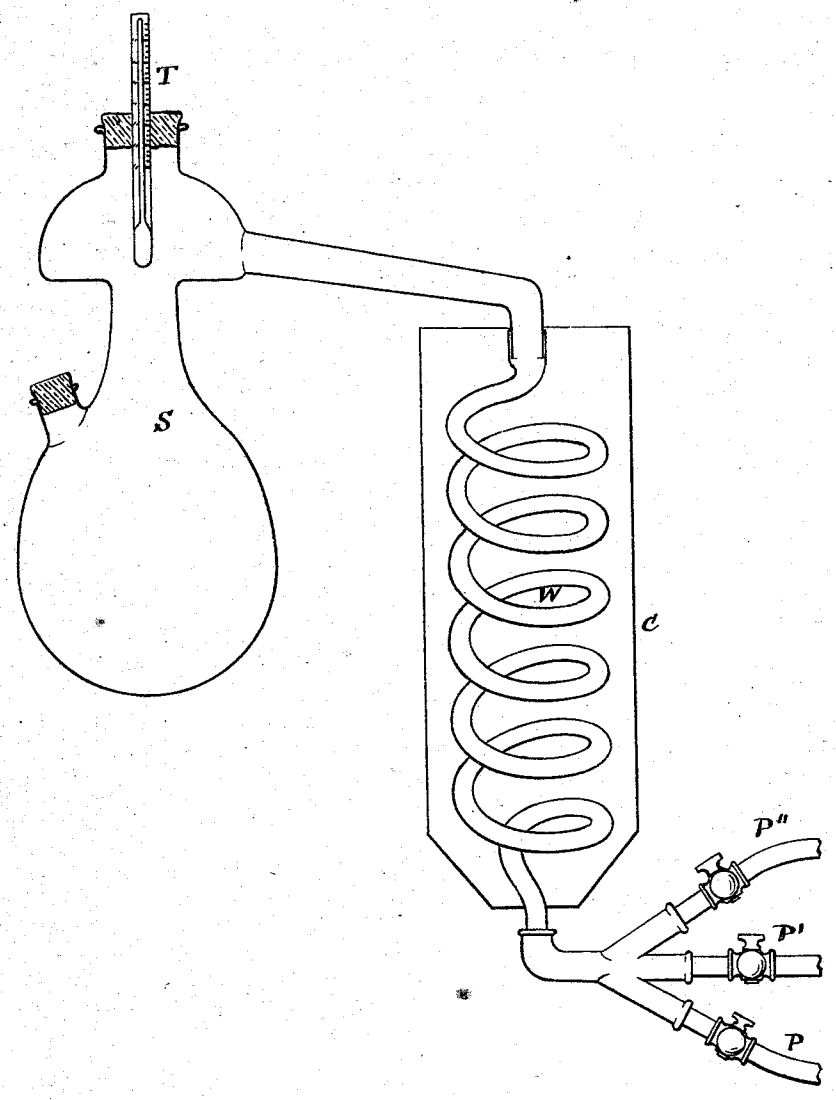
H. H. EDGERTON.

Process of Treating Hydrocarbons for Making Gas.

No. 159,655. Patented Feb. 9, 1875.



Witnesses:
Ernest Wick,
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UNITED STATES PATENT OFFICE.

HENRY H. EDGERTON, OF FORT WAYNE, INDIANA.

IMPROVEMENT IN PROCESSES OF TREATING HYDROCARBONS FOR MAKING GAS.

Specification forming part of Letters Patent No. **159,655**, dated February 9, 1875; application filed January 14, 1875.

To all whom it may concern:

Be it known that I, HENRY H. EDGERTON, of Fort Wayne, Indiana, have invented certain new and useful Improvements in the Manufacture or Production of Gas-Producing Hydrocarbons, of which the following is a specification:

Having discovered that in the making of illuminating-gas from certain materials they require to undergo a previous preparation in order to be used economically, I proceed to give the reasons for and the manner of preparing such materials. My discovery is based on the fact that different amount and intensity of heat is required to decompose different hydrocarbons into gas, and that always equal amounts are required for hydrocarbons precisely identical in composition. (When speaking of gas I mean illuminating-gas of greatest value obtainable from a given hydrocarbon.) The above may be called an axiom, though I am not aware of its having been before distinctly enunciated. If, then, precisely identical hydrocarbons require exactly equal heats to decompose them into best illuminating-gas, it is plainly to be seen that such identical hydrocarbons should be presented in the retort at the same time, and differing hydrocarbons must be presented at different times. The effect of presenting hydrocarbons differing in constitution at the same time in a retort is to convert part of them into best illuminating-gas, other portions are converted into non-illuminating gases, and still another portion passes through as vapor of sufficient condensibility to be lost in the pipes, or become an impurity in the resulting gases, causing them to smoke. The question is, then, how to present hydrocarbons of the same constitution in the retort at the same time? The separation of hydrocarbons by fractional distillation presents, in my opinion, the only practicable method of accomplishing this result. It relies on the fact that identical hydrocarbons have identical boiling-points. Take, for instance, the petroleum series of hydrocarbons, commencing with marsh-gas, C_2H_4, and increasing by C_2H_2, thus: C_4H_6—C_6H_8—C_8H_{10}—$C_{10}H_{12}$—$C_{12}H_{14}$—$C_{14}H_{16}$, and increasing upward. It has been observed that the boiling-point increases in the same direction. The boiling-point of C_2H_4 is not known. C_4H_6 can be liquefied. When we arrive at $C_{12}H_{14}$ more than the ordinary temperature of the air is required to vaporize, and consequently it is always liquid. Each, then, has its boiling-point, and boiling, therefore, affords the readiest means of separation.

