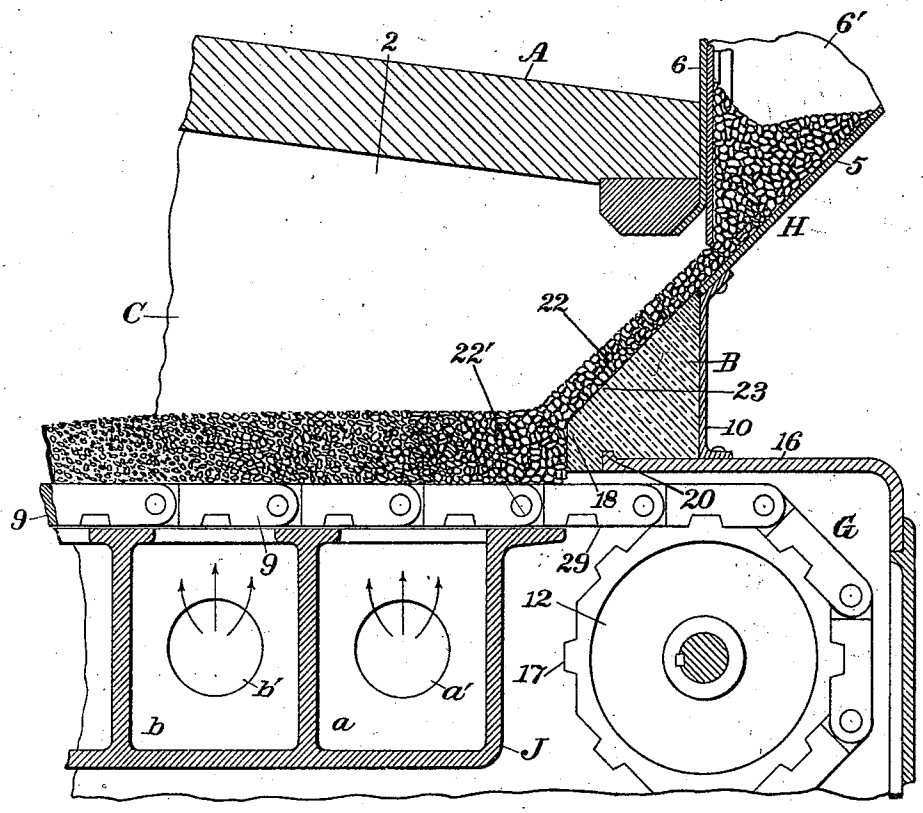
(No Model.)

E. B. COXE.

PROCESS OF BURNING FUEL.

No. 510,567. Patented Dec. 12, 1893.



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PROCESS OF BURNING FUEL.

SPECIFICATION forming part of Letters Patent No. 510,567, dated December 12, 1893.

Application filed May 17, 1893. Serial No. 474,559. (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 Processes of Burning Fuel, of which the following is a specification.

This invention relates to processes of burning fuel, and has for its object to furnish an improved process of preparing or treating the fuel preparatory and conducive to, and for effecting the ignition thereof; it is especially adapted and intended for use in burning the finer sizes of anthracite coal, designated in the market by "buckwheat," "pea" and other like terms.

My present process is in its nature, supplemental, or preparatory to, and is especially adapted to be used in connection with, the process of burning fuel described and claimed in Letters Patent of the United States No. 499,715, granted to me June 20, 1893.

My present invention may be carried into practice in a furnace similar to the one described and claimed in Letters Patent of the United States No. 499,716, granted to me June 20, 1893; but for this purpose I prefer to use the improvement in said furnace which is described and claimed in my later application, Serial No. 472,891, filed May 3, 1893.

The drawing accompanying and forming a part of this specification, shows a sectional side elevation of a portion of a furnace of the class specified, adapted for use in practicing my present invention.

The furnace partially shown in the drawing has the usual side-walls, (the one shown herein being designated by 2,) and the furnace-chamber, indicated by C, 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′. A chain is or may be driven by suitable feed-mechanism, and has its advancing movement on the upper run 29 thereof, toward the left hand, or a direction from the block B, and from the falling-ledge at the inner side of said block.

As a means for operating the traveling furnace-floor, the bars thereof are or may be driven by sprocket-wheels, as 12, having teeth as 17, for engaging in said bars, as set forth in said application Serial No. 452,202.

The grate-mechanism should, in practice, be inclosed by walls after the manner described in the aforesaid Letters Patent No. 499,716; but as those features are not a part of my present invention, the same do not require a particular description herein.

