H. W. BENNER.

MANUFACTURE OF GAS.

APPLICATION FILED FEB. 25, 1914.

1,097,513.

Patented May 19, 1914.

4 SHEETS—SHEET 1.

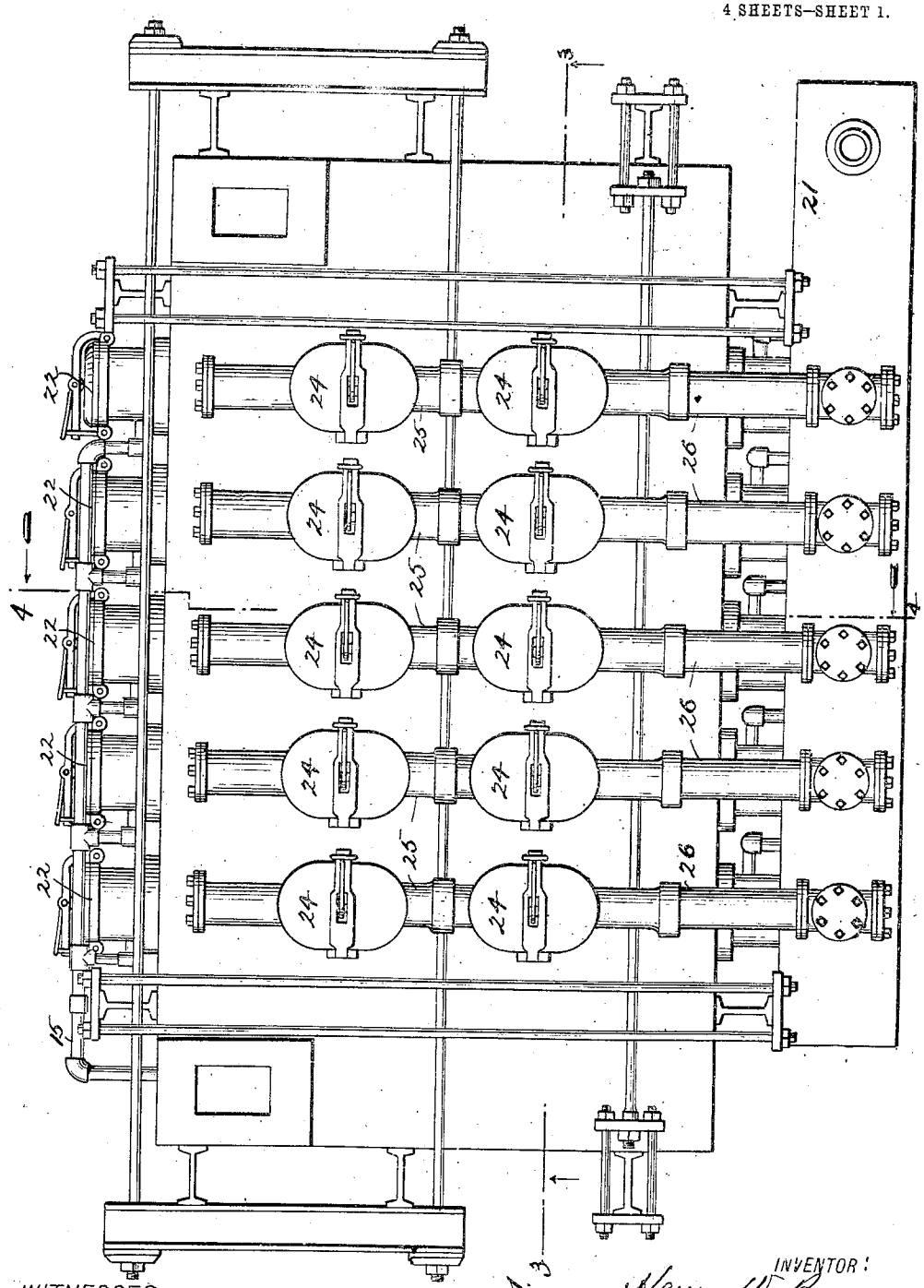


Fig. 1.

