

UNITED STATES PATENT OFFICE.

FREDERICK H. EICHBAUM, OF DETROIT, MICHIGAN, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO WILLIAM W. HORTON, J. T. SALTER, J. H. SHELDON, AND JAMES AIKEN, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN PROCESSES FOR THE MANUFACTURE OF ILLUMINATING-GAS.

Specification forming part of Letters Patent No. **164,822**, dated June 22, 1875; application filed January 13, 1875.

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 Improvement in the Process for the Manufacture of Illuminating-Gas; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The object I have in view is the production of a better and more uniform quality of illuminating-gas in a convenient and cheap way, by enriching, to a desired degree, the gases which may be produced from non-resinous woods, or woods or other suitable vegetable substances which do not produce gases of sufficient candle-power for commercial uses; and my invention therein consists in the production of a fixed or permanent illuminating-gas of a required candle-power at a single operation, without the use of steam or of reheaters, by the simultaneous destructive distillation of wood and a definite quantity of hydrocarbons at the same temperature.

In order to enable those skilled in the art to use my process, I proceed to describe the same more particularly.

When such woods are in the act of distillation, or in the act of evolving illuminating-gas in whatever apparatus may be convenient or suitable for the purpose, I combine with such gases, by any proper mechanical means, in such quantities as may be desired, gases produced from the distillation of hydrocarbons, it being essential that both of the operations of distillation should go on at the same time, and that the combination of both gases should take place in the same vessel and under the same temperature. A convenient method of performing this process will be found in taking a retort adapted to be heated to a very high temperature, and having a stand-pipe with a valve, and placing in the retort a certain quantity by weight of well-seasoned hard wood, and opening the valve in the stand-pipe, so as to give a communication into the air. When this wood has been distilling a few minutes, the products of which first distillation should be permitted

to escape through into the air, the valve in the stand-pipe should be closed so as to turn the products of distillation into the receiver. At this time, the distillation having become active, and gases freely evolved, I permit a certain flow of fluid hydrocarbon, regulated by valves in a pipe leading into such retort, in and upon the wood placed therein.

If it is desired to have an illuminating-gas of sixteen-candle power, I use one gallon of crude naphtha, or its equivalent in gas-producing capacity or carbon, in any solid or fluid hydrocarbons, and one hundred and twenty-eight pounds of dry hard wood, in the manner before described. From this formula, which is not intended to be precisely fixed, as both crude naphtha and dry hard woods vary a little in their gas-producing capacities, but which is substantially correct, it will be perceived that the candle-power desired may be increased either by increasing the quantity of hydrocarbon, or by decreasing the quantity of wood, so that gas of any desirable candle-power may be obtained.

An illuminating-gas of a fixed or permanent nature is thus evolved at one operation, at the same time and under a high temperature, in the evolution of which the wood-gas serves as a diluent and a vehicle to carry the gas from the hydrocarbon, which is evolved without deposit or waste, and both produced at the same time form a single gas of precisely the candle-power desired.

I do not wish to confine myself to any particular apparatus, as very many different kinds may be employed, one or more of which are of my own invention, and for which I am about making application for Letters Patent, my invention herein being simply the process before described.

I am aware that illuminating-gas has been produced by passing the gas evolved from the wood over hydrocarbons contained in another vessel, by means of which the poorer gas, in passing over, is enriched; but in such process the combination of the gases is not made at the time of distillation of each or at a uniform temperature of distillation, the union is not chemically complete, and the result is not a

gas of uniform quality. I am also aware that gas has been produced from the distillation of wood in one vessel, and a richer gas from hydrocarbons produced in another vessel, and the two gases thus produced have been united after production, but in this instance there is not the chemical combination which results from the combination of both in the act of distillation, and the result is that the gas is not an uniform, or even necessarily a permanent or fixed, gas, by which I mean a gas which will not be decomposed in ordinary use. I am also aware that gas has been produced from the distillation of wood in one vessel, and enriched by the addition of the vapors of hydrocarbons; but such process differs essentially from mine in that it lacks the vital element of convenient distillation, and chemical combination in the act of distillation. I am also aware that gas has been produced by the distillation of wood in one retort and hydrocarbons in another retort, and the two gases thus produced have been reheated and mixed in the act of reheating, as has been done by Mark Levy; but this process differs from mine in the fact that I have no reheating of the gases or mixing of them during reheating, but require, as an essential element, that from two different gases there shall be produced, in the act of distillation and

at a uniform temperature, a new gas differing from either. I am also aware that water-gases have been enriched by an admixture of hydrocarbons, as shown in the English patents of Parkes and of Hadley and of Holdredge; but these processes are connected with water-gases, which I do not use, and are all dependent upon the use of steam as an essential element, whereas I not only do not use water-gases or steam, but find the best results in my process where the wood used has been most thoroughly seasoned.

Having thus described my process, what I claim therein as new, and for which I desire Letters Patent, is—

The process of producing, at a single operation, a fixed or permanent illuminating-gas of a required candle-power by the simultaneous destructive distillation of wood and a definite quantity of hydrocarbons at a high temperature common to both distillations, substantially as described.

This specification signed and witnessed this 9th day of January, 1875.

FREDERICK H. EICHBAUM.

Witnesses:

J. H. SHELDON,

CHARLES THURMAN.