The air-supply for successive portions of the grate is regulated by means of the air-box J, which is sub-divided by partitions into a series of air-chambers *a*, *b*, through which air under varying degrees of pressure is supplied to the grate; the regulation being obtained by means of valves in the entrance pipe, or pipes, or between each adjacent chamber. The supply pipes *a′*, *b′*, are to be connected with some source of air-supply, as a blower, air-compressor, or other apparatus. The air-blast apparatus *a*, is located adjacent to the fuel-receiving end of the upper-run 29 of the furnace-floor, to supply air for effecting the ignition of the fuel as this is massed in a layer upon said traveling furnace-floor.

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, the usual end walls, one of which, 6′, is herein shown. The hopper is also usually provided with a suitable gate 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 or "slope" 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 or hot-slope is supported on a suitable plate, or beam, as 16, of 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 in substantial alignment with the normal "angle-

of-repose" of the fresh fuel, so that the stream falling down over said block will be subjected, in a continuous and continuously-moving layer, to heating simultaneously from above and below without aeration, for preparing the fuel for sudden subsequent ignition. The ignition-block is designated as "non-aerating," for the reason that it is so made as to protect the fuel, during the preparatory heating, from the admission of air thereto from below; this would tend to prematurely drive off the gases and 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 the fuel, after the layer is mixed and re-formed, should be subjected to an air-blast immediately forward of the ignition-block. For the purpose of effecting said mixing of the fuel, the block B is shown terminating abruptly in a wall, which is designated as the falling-wall or ledge, and which extends downwardly close to the grate; it is through this abrupt surface or wall that the block B receives the greater proportion of its heat. In order to be effective for its intended purpose, this falling-wall should have a height substantially as great as the thickness or depth of the fuel-stream upon the ignition-block, so as to thoroughly re-form the relatively thin layer of fuel, as this falls over the wall, into the relatively thick layer upon the grate.

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. This arrangement has the effect of increasing the efficiency of the apparatus for the heating of the descending stream of fuel upon the hot-slope. The descending column of fuel flows down from the supply-hopper H over the slope of the block B, and falls upon the grate or furnace-floor at a point contiguous to said ignition-block, as will be understood from the drawing. In passing down over said 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 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 of the furnace should be such that the thickness of the inclined fuel-column 22 will naturally be much 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 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. Heat is absorbed by the ignition-block from the ignited fuel against the inner side or "falling ledge" thereof and is transmitted through said block upwardly to the fresh fuel as this first passes onto the slope thereof; this incline, or "slope," being heated as set forth, is designated as the "hot-slope." The relatively thin stream or layer of fuel lying and descending upon the inclined surface of the ignition-block B is subjected to the direct action of the heated furnace-gases applied to the upper surface of the fuel-stream upon the hot-slope; and the fuel, during the heating thereof as described, is non-aerated,—that is, not blown or cooled from underneath by a blast of air. When the fuel-stream is delivered over the falling-ledge or inner side 18 of the ignition-block, it is thereby intermixed and massed upon the traveling-grate at the base of the hot-slope in a relatively thick layer; and here the pre-heated fuel is subjected to an air-blast for aerating and thereby igniting the heated mass.

By feeding the fine coal downwardly over the inclined and heated slope under the action of the heated furnace-gases, and owing to the natural intermixing of the material of the stream during the flowage thereof, said material or fuel is most thoroughly subjected to the heating action of the furnace-gases upon the upper side of the stream, and to the heating action of the hot-slope upon the lower side of the stream; and thereby the entire mass of the descending stream of fuel is so thoroughly pre-heated preparatory to the intermingling and massing thereof upon the traveling-grate at the base of said slope, that on so massing the fuel in the relatively thick layer, and then subjecting the same to an air-blast, it is quickly and fully ignited, so as to burn freely and give out an intense heat close to the falling-ledge of the hot-slope; whereby said slope is heated from below for further continuing and increasing the described operations.

Having thus described my invention, I claim—

1. The herein-described process of preparing and igniting fuel in furnaces, consisting in feeding the fuel in a continuous and continuously-advancing layer, first in a relatively thin layer downwardly at an inclination and subject to heating simultaneously from above and below without aeration, and next mixing and re-forming the advancing heated layer into a relatively thick layer, and at the same time subjecting the re-formed forwardly-moving layer to an air-blast, substantially as described and for the purpose specified.

2. The herein described process of preparing and igniting fuel in furnaces, consisting in feeding the fuel, first in a relatively thin

layer downwardly at an inclination and subject to heating from above and below without aeration, next mixing the fuel and reforming the first layer into a relatively thick layer by discharging the fuel over a falling-ledge, from a height substantially as great as the depth of the first layer, and immediately subjecting the re-formed fuel to an air-blast for igniting the same, substantially as described.

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