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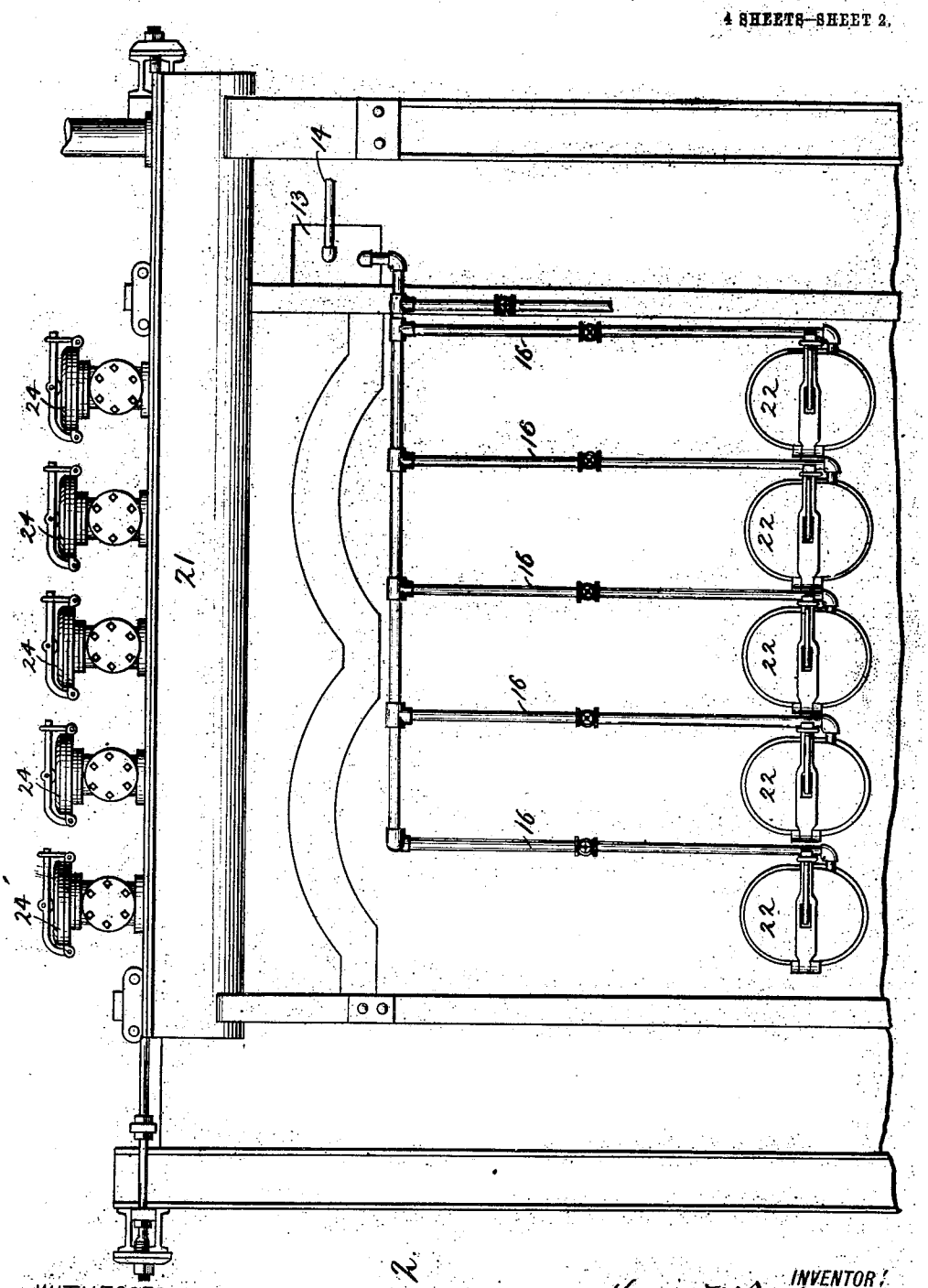


Fig. 2.

