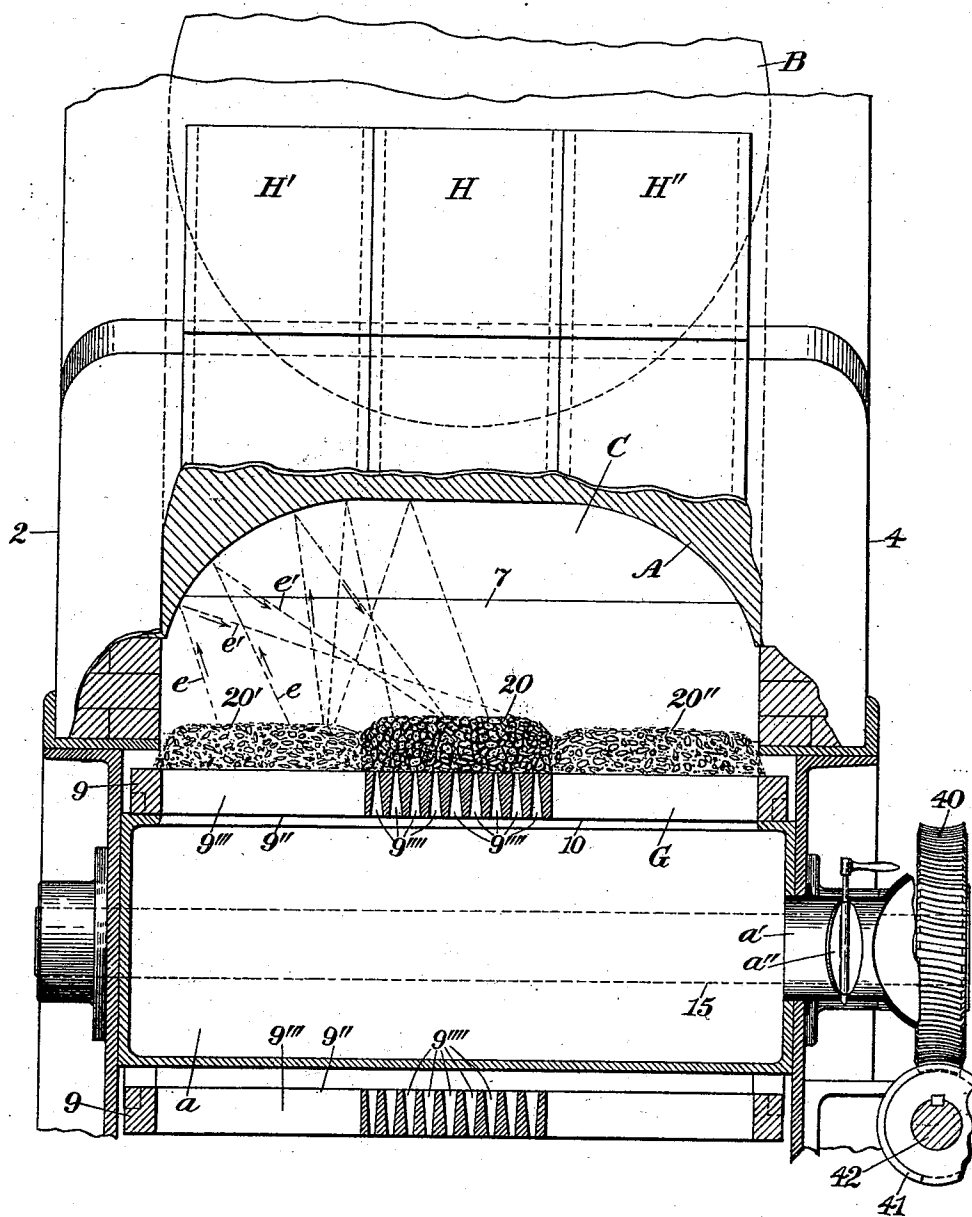


E. B. COXE.
PROCESS OF UTILIZING CARBONACEOUS MINERALS.
No. 510,586. Patented Dec. 12, 1893.

Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

PROCESS OF UTILIZING CARBONACEOUS MINERALS.

SPECIFICATION forming part of Letters Patent No. 510,586, dated December 12, 1893.

Application filed October 16, 1893. Serial No. 488,276. (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 Utilizing Carbonaceous Minerals, of which the following is a specification.

This invention relates to processes of de-carbonizing or burning the lower grades of carbonaceous minerals; the object being to furnish a process adapted for the effective utilization of the carbonaceous slates and minerals found in connection with anthracite coal.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a furnace suitable for practicing my present invention. Fig. 2 is a vertical transverse section of the furnace, in line *y-y*, Fig. 1, showing the parts at the left-hand of said line as seen from a point at the right-hand thereof.

Similar characters designate like parts in all the figures.

The furnace, which is partially shown in the drawings, is or may be similar to the improved furnace described and claimed in Letters Patent of the United States No. 499,716, granted to me June 20, 1893. In the present instance, however, the furnace-chamber, C, is shown covered for a considerable portion of its length, by the reverberatory roof, A, whose construction and office will be hereinafter referred to.

