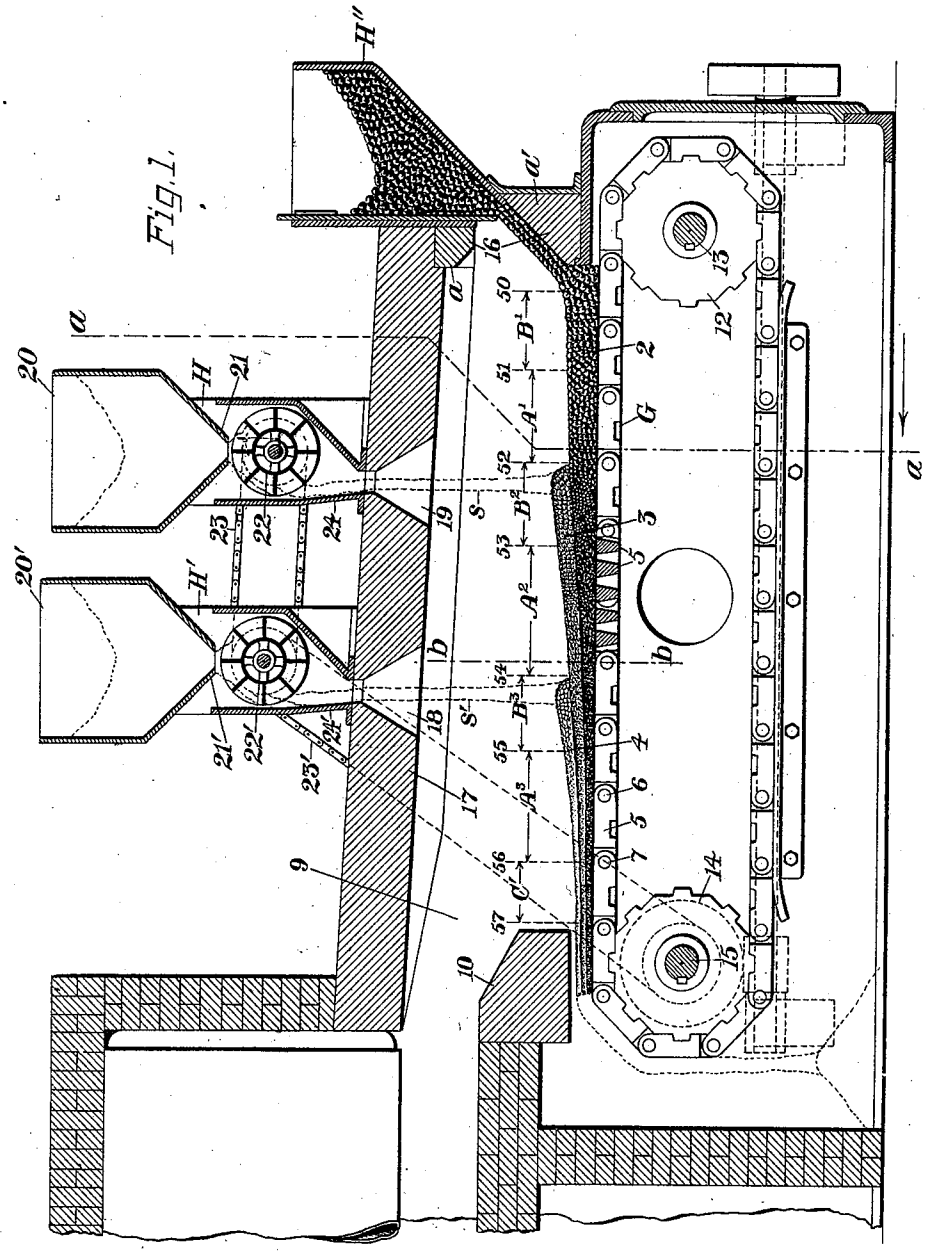
(No Model.) 2 Sheets—Sheet 1.

E. B. COXE.

PROCESS OF BURNING FUEL.

No. 510,578. Patented Dec. 12, 1893.

Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

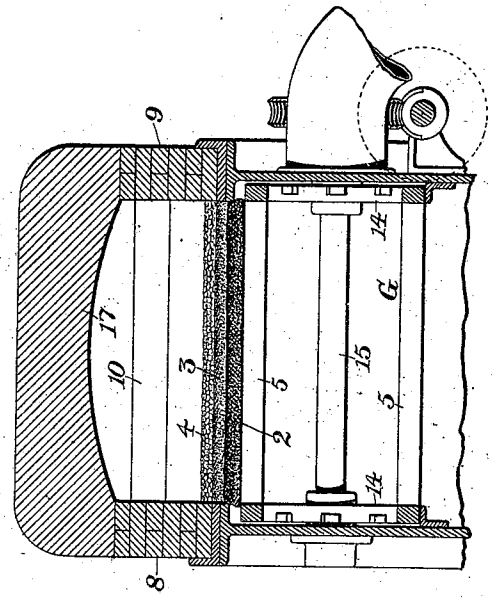
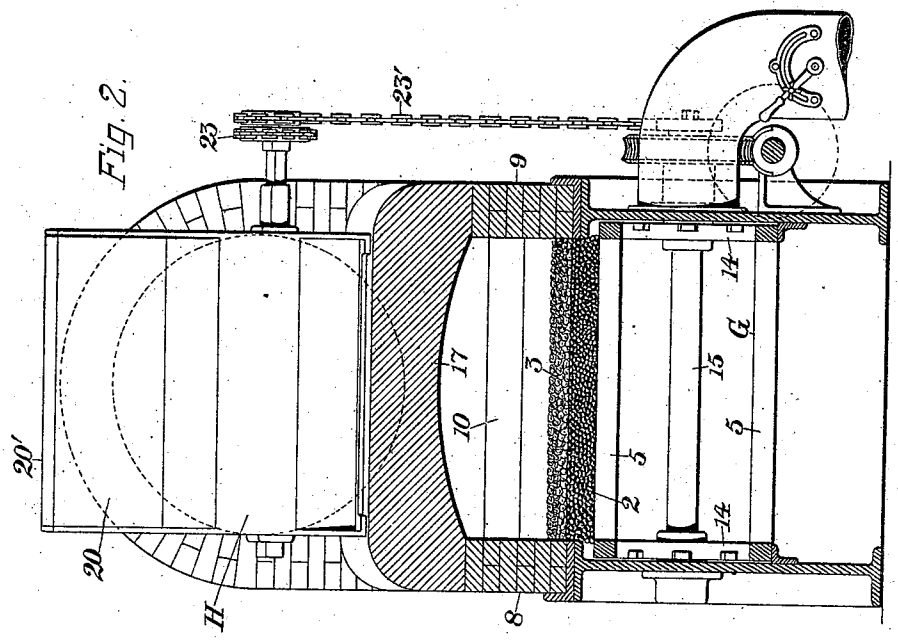


Fig. 2.



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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

PROCESS OF BURNING FUEL.

SPECIFICATION forming part of Letters Patent No. 510,578, dated December 12, 1893.

Application filed July 26, 1893. Serial No. 481,526. (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 especially adapted for burning low grade fuel; the object being to furnish a process whereby the the finer sizes of anthracite coal may be burned with economy and efficiency.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a furnace adapted for carrying out my present invention. Fig. 2 is a vertical transverse section through the furnace on line *a*—*a*, Fig. 1, showing the parts at the left-hand of said line as seen from a point at the right-hand thereof. Fig. 3 is a sectional view on line *b*—*b*, for further illustrating the mode of operation of the furnace.

Similar characters designate like parts in all the figures.

It will be remembered that in burning the finer sizes of anthracite coal, by spreading the same in a layer upon a traveling-grate, the coal will properly, after ignition, bear a relatively high pressure air-blast during the earlier stages of the combustion period, and until the carbon has been reduced to a relatively low percentage; after which time it has been found necessary to reduce the air-blast during the later stages of the combustion period to correspond with the changed condition of the fuel and secure a relatively high economy. According to my present invention, the fuel is delivered to the grate in successive layers, placed thereon, respectively, at successive points in the length of the furnace-chamber, and proportioned for consumption in successively-reduced periods respectively, the layers being ignited and the whole subjected to a uniform air-blast properly proportioned to the successive areas of substantially the same resistance. By this method, each layer (except the last one) is submitted to partial combustion before the spreading of the next layer thereon.

In the drawings, I have shown, so far as is necessary for illustrating my present invention, a furnace arranged for supplying the fuel to the grate in three successive layers, designated by 2, 3, and 4, respectively.

The furnace herein shown is of the traveling-grate variety, the grate being designated in a general way by G, and composed of a series of bars or floor-plates, 5, suitably connected together by joints at 6 and 7, and carried upon chain-wheels 12 and 14, that are supported on the shafts 13 and 15, in a well-known manner. Said shafts 13 and 15, are supported in bearings suitably fixed in place on the framework of the furnace, and are to be revolved at the required speed by suitable driving-mechanism; this may be such as described in the prior Letters Patent No. 499,716, granted to me June 20, 1893, for an improvement in furnaces.

The furnace-chamber is shown inclosed by the side-walls 8 and 9, the rearward wall or bridge 10, the forward wall 16 and the roof 17. The forward furnace wall consists of the upper portion *a*, and the inclined lower portion *a'*, which constitutes an "ignition-block" after the manner described and claimed in my application, Serial No. 472,891, filed May 3, 1893.

The bridge-wall 10, and the side-walls 8 and 9, are of any ordinary description.

The roof of the furnace is shown provided with two fuel-supply passage-ways 18 and 19, over which are set the fuel-supply apparatus, designated in a general way by H, and H', respectively; since these apparatus are, or may be of the same construction and mode of operation, a description of one of them will suffice for a description of both.