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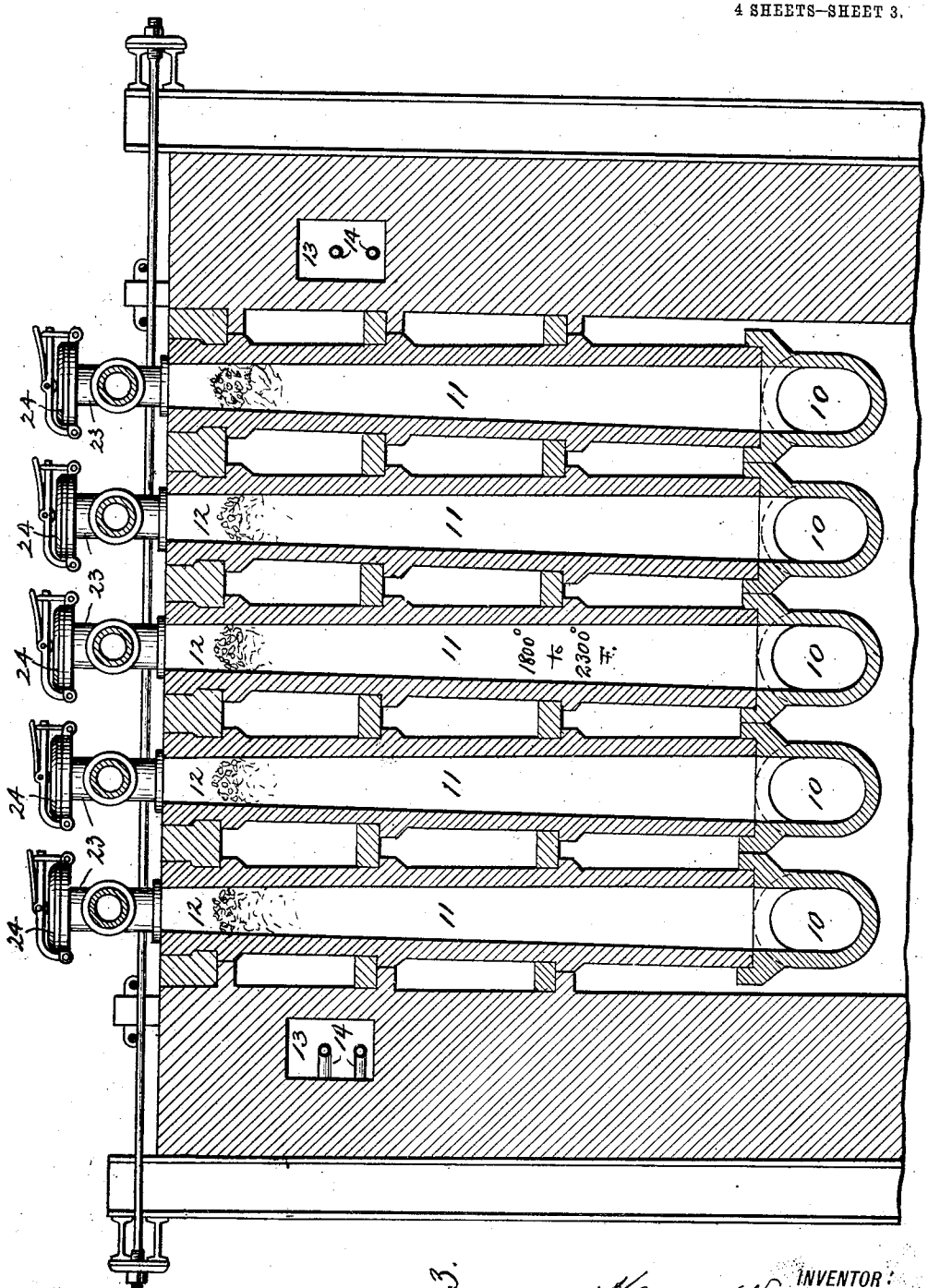


Fig. 3.

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MANUFACTURE OF GAS.

