

No. 627,595.

Patented June 27, 1899.

F. W. C. SCHNIEWIND.
COKE OVEN AND METHOD OF OPERATING SAME.

(Application filed Apr. 26, 1897.)

(No Model.)

Fig. 1.

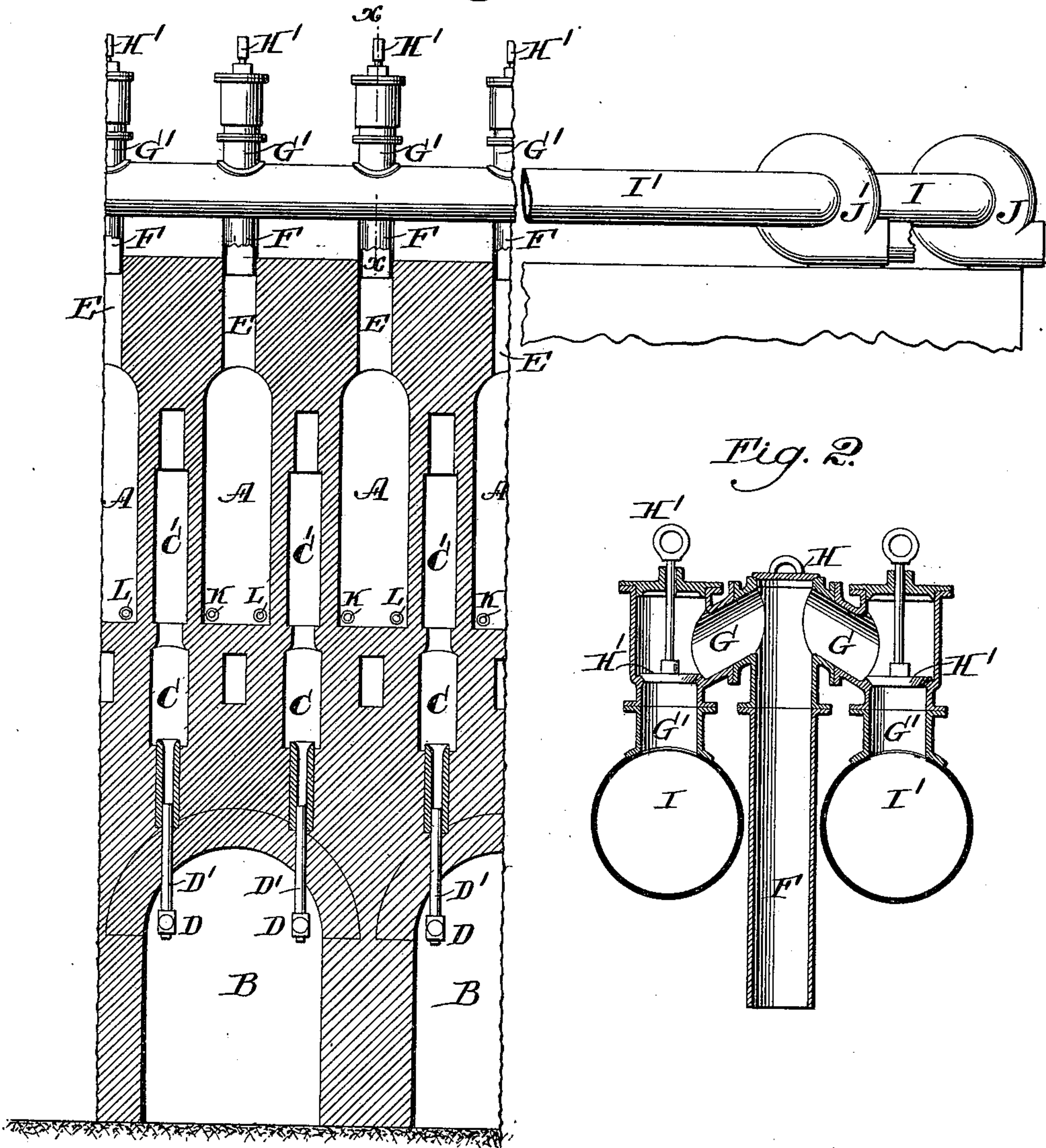
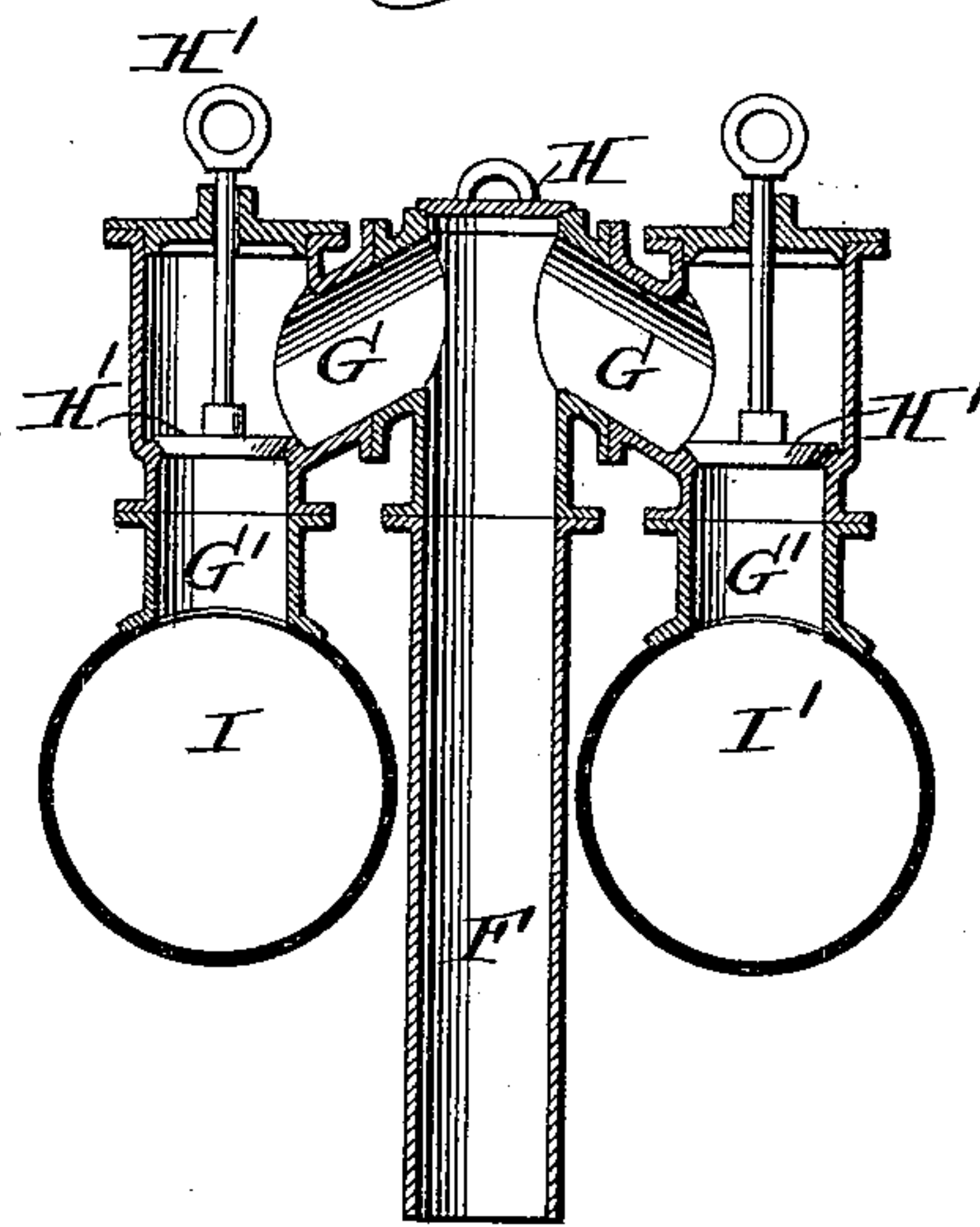