The furnace-chamber is inclosed at the sides and ends thereof by the usual side-walls 2 and 4, the front end-wall 3, and the rear wall, or "bridge-wall," 7. Over the rearward portion of the furnace-chamber C is shown the forward end of a steam-boiler, B, which may be of any well-known type; or, said boiler may be replaced by any other thing to be heated. In the front end-wall, 3, is a passage at 5, through which the fuel is supplied to the grate, this being designated in a general way by G. The grate consists, or may consist, of a series of grate-bars, 9, pivotally connected at 9', to form an endless traveling grate, which is shown, in the present instance, as if supported and operated by the chain-wheels, shafts and driving apparatus described in my

aforesaid Letters Patent. The forward chain-wheel is herein designated by 12, and its shaft by 13, in Fig. 1; and the rearward shaft is designated by 15 in Fig. 2,—this shaft carrying the worm-wheel 40 for driving the grate-mechanism, said worm-wheel meshing with the usual worm, 41, on the driving-shaft 42, supported at the side of the furnace. This driving apparatus, however, need not be herein further described, since the same is fully shown and described in my aforesaid Letters Patent to which reference may be had.

Under the upper, or fuel-carrying run, 10, of the traveling grate, is shown a series of air-blast chambers, *a, b, c, d*, supplied through the pipes, *a', b', c', d'*, respectively; these pipes may connect with suitable air-supply apparatus, as, for instance, a blower or air-pump, not shown, intermediate to which are the regulating valves or gates *a'', b'', c'', d''*, respectively, whereby to regulate the air-pressures in the several chambers respectively, for carrying out the process of burning fuel described in the Letters Patent of the United States No. 499,715, granted to me June 20, 1893. In some cases a single air-blast chamber may, if preferred, be substituted for the series of them herein shown.

According to my present improvements, the fuel and material to be burned are supplied to the grate in two or more adjacent layers; in the present instance, three such layers are supplied to the grate side by side, as shown best in Fig. 2. The central layer, 20, (which is also distinguished by the darker shading) represents the carbonaceous mineral, while the side layers 20' and 20'', are formed of the higher-grade fuel. In practice, the width of these layers, also the depth of the same, may be graduated, experimentally or otherwise, to properly correspond with the natures of the respective materials and the requirements for operating the furnace with efficiency; the mineral, 20, will usually be of a non-self burning character.

At the front of the furnace are placed the three fuel-supply hoppers H, H' and H'', each of which is suitably supplied with the proper fuel or mineral. The side hoppers H' and H'' are to be supplied with the fuel for forming said layers 20' and 20'' on the upper run 10 of the traveling grate. The middle hopper

It is to be supplied with the carbonaceous mineral for forming the middle layer 20 on said grate. As the grate runs toward the left-hand in Fig. 1, the fuel and mineral slide 5 down through the chutes of the respective hoppers to form the continuous layers 20, 20' and 20'', respectively.

The end portions of the several grate-bars or floor-plates 9 are shown formed of alternate bars and spaces, as indicated by 9'' and 9''', respectively, Fig. 1. The middle portion of the length of said grate-bars, however, is shown perforated with the lesser openings 9''', so that the air-blast supplied to the under 15 side of the grate may blow the fuel-layers 20' and 20'' with a considerable degree of force, while only lightly blowing, or "aerating" the middle layer 20 of mineral. By this means, the mineral is not greatly cooled by 20 the air-blast, but is sufficiently aerated to carry off the gases distilled therefrom and mingle these, mixed with air, with the burning gases within the chamber C.

In operating the furnace, the grate being 25 actuated as set forth, and the respective layers 20, 20' and 20'' of fuel and mineral being supplied to said grate side by side suitably ignited at the forward end of the furnace, said layers are then blown as the same are 30 carried along in the furnace, preferably after the manner set forth in my aforesaid Letters Patent; that is, by means of successively-reduced air-blasts corresponding to the gradual reduction of carbon in the fuel. The heat from 35 the intensely burning side-layers 20' and 20'' of fuel is thrown upward against the reverberatory arch A and is thereby reflected laterally and downward upon the central layer 20 of mineral, as indicated by the dotted lines 40 *e* and *e'*, Fig. 2. This action taking place, when two layers of fuel are used, one on each side of the mineral, subjects the mineral to a very thorough distillation, which, together with the slight degree of aeration to which it 45 is also subjected, distills and carries away the carbon therefrom, thus adding by so much to the efficiency of the fuel used. The mineral is subjected to a relatively light or low-pressure

draft, designated as the "aerating-draft," by which is meant a draft or air-blast of lesser 50 power than would be required to effectively support combustion in the mass; and it will be remembered that carbonaceous minerals of the class herein referred to are not normally capable of supporting combustion independ- 55 ently of additional fuel or heat. By subjecting the mass of minerals spread in a layer upon the aerating-floor or portion of the grate between the adjacent layers of burning fuel, the mineral is subjected to the heat and burning 60 gases from the fuel, and also, and simultaneously, to the action of the reverberatory roof, which extends laterally over all of said layers 20, 20' and 20''.

Having thus described my invention, I 65 claim—

1. The process of decarbonizing carbonaceous minerals which consists in spreading the same in a mass upon a floor, aerating the mass by an aerating-draft through said floor, and 70 subjecting the aerated mass to the heat of burning gases from above, substantially as described.

2. The process of decarbonizing and burning carbonaceous minerals which consists in 75 spreading the mass of mineral upon an aerating-floor as set forth, supplying fuel to the grate or floor at the sides of the mineral beneath a reverberatory roof, and subjecting the aerated mineral to the combined and simultaneous action of the burning fuel gases 80 and of said roof, substantially as described.

3. The process of burning carbonaceous mineral which consists in spreading the mass of mineral and aerating the same upon a traveling-grate floor, burning layers of fuel adjacent to the edges of the layers of mineral, and subjecting all of the layers to the reverberatory action of a roof overlying said layers, whereby the heat and gases from the layers 90 of burning fuel are directed upon the layer of mineral, substantially as described.

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