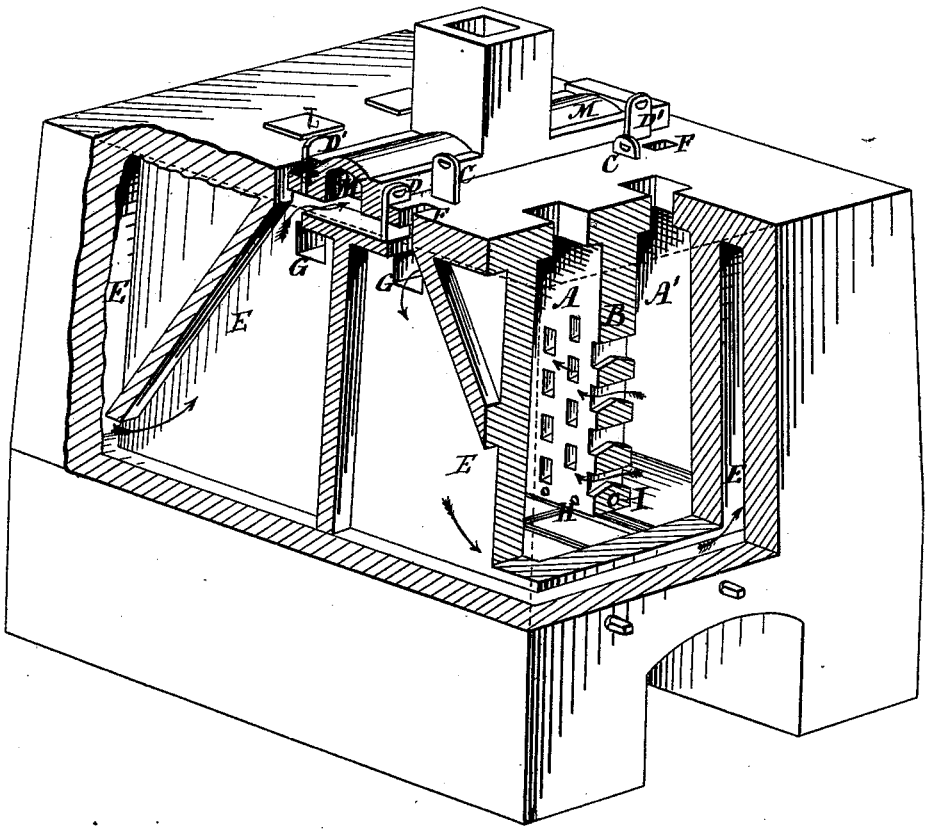
L. STEVENS.

Coking Coal and Desulphurizing the Coke.

No. 196,714. Patented Oct. 30, 1877.



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IMPROVEMENT IN COKING COAL AND DESULPHURIZING THE COKE.

Specification forming part of Letters Patent No. **196,714**, dated October 30, 1877; application filed October 15, 1877.

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington, District of Columbia, have invented an Improved Process for Coking Coal and Desulphurizing Coke; and I do hereby declare that the following description and accompanying drawing are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention without further invention or experiment.

In coking certain coals—as, for example, a large portion of the coal found in the State of Illinois—the coke heretofore produced by any ordinary method is of such friable nature that if used for metallurgic purposes in furnaces, it cannot sustain the weight of the charge without crumbling to powder, through which air cannot be forced uniformly, and only imperfect combustion is produced. These coals also contain an amount of sulphur that must be removed before they can be used successfully in blast-furnaces.

My invention relates to an improved method of coking said coals and other sulphurous coals.

My invention consists in passing the entire volume of the gases from a fresh charge of coal while coking in one chamber into and through a highly-heated body of coke contained in another chamber, resulting from a previous charge of coal, whereby said coke takes up carbon from the gases, retains the same, and is thereby rendered firm and compact, the chambers being alternately charged and discharged, and the course of the gases being reversed.

My invention further consists in introducing steam at about 1,000° Fahrenheit into the ovens or chambers for a certain length of time after the coal is coked, for the purpose of desulphurizing the same.

I am aware that coke-ovens have been constructed in such a manner that the burning gases on top of the coal heated it downward, and as the gases from the coal below were expelled some portions of them were arrested and deposited in the heated coke above. My method differs from this, in that I pass the whole volume of gases expelled from one entire charge through the mass of coke in an adjoining oven, the coke therein being highly heated so as to receive the deposit of carbon throughout the entire mass.