Fig. 2.



Witnesses.

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COKE-OVEN AND METHOD OF OPERATING SAME.

SPECIFICATION forming part of Letters Patent No. 627,595, dated June 27, 1899.

Application filed April 26, 1897. Serial No. 633,876. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC W. C. SCHNIEWIND, a citizen of the United States of America, residing in Pittsburg, in the county of Allegheny, in the State of Pennsylvania, have invented a certain new and useful Improvement in Coke-Ovens and in the Method of Operating the Same, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the construction and mode of operation of closed externally-heated coke-ovens, having for its purpose the separate collection of the gases of varying richness and value given off at different stages of the coking operation, the drawing off of the gases at different stages of the operation by sucking or exhausting devices working at different pressures, the quenching of the coke while still in the oven and with utilization of its heat for the manufacture of water-gas, and the carbureting of that portion of the water-gas which is on generation of sufficient heat to crack hydrocarbon oils.

In the destructive distillation of coal in closed externally-heated coking-ovens the gases and vapors driven off during the first period of treatment are very high in hydrocarbons. After an energetic generation of such gases ensues a second period of treatment, during which the volume of gas is considerably diminished, and following this is a third period characterized by a pronounced rise in the temperature of the coal in the oven and the production of large volumes of gas characterized by a high percentage of hydrogen and a small percentage of hydrocarbons.

Owing to the rapid changes of temperature to which the walls of the coking-ovens are subjected, as well as to the great pressure exerted upon them by the coking-coal, the oven-walls are usually not gas-tight, and consequently there is apt to be either a flow of the gases used for heating the ovens externally into the ovens, which takes place when the pressure within the oven is less than the pressure in the heating-chambers surrounding it, or the flow of gases from the oven into the sur-

rounding chambers, which takes place when the pressure in the oven exceeds the pressure in the surrounding chambers. In either contingency there is apt to be a loss in value either by the adulteration of the rich gases generated in the oven by the poor gases used for heating the oven or by the loss of rich gases escaping from the oven into the heating-flues. Again, the delivery of all gases generated in the coking-ovens into the same take-off mains results in the production of a gas having the average percentage of hydrocarbons of all the gases generated during the coking operation, and this mixed gas is low in hydrocarbons for use as an illuminating-gas and rich in hydrocarbons for use as a heating-gas.

My improved method of operating the ovens has in view the overcoming of the above-mentioned defects of the usual process; and it consists in drawing off the gases generated in the oven at different stages of the coking operation through different gas-mains and by means of exhausting devices working at different pressures, whereby the pressure in the ovens may be maintained approximately constant and approximately equal to the pressure in the surrounding heating-flues. In this way it will be obvious that not only will the poor and rich gases be collected separately, but the loss of oven-gas or its admixture with heating-flue gas practically prevented.

It is usual in the operation of the closed externally-heated coke-ovens to withdraw the coke when the coking operation is complete and quench it outside of the oven. This is accompanied by two drawbacks—first, the loss of the heat of the incandescent coke, and, second, the fact that it leaves the walls of the oven at practically their maximum temperature, as a result of which the dumping of a new charge of coal into the retort results in a rapid and destructive chilling of the retort-walls and at the same time in the evolution of a large quantity of rich gas, which issues freely through the charging-opening and is not only wasted, but is very troublesome to the workmen. These losses and objectionable features of the usual practice I have

overcome by introducing steam into the retort after the coking operation is complete and before the ovens are opened, thereby gradually quenching and cooling the coke and the oven-walls and utilizing the heat of the incandescent coke for the manufacture of water-gas, which is drawn off in one of the gas-mains connected with the oven and at an appropriate pressure. For the best results I introduce not only steam but hydrocarbon oil or oil-vapor into the retort while the coke is still sufficiently hot to crack the oil, thus making at the same time water-gas and oil-gas, which carburets and enriches the water-gas. I discontinue the injection of oil when the temperature falls below the point at which a permanent gas would be formed, continuing, however, the introduction of steam until the temperature falls to a point too low for the production of water-gas.

Reference being now had to the drawings, which illustrate an apparatus adapted for use in accordance with my newly-invented method and embodying the structural features which I have also invented, Figure 1 is a sectional elevation of a portion of a bank of coke-ovens provided with my new appliances, and Fig. 2 is a cross-sectional view taken on the line *x x* of Fig. 1.

A A A indicate individual coke-ovens; B, tunnels situated below the ovens and in which I have shown the gas-supply pipes D D, from which the individual burner-pipes D' lead to the combustion-chambers C, which in turn communicate with the heating-chambers C', situated between each adjacent pair of coking-ovens.