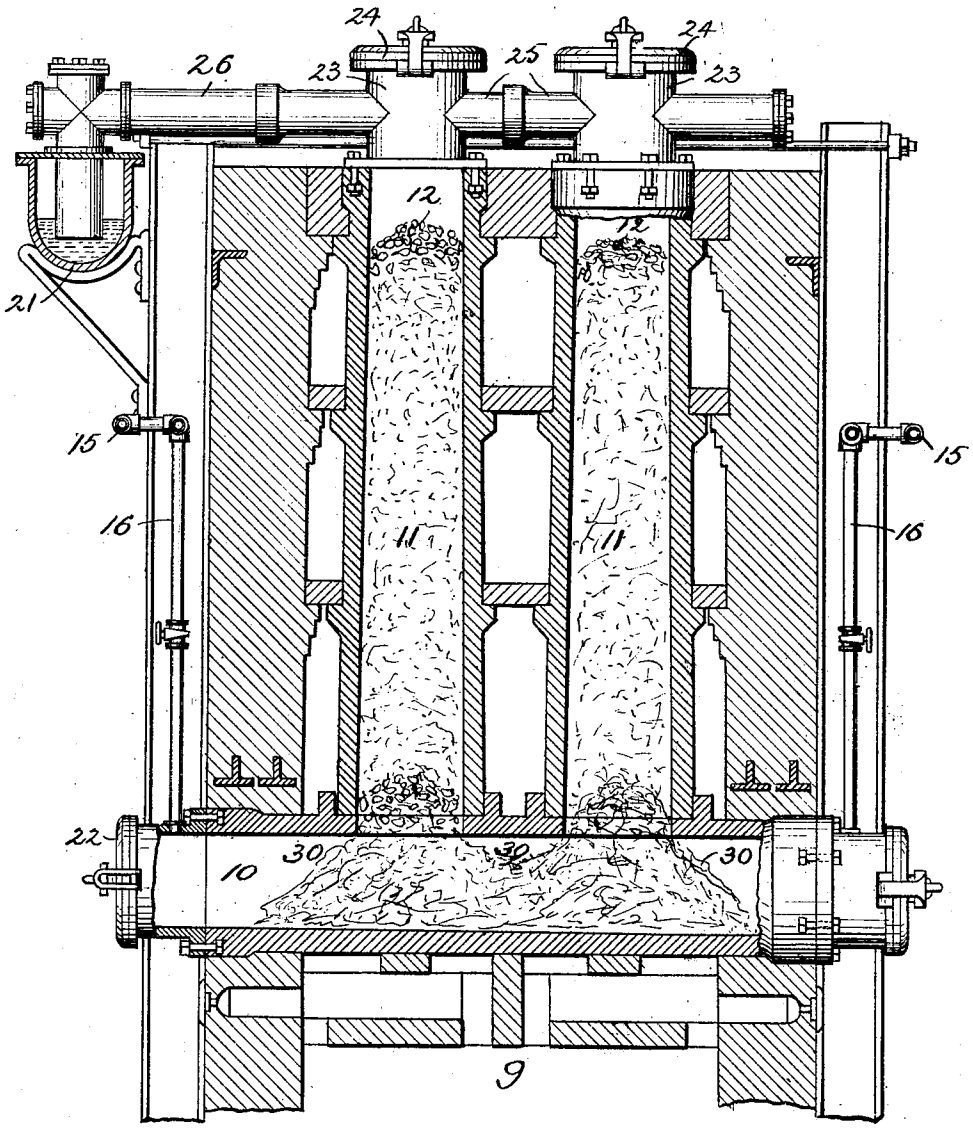
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4 SHEETS—SHEET 4.

Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

HENRY WALLACE BENNER, OF BETHLEHEM, PENNSYLVANIA, ASSIGNOR TO INTERNATIONAL GAS DEVELOPMENT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MANUFACTURE OF GAS.

1,097,513. Specification of Letters Patent. Patented May 19, 1914.

Application filed February 25, 1914. Serial No. 820,979.

To all whom it may concern:

Be it known that I, HENRY WALLACE BENNER, a citizen of the United States, residing at Bethlehem, Northampton county, State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of gas in vertical or substantially vertical retorts, and is designed to permit the gas making operation to proceed with celerity from the time that the retorts are charged, and with the avoidance of adhering deposits of carbon upon the inner walls of the retorts, so that, at the completion of the gas-making operation, the retorts can be readily discharged of their contents of coke without interference by such accretions, and so that scraping and scurfing of the retort walls, with the attendant loss of time, interruption of the gas making, and injury to the retorts, may be obviated.

In the practice of the invention, the retorts are first raised to a high temperature, for which purpose they are located in a retort bench, heated by a gas producer of ample capacity. They are then filled, by a traveling hopper, or the like, with a charge of gas coal dropped into them from above. An instantaneous development of gas follows the charging of the coal into the retorts, by reason of the contact with the highly heated walls thereof, and, immediately after this first flush of gas production, a small amount of water-gas is admitted at the bottom of the retorts, this water-gas being preferably made by passing steam, preferably superheated, through a highly heated body of coke upon which the gas coal constituting the charge rests. In starting the operation, this coke is inserted in a substantially horizontal retort with which the vertical retort or retorts communicate, and in subsequent operations, the body of coke is supplied from the vertical retorts themselves after the gas coal which they contain has given up its gas.

In the accompanying drawings, Figure 1 represents a top view of a single apparatus or bench for carrying the invention into effect; Fig. 2 represents a front elevation of same; Fig. 3 represents a vertical transverse section on the dotted line 3—3 of Fig. 1; Fig. 4 represents a vertical longitudinal section on the line 4—4 of Fig. 1.