The fuel-supply apparatus H, comprises some suitable framework supported in position upon or over the furnace roof, and has a fuel-hopper, 20, beneath whose spout 21, is revolubly supported a bucket-wheel or feed-wheel, 22, which is driven by the chain 23, connecting with any convenient driving-shaft. This wheel receiving the fuel in a stream from the supply-hopper 20, delivers the same upon the incline or chute 24, to the aforesaid passage 19, in the roof of the furnace; thence the fuel falls in a stream, *s*, to form the second layer 3, which lies upon the first layer 2, as illustrated in Fig. 1. In like manner the second supply-apparatus H', delivers its fuel through the second roof pas-

sage-way 18, to form the third layer 4, which is superimposed upon the second layer of fuel upon the grate, as also illustrated in Fig. 1. The first layer of fuel 2, is shown as being supplied from the hopper, H'', over the aforesaid ignition-block a' after the manner described and claimed in my aforesaid application, Serial No. 472,891.

In carrying my process into practice by means of the described furnace, the fuel is ignited at the point 50, where it is distributed in a relatively thick layer, and the pressure of the air-blast is regulated to blow the fuel at that point slightly under the normal amount, thereby gradually bringing the fuel to a state of complete or perfect combustion which (with proper regulation of the fuel supply and the air-blast) will take place at about the point 51. From this point forward (for instance through the distance A' to the point 52,) the fuel is blown at a maximum normal pressure, and is regularly consumed at a relatively rapid rate, so that beyond said point 52, the first layer 2, of the fuel will become much decarbonized and be in a condition naturally requiring a reduction of the air-blast to prevent reducing the combustion and lowering the economy and efficiency of the same. At about this point in the travel of the fuel along the furnace-chamber, I therefore supply the grate with a second layer 3, of fuel, sufficient to increase the resistance of the fuel to the air-blast over the area B^2 to substantially the same quantity as exists over the area B', at the forward end of the furnace-chamber. As the two superimposed layers 2 and 3, of the fuel are carried along beyond the point 53, the lower layer 2, continues to be consumed and the upper layer 3, to be burned until at the point 54, the two layers together are so reduced as to substantially equal in their resistance to the air-blast, the first layer 2 at the point 52. At about the point 54, I therefore supply to the grate a third layer 4, of fuel of a depth or thickness sufficient to again bring the resistance to the air-blast up to the resistance existing over the areas B' and B^2. After this the three layers are consumed together, the first layer 2 being here reduced to cinder or practically so; the second layer 3 being in the later stages of combustion, and the third layer 4, being in the early stages of combustion. Following this period covering the area A^3, between the points 55 and 56, there is a remaining area C', which, in practice, will be of more or less length, according to the proportions of the furnace itself, the speed of the grate, the depths of the fuel, and the qualities of the same. Said area C', it will be observed, is covered by three superimposed layers of cinder, derived from the first, second and third layers of fuel, 2, 3 and 4, respectively; and the resistance of said combined layers of cinder to the air-blast through the grate may, by a proper regulation of the thicknesses of the successive layers of fuel, be made equal to, or slightly greater than, the resistance to the air-blast over the areas B', B^2 and B^3.

In practice, and when using the fuel of substantially the same grade, the successive layers 2, 3 and 4, of fuel should be supplied to the grate in successively reduced thicknesses, substantially as indicated for instance in the areas B', B^2 and B^3, Fig. 1; by this means each successive layer of fuel requires a less period of time (than the preceding layer) for its complete combustion, so that the second and third layers may be burned out only a little, if any, later than the first layer.

The improved furnace herein shown and described, for carrying into practice my present invention, is described and claimed in a separate application, Serial No. 479,988, filed July 10, 1893.

Having thus described my invention, I claim—

1. The herein-described process of burning fuel, which consists in spreading the fuel on a traveling grate in two or more successive superimposed layers to form successive areas of substantially equal resistance, igniting the several layers, and subjecting the whole area to an air-blast.

2. The herein-described process of burning fuel, which consists in spreading the fuel on a traveling grate in successive layers proportioned for consumption in successively-reduced periods respectively, submitting each layer (except the last one) to partial combustion before the spreading of the next layer thereon, and subjecting the whole to an air-blast.

3. The herein-described process of burning fuel, which consists in igniting one mass spread in a layer on a traveling grate and subjecting the same to partial combustion, spreading a second layer of fuel, proportioned for consumption in a lesser period of time than said first layer, upon the burning first layer at a point remote from the ignition point of such first layer, and subjecting the whole to the same air-blast.

4. The herein-described process of burning fuel, which consists in spreading one supply of fuel in a layer on a traveling grate and over an air-blast, and igniting the same, and in spreading a second supply of fuel in a layer upon the first layer, beyond the ignition-line thereof, substantially as described.

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