E E, &c., indicate the vertical passages leading into the tops of the coke-ovens, by which they may be charged and through which the gases escape. As shown, they communicate with conduits F, closed at the top by plates H and from which lead branches G G, communicating, through passages G', with the gas-mains I and I', respectively, H H indicating valves by which either of the gas-mains I or I' can be placed in communication with the conduit F at pleasure.

J and J' indicate exhaust-fans connected, respectively, with the conduits I and I' and which, as before described, should be run at different speeds.

K K, &c., indicate steam-pipes leading into the coke-ovens A; L L, &c., pipes for the introduction of hydrocarbon oils or oil-vapors, also leading into the ovens A.

In operation the coke-ovens are charged in the usual or any convenient way and are heated by the combustion of gas in the flues C'. One of the gas-mains—I', for instance—is placed in communication with the oven by a proper manipulation of the valves H and the rich gases drawn off at an appropriate pressure regulated by the exhaust-fan J. As the gas becomes poor in hydrocarbons the main I' is disconnected with the ovens and the main I placed in connection with them.

The exhaust-fan J, being run at a speed proportionate to the evolution of gas, will maintain an appropriate pressure in the ovens, and of course the desired separation of the rich and poor gas is effected at the same time. I have shown but two mains and two exhaust devices; but obviously more can be employed with advantage where it is desired to effect a still greater separation of gas of different quality or to more nicely regulate the pressure in the coke-ovens, and this matter of pressure can also be regulated by varying the action of the exhaust device, although for practical purposes and in view of the fact that each main will in practice be united with a number of ovens it is preferable to run the exhausting devices at a practically constant speed and pressure. After the coking of the coal is complete I turn steam into the ovens through the pipes K, quenching the coke, gradually cooling the flues of the oven, and by the decomposition of the steam forming water-gas, which is carried off through the appropriate gas-main and at the proper pressure. Preferably, as before stated, I also inject hydrocarbon oils through the pipes L during the early part of the quenching operation for the purpose of enriching the water-gas and increasing the general proportion of rich illuminating-gas obtainable from the ovens.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of manufacturing coke and of likewise recovering separately, as auxiliary products, gases, differing in richness, driven off from the body of the coking-coal, which consists in inclosing successive charges, one at a time, in a closed oven, subjecting each successive charge to a coking heat applied from without purely by conduction through the walls of the oven and to all parts of the charge and distilling off thereby the volatile hydrocarbon gases, fractionally separating said gases by drawing off and collecting those generated at different stages of the coking of the charge into separate receptacles and thereby preventing the adulteration of the richer by the poorer gases and finally drawing the coked charge from the oven preparatory to recharging the same.

2. The method of manufacturing coke and of likewise recovering separately as auxiliary products gases differing in richness driven off from the body of the coking-coal, which consists in inclosing the coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, fractionally separating the said gases by drawing off and collecting them at various stages of the coking operation into separate receptacles and maintaining during the various stages of the coking operation a substantial equilibrium of pressure between the oven-gases and the external

heating-gases thereby preventing the adulteration of the richer by the poorer gases and harmful variations of pressure in the oven.

3. The method of manufacturing coke and of likewise recovering as an auxiliary product gases driven off from the body of the coking-coal which consists in inclosing a coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, then when the coal is substantially coked quenching the igneous coke in the oven, cooling the walls of said oven and producing a further gas generation by injecting steam into the closed oven, then withdrawing the quenched coke, recharging the cooled oven with a fresh body of coking-coal and continuing the treatment as above.

4. The method of manufacturing coke and of likewise recovering as an auxiliary product gases driven off from the body of the coking-coal which consists in inclosing a coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, then when the coal is substantially coked quenching the igneous coke in the oven, cooling the walls of said oven and producing a further gas generation by injecting steam and hydrocarbon oil into the closed oven, then withdrawing the quenched coke, recharging the cooled oven with a fresh body of coking-coal and continuing the treatment as above.