In the drawings, 10 designates corresponding parallel side by side independent horizontal retorts, in which the water gas is produced, and 11 designates vertical retorts within which the beds or columns of coal 12 are placed and from which the coal gas is distilled; said vertical retorts opening at their lower ends into the horizontal retorts 10, and there preferably being two or more vertical retorts in communication with each horizontal retort. Below the retorts 10, 11, is provided a suitable furnace for externally heating the retorts 10 and 11 which are surrounded by heating chambers, as shown.

In the side walls of the apparatus or bench I provide spaces 13 through which steam pipes 14 may be passed for superheating the steam employed in the production of the water-gas, the pipes 14 leading from a suitable source of supply and after passing through the chamber 13 delivering the steam into a main distributing steam pipe 15 having branches 16 leading to the end portions of the several horizontal retorts 10 so as to deliver the steam thereinto. I provide each side wall of the bench with a superheater chamber 13 and lead steam pipes 14 therein into, one pipe and its connections 15, 16 being at the front of the bench and the other pipe 14 and its connections 15, 16, being at the rear of the bench, so as to render it convenient to deliver the superheated steam into both ends of the horizontal retorts 10. The ends of the horizontal retorts 10 will be supplied with suitable doors 22 adapted to be firmly locked in closed position and conveniently opened when desired, and the upper ends of the vertical retorts 11 will be equipped with suitable pipes 23 having above them suitable doors 24 adapted to be securely locked in closed position and conveniently opened when desired. The pipes 23 for the vertical retorts connected with each horizontal retort 10 are connected together by piping 25 and with the hydraulic main by piping 26. The pipes 25, 26, serve to conduct the gas from the upper ends of each set of vertical retorts 11 to the hydraulic main 21.

During the operation of the apparatus hereinbefore described, and in the practice

of my invention, I maintain within the horizontal retorts 11 an incandescent bed of coke, indicated at 30, in Fig. 4, at the foot of each vertical retort 11. Before the vertical retorts are charged upon the said incandescent body of coke 30, I bring the vertical retorts to a very high temperature, ranging from 1800° Fahr. to 2300° Fahr., it being unnecessary to exceed this upper limit. The charge of gas coal, say 600 lbs. is thereupon introduced into each vertical retort, at one operation, and as quickly as possible. It substantially fills all of that portion of the vertical retorts up to a zone therein (near the roof portion of the bench) at which the temperature is insufficient to decompose the newly made gas, whereby lamp black would otherwise be produced. In other words, the distilling coal occupies all of those portions of the vertical retorts exposed to the proper temperature to effect the distillation of the coal, and the gas arising from the distilling coal is then conducted through a cooler zone on its passage to the hydraulic main. The beds of distilling coal will remain stationary except for the natural settling down during the process of distillation.

As hereinbefore noted, the first effect of dropping the charge of coal into the highly heated vertical retorts and upon the body of incandescent coke contained therein is to produce an instantaneous flush of gas, which passes off into the hydraulic main. Distillation then proceeds more uniformly, and, immediately, after the first flush of gas referred to, steam is admitted at both ends of the horizontal retorts. The function of this steam is to produce water-gas, and it is admitted in such limited amount that it will not cut down too much the candle power of the coal gas, and yet will have the protective effect contemplated by my invention. I have found that the admission of an amount of steam sufficient to add to the distilling coal gas a quantity of water gas ranging from 10% to 15% by volume, will suffice for the purpose.

In ordinary coal gas practice, part of the gas evolved from the coal comes into contact with the heated walls of the retort whereby certain of the rich hydrocarbons are decomposed, the carbon adhering to the inner walls of the retort in the form of retort carbon, and the hydrogen passing off as a blue gas. Certain other portions of the hydrocarbons pass off in the gas, among them many high illuminants, such as benzol, etc. These high illuminants, cooling to a certain temperature, are condensed and go into the tar, thus becoming lost to the final gas product.

By the introduction of water-gas, as described, this lean gas seizes upon such hydrocarbons in the process of their transition into carbon, inasmuch as the lean gas has a great affinity for these rich hydrocarbons; consequently, retort carbon is not formed. Moreover, the water-gas admitted is thus carbureted, so that the volume of the mixed gas is increased without material diminution of its average candle power. That the water gas does seize these hydrocarbons is proven by the fact that no retort carbon is deposited on the retort walls. The water gas also combines with certain rich illuminants passing off with the gas, such as benzol, etc., as they also have an affinity for each other. This combination produces a fixed gas, and these rich hydrocarbons are not lost in the tar. Naphthalene is practically absent, its valuable constituents remaining in the gas instead of being segregated out therefrom.

