

UNITED STATES PATENT OFFICE.

FREDERICK H. EICHBAUM, OF DETROIT, MICHIGAN.

IMPROVEMENT IN PROCESSES OF MANUFACTURING ILLUMINATING-GAS.

Specification forming part of Letters Patent No. **176,610**, dated April 25, 1876; application filed March 22, 1876.

To all whom it may concern :

Be it known that I, FREDERICK H. EICHBAUM, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Process for Manufacturing Illuminating-Gas; and I do hereby declare that the following is a full and exact description of the same.

My invention, which is the subject of this application, is an improved process for the manufacture of illuminating-gas, and the novelty therein consists in making gas from coal, from wood, and from hydrocarbons in the same bench of retorts, at the same time, and from the combination of the three gases, producing a fixed or permanent illuminating-gas of a certain desired candle-power.

In order that those skilled in the art may know how to use my process, I now proceed to describe the same.

I take any suitable bench of retorts, preferably such as are described in my Letters Patent, numbered respectively 164,022 and 168,006, and in my application for Letters Patent filed February 8, 1876, and furnished with an apparatus for supplying liquid hydrocarbons, substantially such as described in my Letters Patent numbered 165,800, and where a bench of three retorts, set triangularly, is used, I place wood in one of the lower retorts, and coal in the other lower retort, and admit hydrocarbon in a liquid form into the upper retort. Where such retorts are set vertically, either the lower or middle retort may be used for wood or for coal, as may be preferred, but the upper one in all instances must be used for the hydrocarbons. Where benches of five retorts are used, or six, in like manner, the lower retorts are used for coal or wood, and the upper ones, where six retorts are used, or the single upper one in a bench of fives, are used for the fluid hydrocarbons. It is a matter of convenience whether the wood shall be used in the retorts upon one side of the bench, and the coal in the retorts on the other side of the bench, or wood and coal are used alternately in the two lower retorts on each side, or wood and coal used in the same retort. The retorts are charged with coal in the usual way, and with wood as described in my said Letters Patent and application, and the gas

distilled both from the wood and coal pass up into the upper retort, which preferably should have an inclosed retort into which the fluid hydrocarbon is introduced, but the same may be omitted, and the hydrocarbon may be admitted directly into the upper retort in a solid form or in a liquid or vaporized form, as may be preferred. It will be observed, however, that I prefer to subject the coal to an exhaustive distillation, for the purpose of enhancing the production of coal-gas, the quantity of which may be increased nearly twenty-five per cent. over that ordinarily obtained in gas-works, while its illuminating power is correspondingly reduced and its specific gravity lessened. It will also be found best in practice, where wood and coal are used in the same retort, to place the wood in the back end of the retort and the coal in the front end. The wood being in the hottest part of the retort and the coal in the coolest part, it follows that there is a rapid distillation of wood-gas, which flows to the front of the retort, overtaking the vaporous gases of the coal, diluting and carrying the same along into the mixing retort and there uniting and combining with the same, and both gases overtaking, absorbing, and uniting with the hydrocarbon gas.

As the gas produced from the coal and from the wood meet in the common upper retort, the volume of the same, which is great and of small specific gravity, uniting and combining, overtakes and carries along the gas produced from the hydrocarbons, which is comparatively small in volume but of greater specific gravity than the other gases named; and, at the same time, the three gases, uniting, form a single homogeneous fixed illuminating-gas. In the use of this process in benches already constructed, it will be obvious that the retorts, being of the same size, and wood being more rapidly converted into gas than coal, and producing a much larger proportion of gas, the volume or proportion of wood-gas will be greater than that of coal-gas, but, as the wood-gas is a perfect diluent both for coal and hydrocarbon gases, the wood-gases will mingle freely and unite with the other gases without waste or deposit from either of them; and the gas which would re-

sult from the coal and wood alone, being deficient in illuminating power, can be sufficiently enriched by the hydrocarbon gas to any desired degree by regulating the flow of the hydrocarbon into its proper retort, or by regulating the charge of solid hydrocarbons in such retort. It is apparent, however, that in constructing benches of retorts especially for the use of this process, the sizes of the retorts designed respectively for wood or coal may be changed to suit convenience.

In the process described, the principal advantage will be found in convenience of application to benches of retorts now used for making coal-gas without any expensive change of construction; in the economy of manufacture, since all the gases in the coal are extracted and the whole of the spent coke thus produced may be utilized for heating the benches, (for which it is quite suitable, although not fit for many of the purposes for which ordinary coke is used,) instead of becoming a nuisance, difficult of sale, and littering up the premises, as now, in gas-works; in the saving of expense in scrubbing or purifying, as this gas will be found to require less of either than coal-gas; and in the cleanness of the pipes, as this gas will remove all de-

posit and keep the pipes constantly free from naphthaline and other deposit. I do not pretend that it is as cheap as the mode of manufacturing described in my application of February 8, 1876, by which poor coal-gas is enriched by the addition of a very rich wood and hydrocarbon gas, or the mode described in my patents before referred to for making wood and hydrocarbon illuminating-gas, but it will be found convenient of use, more economical than the coal-gas now made, and very convenient and economical where wood is expensive, and petroleum, or its products, are cheap, or where coal is cheap, but needs, in gas-making, an enriching-gas in order to meet public demands.

Having thus described my process, what I claim therein as new, and my invention, is—

The process, substantially as described, of producing an illuminating-gas from the concurrent distillation of coal, wood, and hydrocarbons at the same time, as set forth.

This specification signed and witnessed this 18th day of March, 1876.

FREDERICK H. EICHBAUM.

Witnesses:

H. S. SPRAGUE,

W. H. SHAW.