5. The method of manufacturing coke and of likewise recovering as an auxiliary product gases driven off from the body of the coking-coal which consists in inclosing a coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, then when the coal is substantially coked quenching the igneous coke in the oven, cooling the walls of said oven and producing a further gas generation by injecting steam and hydrocarbon oil into the closed oven, maintaining during the various stages of the coking operation a substantial equilibrium of pressure between the oven-gases and the external heat-

ing-gases then withdrawing the quenched coke, recharging the cooled oven with a fresh body of coking-coal and continuing the treatment as above.

6. In combination with a closed externally-heated coke-oven, separated gas-mains I and I' having valves as H H whereby they can be connected or disconnected from the oven and each having an independent exhaust device as J J'.

7. In combination with a closed externally-heated coke-oven, separated gas-mains I and I' having valves as H H whereby they can be connected or disconnected from the oven and each having an independent exhaust device as J J', and a steam-conduit opening into the oven.

8. In combination with a closed externally-heated coke-oven, separate gas-mains I and I' having valves as H H whereby they can be connected or disconnected from the oven and each having an independent exhaust device as J J' and steam and oil conduits opening into the oven.

9. The combination with a bank or plurality of closed exteriorly-heated coke-ovens, of separated gas-mains I and I' communicating with said ovens, said gas-mains having valves H' H', whereby any oven can be connected or disconnected from either main, each of the mains having an exhaust device, as J J'.

10. The combination with a bank or plurality of closed exteriorly-heated coke-ovens, of separated gas-mains I and I' communicating with said ovens, said gas-mains having valves H' H', whereby any oven can be connected or disconnected from either main, each of the mains having an exhaust device, as J J' and a steam-conduit opening into it.

11. The combination of a bank or plurality of closed exteriorly-heated coke-ovens, of separated gas-mains I and I' communicating with said ovens, said gas-mains having valves H' H', whereby any oven can be connected or disconnected from either main, each of the mains having an exhaust device, as J J' and steam and oil conduits opening into it.

F. W. C. SCHNIEWIND.

Witnesses:

CHAS. F. MYERS,
D. STEWART.

DISCLAIMER.

627,595.—*Frederic W. C. Schniewind*, Pittsburg, Pa. IMPROVEMENT IN COKE-OVENS AND METHOD OF OPERATING SAME. Patent dated June 27, 1899. Disclaimer filed November 6, 1901, by the assignee, *The United Coke and Gas Company*, of Charlestown, W. Va., and Philadelphia, Pa., a corporation of West Virginia.

Enters its disclaimer—

"To such parts of the thing patented as are especially pointed out and referred to in the first, third, and fourth claims of said Letters Patent, constituting the subject-matter of said claims, which are in the following words, to wit:

"1. The method of manufacturing coke and of likewise recovering separately, as auxiliary products, gases, differing in richness, driven off from the body of the coking-coal, which consists in inclosing successive charges, one at a time, in a closed oven, subjecting each successive charge to a coking heat applied from without purely by conduction through the walls of the oven and to all parts of the charge and distilling off thereby the volatile hydrocarbon gases, fractionally separating said gases by drawing off and collecting those generated at different stages of the coking of the charge into separate receptacles and thereby preventing the adulteration of the richer by the poorer gases and finally drawing the coked charge from the oven preparatory to recharging the same.

"3. The method of manufacturing coke and of likewise recovering as an auxiliary product gases driven off from the body of the coking-coal which consists in inclosing a coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, then when the coal is substantially coked quenching the igneous coke in the oven, cooling the walls of said oven and producing a further gas generation by injecting steam into the closed oven, then withdrawing the quenched coke, recharging the cooled oven with a fresh body of coking-coal and continuing the treatment as above.

"4. The method of manufacturing coke and of likewise recovering as an auxiliary product gases driven off from the body of the coking-coal which consists in inclosing a coal charge within a closed oven, subjecting it to a coking heat by conduction through the walls of the oven from without and distilling off thereby the volatile hydrocarbon gases, then when the coal is substantially coked quenching the igneous coke in the oven, cooling the walls of said oven and producing a further gas generation by injecting steam and hydrocarbon oil into the closed oven, then withdrawing the quenched coke, recharging the cooled oven with a fresh body of coking-coal and continuing the treatment as above."—[*Official Gazette*, November 12, 1901.]