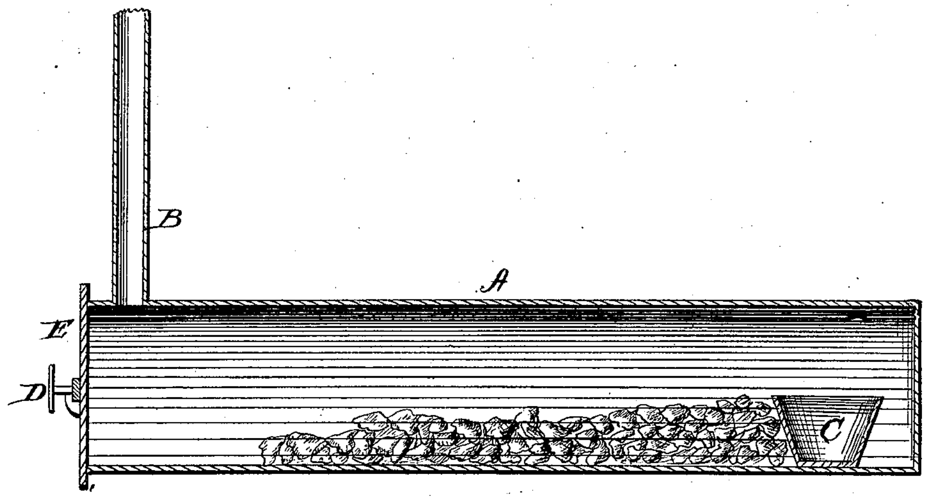
A. C. RAND.

Process of Manufacturing Illuminating Gas.

No. 202,050. **Patented April 2, 1878.**



WITNESSES
Frank L. Ourand.
Frank Galt

INVENTOR
Alonzo C. Rand
Alexander Mason
ATTORNEYS

UNITED STATES PATENT OFFICE.

ALONZO C. RAND, OF MINNEAPOLIS, MINNESOTA.

IMPROVEMENT IN PROCESSES OF MANUFACTURING ILLUMINATING-GAS.

Specification forming part of Letters Patent No. **202,050**, dated April 2, 1878; application filed January 16, 1878.

To all whom it may concern:

Be it known that I, ALONZO C. RAND, of Minneapolis, in the county of Hennepin and in the State of Minnesota, have invented certain new and useful Improvements in Manufacturing Illuminating-Gas; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention relates to the manufacture of illuminating-gas; and it consists in a process for using petroleum or other light hydrocarbon liquid to enrich the gas, as will be hereinafter more fully set forth.

In the annexed drawing, A represents an ordinary retort, with stand-pipe exit B for the gas. C is an iron pot, placed in the rear end of the retort. D is the device for fastening the lid E of the retort.

My process consists in lessening the condensation of coal-tar vapors and preventing the deposition of dry carbon, thereby increasing the yield and candle-power, by passing the vapors of light hydrocarbon liquids through a retort containing the charge of coal during the earlier stages of the distillation of the coal.

One of the modes of carrying out my invention is by placing a quantity of oil, measured by the candle-power, in a pot or pots placed at the rear of the retort, and it is preferable to use a light hydrocarbon oil, such as naphtha or other light oil. It is used in the following manner: Into the pot an absorbent of the oil is placed—say, fine coal-dust, coke-dust, sawdust, or fine shavings. This is saturated with the liquid, and the pot then placed in the extreme end of the retort, and the retort then charged with coal in the usual manner. The iron pots are heavy and thick, and by the time they have absorbed heat sufficient to vaporize the fluid the heat lost by the charge of coal absorbing it from the retorts has been restored, and the vapor arising from the pot mingles in its passage inward toward the stand-pipe with the vapors of the coal. The strong affinity existing between the hot coal-tar vapors and the oil vapors is so great that they are together decomposed, and thus very much of the coal-tar vapor is utilized that would, under the old method of distilling coal alone, have been condensed into coal-tar.

By actual experiments in running by this plan in gas-works I have found that the results show an increase of ten per cent. in the yield and forty per cent. increase in candle-power.

Of course, by this process the production of coal-tar is reduced; but the yield and quality of the gas are very much increased. This plan is very simple, and can be modified—that is, the oil could be fed into the rear of the retort into a pan, or the vapor of the oil could be introduced in the rear of the retorts during the period of the distillation of the coal when the rich coal-tar vapors are passing off; but it is obvious that this must be arrested after the richer vapors of the coal have passed off, else the high heat of the partially-decomposed coal would convert the vapors of the oil into dry carbon. Hence, to make the process simple and the results uniform, I prefer the use of the oil-pots, made of sufficient thickness to become heated up to a point when the vapors of the oil will pass off simultaneously with the richer coal vapors, and thus the combined vapors, simultaneously decomposed, arrest the condensation of the rich coal-tar vapors by reducing the specific gravity of the vapors arising from the coal.

The condensed vapor of coal-tar has a largely-increased gravity over the vapors of petroleum when condensed—that is to say, a gallon of coal-tar largely exceeds in weight a gallon of petroleum.

In practice I find that three-fifths of a gallon of petroleum or other light hydrocarbon liquid to each one thousand feet of coal-gas increases the yield ten per cent. and the candle-power forty per cent. For example, in one month's run of coal the yield was 4.65 feet to the pound of coal, and the gas was fourteen-candle power, tested with a photometer two miles away from the works while the earth around the street-mains was frozen. The next month the yield was 5.45 feet to the pound of coal, with over twenty-candle power, the gas tested in the same place and under the same conditions, quality of coal the same, the heats the same, and the only addition made was

using seven gallons of naphtha, costing six cents per gallon, or forty-two cents for each two thousand pounds of coal.

The advantages arising from this discovery may therefore be briefly summed up as follows: Seven gallons of naphtha, costing forty-two cents, will increase the production of gas from two thousand pounds of coal sixteen hundred feet, and, what is still more important, will add forty per cent. to the candle-power of the same.

The next important thing to be accomplished in this process is the separation of the constituents of steam by introducing into the rear of the retort a pipe leading from a superheater filled with steam, and so arranged as to utilize the waste-heat of the stack.

The steam is not to be turned on until the charge of coal has been distilled; then the coke remaining in the retort at high heat will be in condition to combine with the oxygen, and thus the hydrogen will be liberated. This will enable a larger percentage of the oil to be used, and consequently a larger per cent. of the coal-tar would be converted into gas.

It is not the intention to run the steam into the hot coke constantly for the purpose of oxidizing the coke, but only to make as much hydrogen as the heat contained in the coke and the steam that has been superheated by the waste-heat from the bench will permit without the additional consumption of fuel.

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

In the manufacture of illuminating-gas, the process of lessening the condensation of coal-tar vapors and preventing the deposition of dry carbon, thereby increasing the yield and candle-power, which consists in passing the vapors of light hydrocarbon liquids through the retort containing the charge of coal during the earlier stages of the distillation of the coal, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 3d day of January, 1878.

ALONZO C. RAND.

Witnesses:
HARRY W. BROWN,
RUFUS R. RAND.