UNITED STATES PATENT OFFICE.

THOMAS L. WILLSON, OF NEW YORK, N. Y., ASSIGNOR TO THE ELECTRO GAS COMPANY, OF WEST VIRGINIA.

PROCESS OF MAKING AND CONSUMING GAS.

SPECIFICATION forming part of Letters Patent No. 555,198, dated February 25, 1896.

Application filed July 9, 1894. Serial No. 517,008. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS L. WILLSON, of the city, county, and State of New York, have invented a new and useful Process for the Production and Consumption of Hydrocarbon Gas, of which the following is a full, clear, and exact description.

This invention relates to the production of and the subsequent burning of acetylene gas so as to produce a flame of high luminosity when the same is previously mingled with air. This is done by allowing the acetylene gas to escape from a suitable pressure and through a suitable burner to the atmosphere where in its process of combustion it gives, mingled with air before such combustion, a flame of extraordinary luminosity.

The gas which I propose to use is not in and of itself my discovery, being that hydrocarbon compound having the formula C_2H_2 and known as "acetylene."

My discovery consists in the fact that this gas can be practically, successfully, and economically generated from a metallic compound with carbon—as, for instance, calcium carbide—and when so generated and burned under proper conditions becomes a valuable and important substitute for the present gases used for illuminating purposes. I have discovered, therefore, a valuable commercial use for a hitherto valueless gas. I have discovered that that gas when properly burned possesses extraordinary illuminating power, and that said gas, if transmitted through mains, possesses an advantage over practically-used illuminating-gases, in that it is an absolutely-fixed gas, not being, as are practically all other illuminating-gases, a vehicle carrying hyrdrocarbon vapors more or less fixed in suspension and therefore certain to deposit said hydrocarbon in liquid form in its progress through the mains. Hence it follows that such mains must be provided with drips or receptacles for such deposited hydrocarbon, and it also follows, as a well-known fact, that a gas of a certain illuminating power at the works or place of production has a considerably less illuminating power when the same is measured at a considerable distance from said works; also, it follows that in the use of that class of gases any considerable pressure in the mains is impossible, because such pressure causes a still more rapid deposition of the physically-carried hydrocarbon and consequent impoverishment of the gas. It has, therefore, always been impossible to practically distribute illuminating-gas in small mains under high pressure by reducing the pressure at the point of consumption, which would be manifestly a great advantage if it could be practically done. The gas which I propose to use for this purpose is, on the contrary, an absolutely-fixed definite chemical compound, not carrying free hydrocarbon and impossible of separation into its constituent elements, excepting by heat or chemical action; also, I have discovered that this gas in open burners is capable of great subdivision, while at the same time giving greatly-increased results in illumination over any present practically-distributed gas. I believe that no gas is practically distributed which, burning in an ordinary five-foot burner, produces over thirty-five-candle power on a photometer.

In an open burner burning but one foot of the gas this gas will produce an illumination approximating fifty-candle power, whereas in a similar burner ordinary illuminating-gas gives practically no valuable illumination whatever. This discovery enables me to accomplish the same results accomplished in the subdivision of the electric light, subdividing for the same consumption of gas my light into many more foci of illumination, and thereby securing equality and uniformity of illumination through considerable spaces rather than concentrating such illumination in a much smaller number of foci.

I am aware of the fact that the body which I use to produce the acetylene gas—namely, calcium carbide—has been known as a chemical curiosity, and it has been known that this body had the power to decompose water by reason of the greater affinity of the calcium for the oxygen of the water than for the carbon of its own structure. This calcium carbide, however, was entirely unknown for any commercial purposes whatever, and was strictly a chemical curiosity until I succeeded in producing it electrically in large quantities, thereby enabling me to study the com-

position and action of the gas resulting therefrom, and to determine for the first time its qualities and the conditions under which it could be practically used.

In order to construct and operate a practical gas-plant under my invention no material but water in addition to the calcium carbide is requisite. A practical operative gas-plant requires, therefore, only a generating retort or chamber, and a suitable receptacle or gas-holder for receiving the generated gas. As no heat is required, skilled labor is entirely unnecessary in the production of this gas, and if desired it is produceable in every separate house or place of consumption.

Practically, I employ a retort or receptacle capable of containing a sufficient amount of the metallic carbide, preferably calcium carbide, employed, and of the converting-water. I have discovered that under the conditions of the mingling of water and calcium carbide the gas is produced under such pressure as that no further pumping into the holder or receptacle is required, as is ordinarily the case. I mingle the gas so produced in said holder or otherwise with a suitable proportion of air—say from forty to fifty per cent.—before leading it to the burner. In this way smoke and clogging of the burner are diminished. When this mixture is burned in an ordinary burner approximately fifty-candle power of illumination may be expected for each foot of acetylene burned per hour. These proportions may be varied.

In order to carry out my process practically, I take, approximately, for each five feet of the gas desired to be produced one pound of calcium carbide. This I mingle with water in a closed vessel communicating with an ordinary gas-holder having the usual pressure, say, of two inches. This pressure may be somewhat varied—as, for instance, from one inch to three or more—but the ordinary pressure of such gas-holders is proper for the combustion of such acetylene gas in a smokeless flame in a suitable one-foot burner. As the generation of gas is rapid, it is important to have the outlet of sufficient area, as on account of the pressure of the gas so generated an explosion might otherwise occur. The said gas may be allowed to pass into the holder until the same is approximately half-full, when the holder being raised in any suitable way so as to extend it to its full capacity, while at the same time an air-inlet is opened, a mixture is made of one-half acetylene gas and one-half air, or, if desired, the holder may be preliminarily one-half filled with air and then completely filled with the gas. After an experiment the amount of calcium carbide required can be readily determined by weight, so that measurement is no longer required of the resulting gas. Of course, proportionate additions to the amount contained in the holder are readily made in a similar manner.

It is obvious that though I have spoken of the addition of atmospheric air to the acetylene gas to aid in its combustion, other gases aiding in such combustion could also be added. It is also possible to supply or add the oxygen or air required at the burner. I prefer, however, the process hereinbefore described as insuring a determined and fixed relation of the air to the gas. The gas in said holder is ordinarily burned therefrom in the usual way; but it is obvious that, if desired, the gas in said holder may be placed in tanks and burned elsewhere—as, for instance, on a moving vehicle; but it is important that the burning-pressure shall be very much less than that of the pressure of generation and should be approximately the pressure of an ordinary gas-holder when the gas is to be burned, as here indicated, in a burner, say, of one-foot capacity, of the ordinary Bray type. It is obvious that the pressure in such receptacle or holder may be produced by the expansion of the gas directly or in any other suitable way.

I do not in this application claim the process of burning acetylene gas without the admixture of air, said process having been applied for by me on the 13th day of January, 1896, Serial No. 575,370, which is a division of this application.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The process of producing an illuminating-flame of high luminosity, which consists in combining water and calcium carbide, thereby producing acetylene, in collecting the resulting acetylene, in mingling the same with a suitable quantity of oxygen or air, and finally burning the same under pressure in a suitable burner, thereby producing an illuminating-flame, substantially as described.

2. As a new composition of matter, useful for purposes of combustion, acetylene gas, nitrogen and oxygen mingled together in substantially the proportions stated, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS L. WILLSON.

Witnesses:
WM. A. POLLOCK,
H. COUTANT.