When separated and brought into a retort heated to redness they are resolved into gases; and the decomposition into best illuminating-gases may be stated and illustrated as follows: The resulting gases must contain little or no free hydrogen, and no carbon must be formed in the retort. $C_{10}H_{12}$ will decompose as follows, if properly carried out: $C_4H_4+C_4H_4+C_2H_4$, or entirely olefiant gas and marsh-gas. In practical operations on a large scale such favorable results are not obtainable, but a very close approximation is attainable.

I may here state that I consider the action of heat in decomposing vapors into light gases to be as follows: The particles of carbon and hydrogen are expanded so far apart that the atoms group themselves into positions assumed in other compounds. For instance, a hydrocarbon vapor of 3,000 density, air 1,000, is expanded by heat until it becomes 1,000 density, which would require 1,440°. The atoms take the relations of compounds of that density, and remain so expanded. However the transformation occurs the fact remains that in presenting hydrocarbons, as above described, very desirable and economical results are obtained.

Now, I am aware of the fact that many inventors have proposed to first vaporize hydrocarbons in a separate vessel, and then conduct the vapors to a retort; but a careful insection of their plans and methods show that they themselves were unaware of this necessity of presenting them in the order of their boiling-points. The fundamental idea was to secure a more prolonged and perfect contact with the heated surface, which, in my opinion, is undesirable. The desired expansion must be obtained with the shortest possible exposure.

The carrying out of the Gale process, by Rand, in 1870, led to the demonstration of these facts. Rand filled a still with a petro-

leum distillate, and presented the vapors within a retort as they came over. This process has achieved a great practical success. However, in many cases it is far preferable to feed the material in liquid form directly into the retort, and still attain as good results; and this I propose to do in the following manner, illustrated by the diagram in the accompanying drawing:

S represents a still; T, a thermometer; C, a condenser; W, the condenser-coil or worm; P P′ P″, &c., pipes, leading to various tanks. A charge of mixed hydrocarbons is introduced into the still. Heat is applied, and the vapors coming off are condensed in the coil W, arriving in the pipes P P′ P″ nearly in the order of their boiling-points. Let the first distillate run into a tank, No. 1; after a certain increase of temperature, shown in thermometer T, let the product into tank 2, by suitable valves, and so on until all that is valuable for gas purposes is distilled and separated. This process can be carried on in the oil regions and refineries, the tanks being marked to indicate the quality of material.

Petroleum is now separated primarily for kerosene oil and for lubricating-oil. The first or lighter product is considered a waste product of little value, and is now sold, first, for gasoline-machines; the balance is sold with difficulty. None of these separations are for gas material, in fact are not suitable at all in the two heavier grades, unless treated by the Gale and Rand process.

By my invention, as above explained, I separate the crude material into liquid hydrocarbon subdivisions, the constituents of each subdivision having substantially identical decomposing-points, the result of this separation for gas-producing purposes being that I obtain perfect action in the retort without presenting the material to the retort in vapor form.

Under my invention the separation can be effected at the refineries, which results in greater economy, and is of value for many other reasons, the most important being that the gas-maker can select his material, and order it with a view to his particular use and circumstances. For instance, in existing coal-gas works, when it is desired to furnish half coal-gas and half petroleum or oil gas, a material of a certain density can be used with greatest economy, whereas if all oil-gas is to be used a lighter material is desirable. In practice petroleum would be divided into about ten products for gas-making purposes. The lighter materials require fewer subdivisions; the denser more numerous to work with economy.

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

For use in the process of manufacturing illuminating-gas from gas-producing hydrocarbons by presenting hydrocarbons of the same consitution in the retort at the same time, as described, the method of preparing said hydrocarbons, by separating the same into liquid subdivisions whose respective constituents have substantially identical decomposing points, as set forth, whereby any one of said subdivisions is available in liquid form for gas-making purposes, independently of the others.

In testimony whereof I have hereunto signed my name this 19th day of December, A. D. 1874.

HENRY H. EDGERTON.

Witnesses:
EWELL A. DICK,
HENRY R. ELLIOTT.