. In effect, therefore, my improvement operates not only to thinly spread the fuel as this enters the furnace and thus expose the same more fully to the direct action of the heated furnace-gases before it is massed in a thicker layer on the traveling grate, but the heat absorbed by the ignition-block from the igniting fuel over the lower side thereof is transmitted through said block upwardly to the fresh fuel as this first passes onto said block.

The greater thickness of coal upon the grate is obtained by regulating the depth of the opening 5 of the gate 7, in connection with the depth of the forward side 21 of the ignition-block B. The coal falling over the front of the ignition-block onto the grate accumulates there in a mass, and the stream of coal continuing to flow down over said block is piled upon said mass after the manner of superimposing one layer upon another. The result of this action, with a furnace of the proportions shown herein, is illustrated in Fig. 2, where the mass of fuel spread upon the grate is approximately double the thickness of the descending stream of fuel upon the ignition-block.

The operation of the invention will be readily understood from the drawings in connection with the preceding description. The furnace-grate having been set in motion by suitable mechanism not herein shown, and the fire having been started upon the grate in an ordinary manner, the coal is fed down by gravity from the supply-hopper over the ignition-block, to replenish the burning mass on the grate as this travels forward toward the left hand in the figures of drawings. During the descent of the fuel over the ignition-block, it is heated, as hereinbefore described, throughout the mass thereof: first, by direct heat from the furnace-chamber and by reflected heat from the arched roof thereof; and second, by absorption of heat from the ignition-block below the down-flowing stream of fuel. These operations having been properly regulated, the fuel, on reaching the lower edge of the ignition-block and falling upon the grate, will be in a state of incipient ignition and in condition for immediate combustion on reaching the grate and being there subjected to the usual air-blast through the bars of the grate. By this means the fuel upon the grate is readily maintained in a state of active com-

bustion close to the ignition-block, and the combustion is maintained continuously.

By subjecting the fuel to heat upon the ignition-block, and especially by heating the fuel from above and below simultaneously by means of the combined heating- and ignition-block, this having an inclined face and set above the grate at the fuel-receiving end of the chamber and with its inclined surface toward said chamber, the fuel is heated and prepared without aeration, to at once enter a state of active combustion on passing forward of the ignition-block and receiving the air-blast through the grated furnace-floor at that point.

Having thus described my invention, I claim—

1. In a traveling-grate furnace, the combination with the traveling grate, of a non-aerating ignition-block substantially as described of fire-brick or like refractory material set above and in close proximity to the grate at the fuel-receiving end of the furnace-chamber and having its upper surface inclined in substantial alignment with the angle-of-repose of the fuel, and a fuel-supply set to deliver the fuel to the grate over the inclined surface of said block, whereby the in-flowing fuel is subjected in a layer of substantially uniform thickness throughout its length to treatment preparatory to ignition, substantially as described.

2. In a traveling-grate furnace, the combination with the traveling grate, of the non-aerating ignition-block having the inclined upper surface and terminating abruptly at its inner side with a falling-wall extending downwardly into close proximity to the grate, means for supplying fuel to the grate in a descending layer over said block, and means for blowing the fuel on the grate contiguous to said wall, substantially as described and for the purpose specified.

3. In a furnace of the class specified, the combination with the traveling grate, and with the non-aerating ignition-block B having the inclined upper surface and the falling-wall in close proximity to the grate, at the fuel-receiving end of the furnace-chamber, of means for supplying fuel in a relatively thin layer over said ignition-block to the grate, a reverberatory arch set over the furnace-chamber in position for reflecting the heat thereof upon the fuel-layer upon said block, and means for blowing the fuel on the grate contiguous to said falling-wall, whereby the fuel is treated by simultaneous heating from above and below, is mixed and re-formed into a relatively thick layer on the grate, and is there ignited, substantially as described.

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