It is, of course, evident that, if desired, the candle power of the gas may be raised still further by the admission of oil, oil vapor, or the like, into the vertical retorts; but, except where a gas of more than usual candle power is desired, this will not be necessary.

What I claim is:

1. The method of distilling coal in substantially vertical retorts for the production of illuminating gas, which consists in first heating the retorts to a temperature sufficiently high to initiate the distillation of the coal when charged; thereafter charging the retorts with the coal to be distilled; and immediately after the charge of the coal into the retorts, admitting at the bottom of the charge and passing therethrough a sufficient quantity of water-gas to prevent the deposit of adhering carbon from the distilling charge upon the inner walls of the retorts; substantially as described.

2. The method of distilling coal in substantially vertical retorts, for the production of illuminating gas, which consists in first heating the retorts to a temperature sufficiently high to initiate the distillation of the coal when charged; producing at the foot of the retorts a bed of incandescent coke; then charging the coal to be distilled, so that it shall substantially fill the retorts and rest upon the incandescent coke; and, immediately after the charging of the retorts, admitting at the bottom of the charge and passing therethrough a sufficient quantity of water-gas to prevent the deposit of adhering carbon, from the distilling charge, upon the inner walls of the retorts, said water-gas being formed by passing the requisite quantity of steam through the said bed of incandescent coke; substantially as described.

3. The method of distilling coal in substantially vertical retorts, for the production of illuminating gas, which consists in distilling in said vertical retorts a body of

coal; drawing the resultant coke from the vertical retorts, and forming therefrom a horizontal body of coke at the foot of the emptied retorts; then substantially filling the vertical retorts with a fresh charge of coal; and immediately after the charging of the retorts, passing steam through the body of incandescent coke to produce water-gas in amount sufficient, when admitted to the bottom of the charge and passed therethrough, to prevent the deposit of adhering carbon from the distilling coal upon the inner walls of the retorts; substantially as described.

4. The method of distilling coal in substantially vertical retorts, for the production of illuminating gas, which consists in heating the retorts to a temperature higher than 1800° Fahr.; then, while the retorts are at such high temperature, substantially filling them with a charge of coal; and immediately after the charging, admitting at the bottom of the charge and passing therethrough an amount of water-gas sufficient to prevent the deposit of adhering carbon from the charge upon the inner walls of the retorts; substantially as described.

5. The method of distilling coal in substantially vertical retorts, for the production of illuminating gas, which consists in first heating the retorts to a temperature higher than 1800° Fahr.; forming a body of incandescent coke at the foot of the retorts; then, while the retorts are at such high temperature, substantially filling them with a charge of coal deposited upon the bed of incandescent coke; and immediately after the charging, passing steam through the incandescent coke to produce water-gas in such quantity that admitted at the bottom of the retorts, and passed therethrough, it will prevent the deposit of adhering carbon from the charge upon the inner walls of the retort; substantially as described.

6. The method of distilling coal in substantially vertical retorts, for the production of illuminating gas, which consists in first heating the retorts to a temperature higher than 1800° Fahr.; then substantially filling the retorts at such temperature with a body of coal to be distilled; and, immediately after charging, admitting at the bottom of the distilling charge and passing therethrough, an amount of nascent water-gas sufficient to prevent the formation of adhering carbon, from the charge upon the inner walls of the retorts, but not exceeding 15% of the total volume of the mixed gas resulting from the operation; substantially as described.

7. The method of distilling gas in substantially vertical retorts, for the production of illuminating gas, which consists in first heating the retorts to a temperature higher than 1800° Fahr.; forming a bed of incandescent coke at the foot of the retorts; then substantially filling the retorts with a charge of the coal to be distilled; and, immediately after charging, admitting into the bottom of the distilling charge and passing therethrough an amount of water-gas produced from steam passing through the incandescent coke to prevent the deposit of adhering carbon, from the charge, upon the inner walls of the retorts, but not exceeding 15% of the total volume of the mixed gases produced in the operation; substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

HENRY WALLACE BENNER.

Witnesses:

ROUCHER THORNE,

JOHN C. PENNIE.