I am also aware that steam at high pressure (which is about 340° Fahrenheit) has been used to desulphurize coke. I have found that steam introduced at this temperature absorbs heat so rapidly that the temperature of the coke in the oven is reduced too low before the sulphur from a heavy sulphurous coal is expelled. To overcome this reduction of heat in the coke, I have found it necessary to heat the steam before it comes in contact with the coke to about 1,000° Fahrenheit. With steam at this temperature the heat of the coke is but slightly, if any, reduced.

Referring to the accompanying drawing for a more complete explanation of my invention, the drawing represents, in perspective, and partly in section, two ovens built together to economize material and to utilize heat to the best advantage.

In coking coal that contains a large percentage of volatile hydrocarbons it is necessary to sustain a high temperature in the ovens, and to construct them with separate chambers that are charged alternately with coal in such a manner that one of the chambers—namely, the one containing the coke—is kept charged and at a high temperature, whereby the coke therein is kept in a condition to receive the deposit of rich carbon gas from the coal in the next chamber. By this means the carbon from the volatile products of the coal in the adjoining chamber is arrested and deposited on the coke, improving it in quantity and quality.

A A′ represent two chambers; B, the partition between them; C C′, the dampers that change the course of the gases as the chambers are alternately charged. D D′ are dampers that direct the gases to the main flue M after they have passed around the ovens in the flue E. F F′ are openings through which air is introduced into the surrounding flue E to burn the gases as they escape from the ovens into said flue through the passage G, controlled by the damper C. A steam-pipe, I, extends from front to rear of partition-wall B, and is perforated with holes corresponding to holes H in partition-wall B.

The operation is as follows: The chamber A′ being charged with coal that becomes heated, the gases pass through the perforated wall B into the chamber A (the damper C being raised and the damper C′ closed) and heat it, and then pass through the flue shown at G, controlled by the damper C, into the flue E, at the point where air is admitted through the opening F to burn said gases. They then pass around the ovens, as indicated by the arrows, to the main flue M, through a flue controlled by the damper D′, and escape to the chimney. After the chamber A′ has been in operation for about twelve hours, the chamber A is charged with coal through the opening L, the dampers C and D′ are closed, and dampers C′ and D are opened, changing the course of the gases from the chamber A to A′, where the coke therein receives the deposit of carbon until steam is admitted to desulphurize said coke, and it is then discharged, leaving the chamber A′ ready for a new charge of coal, when the position of the dampers is again reversed, and brought to the position shown in the drawings.

After the coal is thoroughly coked, as stated above, and for about an hour before it is discharged, I introduce steam heated to about 1,000° Fahrenheit into the pipe I, from superheaters set in a separate furnace, patented January 20, 1873. The temperature of the coke being about 1,800° Fahrenheit, the introduction of steam at this high temperature will not reduce the temperature of the coke very materially. Steam under these conditions is readily decomposed, furnishing hydrogen and oxygen, that readily combine with the sulphur and carry it off. The ovens can be arranged in many ways so that two of them can be made to operate together. The gases can also be introduced in various ways and produce similar results without departing from the nature of my invention. Any device that will cause the gases from either oven, when charged with coal, to pass through a corresponding oven that has been charged a sufficient length of time for the gases of the coal to be expelled, the coke therein contained being heated to incandescence, will produce the desired result of arresting in the coke a large percentage of the rich carbon gases that would otherwise be lost, and rendering it heavier and more compact than now produced by any ordinary modes of coking.

Having thus described my invention, what I claim is—

1. The herein-described process of coking coal, which consists in passing the gases evolved from the coking coal contained in one chamber into and through the coke contained in an adjoining chamber, produced from a previous charge, and kept at a high temperature, whereby said coke takes up carbon from the hydrocarbon gases of the coking coal, and is thereby rendered compact and firm, in the manner substantially as described.

2. The process of coking and desulphurizing coal, which consists in passing the gases from the coking-chamber into highly-heated coke contained in an adjoining chamber, and subsequently passing steam heated to about 1,000° Fahrenheit into said highly-heated coke, whereby the latter is desulphurized, substantially as described.

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Witnesses:
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