

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN LIQUIDS FOR CARBURETING AND ENRICHING GASES USED FOR ILLUMINATING AND HEATING.

Specification forming part of Letters Patent No. 58,054, dated September 18, 1866.

*To all whom it may concern:*

Be it known that I, JOHN F. BOYNTON, of the city of Syracuse, in the county of Onondaga and State of New York, have made a new and useful Improvement in Liquids for Carbureting and Enriching Gases used for Illumination, and in their application for the purpose of carbureting gases and air; and I hereby declare the following to be a full and exact description of the same.

The value of gases for illumination, when burned in the ordinary manner, depends upon the relative proportion of carbon and hydrogen. If hydrogen gas is in excess, combustion will produce a large amount of heat and but little light. If carbon is in excess, it is difficult to keep the flame from smoking.

There are certain kinds of coal which, when distilled in the manner usual in gas-works, produce gas rich in light-giving properties; but it is not always practicable to obtain such coal, and gas from good coal is liable to deteriorate when conveyed in pipes long distances, or when it remains for some time in contact with cold water. Hence it has long been an object to find some practical mode of enriching poor gases, and for restoring that which has become poor by the condensation of the light oily hydrocarbons, upon which its illuminating property is known to depend.

The first mode proposed for accomplishing this was to saturate the gas at or near the meter with the vapors of one or more of the products obtained by the distillation of gas-tar, or tar from gas-works. These products are very numerous, but all contain a large proportion of carbon. The lightest of these has long been familiar to the public under the name of "benzole" or "benzine." This, at ordinary temperatures, is a light volatile liquid of a specific gravity of about 0.85. The benzole of commerce is generally a mixture of the benzole of the chemist with homologous hydrocarbons, all derived from coal in the usual process of manufacturing illuminating-gas, and is more properly designated "naphtha," or "rectified naphtha."

The least volatile of these hydrocarbons is naphthaline, which, when separated from the others, is solid at the ordinary temperature of

the air. For the sake of classification, all these hydrocarbons are designated the naphthaline series of hydrocarbons.

The formula which expresses the composition of benzole is  $C^{12}H^6$ , and naphthaline,  $C^{20}H^8$ . The other members of the series have a composition intermediate between these two. Being all rich in carbon, their addition to gas will greatly increase its illuminating power. But after a long series of practical experiments the use of these liquids failed of general introduction, principally for the reason that these liquids are so easily affected by changes of temperature that the gas carbureted by them is not uniform, the degree of carbureting being excessive in warm weather and failing almost entirely in cold weather. The same difficulty attends the carbureting of air to produce what is known as air-light or benzole-light, and in carbureting the mixed gas produced by what is known as the "water-gas process."

The development and general introduction of petroleum a few years ago brought before the public another class of hydrocarbons, resembling in many respects the volatile liquids from gas-tar, but of very different chemical constitution, and also different as respects their freezing-point.

From some resemblance to the liquids from the tar of gas-works, the light products from petroleum of a specific gravity of .70 to .75 are frequently called "benzole" or "benzine," and under that term, or as "gasoline," "naphtha," "carbon spirits," and other commercial names, have gone into use in the arts, and have been largely employed within the last few years, especially for carbureting air and gas. That one which corresponds most nearly in its general appearance to the benzole of gas-tar has the chemical formula  $C^{12}H^{14}$ . Other members of the group have been separated from petroleum, some more and some less volatile, but all having an excess of hydrogen, while in the gas-tar products the carbon is in excess.

These liquids do not congeal at the lowest temperature met with in our latitudes, and on that account present a great advantage as carbureting-liquids. But as carbureting-liquids these are defective, for the reason that the

amount of carbon they contain is much smaller than in the gas-tar liquids. For carbureting gas they are also defective, for the reason that the vapors of the petroleum liquids do not readily combine with coal-gas.

After numerous experiments in carbureting gas and air with both of the above-mentioned classes of hydrocarbons, the idea occurred to me to combine them. The result was such as I expected, as these two series of liquids readily combine, being mutually solvents one of the other.

The nature, therefore, of my invention consists in making liquids for carbureting and enriching coal-gas, air, water-gas, and the like by combining hydrocarbons of the coal-tar or naphthaline series with hydrocarbons of the petroleum series, or their equivalents.

By this process I produce liquid suitable for carbureting either air or gas, which may be depended upon at all seasons of the year; and by the application of my invention the gas from cheap coal may, at small expense, be made equal in illuminating power to gas from the richest and most expensive coal.

Where coal-gas cannot be obtained, my compound liquids may be applied to the carbureting of air or water-gas, so as to produce a good and cheap light.

The compound liquids produced by my invention do not congeal, since the petroleum spirits act upon the hydrocarbons of the naphthaline series as alcohol does upon water. They are sufficiently rich in carbon to render the poorest coal-gas suitable for illumination. Besides, by using the very light spirits from petroleum, I can use some of the heavy oils from coal-tar, which would otherwise not be sufficiently volatile. The light and heavy vapors of the different series of hydrocarbons have so strong an affinity for each other that the light vapor will carry with it the heavy, as water is carried over by the vapor of alcohol in distillation.

I have mentioned especially the hydrocarbons from petroleum, for the reason that they are most abundant; but the liquid oils derived by distilling coals at a low temperature are substantially the same in constitution as these products of petroleum. The so-called "paraffine-oils" belong to this class, and may be considered as the equivalent of the oils from petroleum.

To enable others skilled in the art to make

and use my invention, I proceed to describe one method of preparing the fluid.

Of petroleum products rectified, I mix with the products of gas-tar in the following proportions, viz: Three parts of naphtha from gas-tar, three parts of benzole from gas-tar, two parts of petroleum spirits or gasoline. These may be used after being simply but thoroughly mixed; but it would be better to redistill them together before using, stopping discillation at about 350° Fahrenheit. Or I take the unrectified products in quantities sufficient to insure the above proportions, mix them together, and distill over till the gravity is the same as that of the mixture of rectified products above given.

If the gas to be carbureted is very poor in illuminating properties, I add to the above-named proportions one gallon of petroleum spirits of specific gravity of about .70 and one gallon of gas-tar benzole.

I have indicated above the proportions I prefer; but these may be greatly varied, and must, to some extent, depend upon the quality of the gas to be enriched, and also upon the gravity of the liquid used.

The liquids produced by the above process may be applied by means of my multipliers, or by any of the machines in use for similar purposes that may be properly constructed.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The improved liquids for carbureting or enriching gas or air produced by combining one or more hydrocarbons derived from petroleum or its equivalent with one or more hydrocarbons of the coal-tar series.

2. Carbureting or enriching coal-gas, water-gas, or air by combining with them the vapor of a liquid made by combining hydrocarbons of the coal-tar series with those of the petroleum series, substantially as herein described.

3. The method or process herein described of manufacturing liquids for carbureting or enriching gas or air by combining one or more hydrocarbons derived from petroleum or its equivalent with one or more hydrocarbons of the coal-tar series.

JOHN F. BOYNTON.

Witnesses:

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JNO. C. WINN.