UNITED STATES PATENT OFFICE.

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

PROCESS OF PRODUCING AND CONSUMING HYDROCARBON GAS.

SPECIFICATION forming part of Letters Patent No. 577,803, dated February 23, 1897.

Original application filed January 9, 1894, Serial No. 517,008. Divided and this application filed January 13, 1896. Serial No. 575,370. (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 Improvement in Processes for the Production and Consumption of Hydrocarbon Gas, of which the following is a full, true, 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. 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 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 carbid, 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 hydrocarbon 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 secure in combination the advantages of a high efficiency and subdivision or capacity of distribution. With ordinary gas high efficiency is only attained (as in the Lungren burner) by consuming great volumes of gas at a single center of illumination, whereas with my invention a yet higher efficiency is secured with the consumption of small volumes of gas at many centers distributed over a considerable area.

I am aware of the fact that the body which I use to produce the acetylene gas, namely, calcium carbid, 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 car-

bon of its own structure. This calcium carbid, 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 composition 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 carbid 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 producible in every separate house or place of consumption. Practically I employ a retort or receptacle capable of containing a sufficient amount of the metallic carbid, preferably calcium carbid, employed and of the converting water. I have discovered that under the conditions of the mingling of water and calcium carbid the gas is produced under such pressure as that no further pumping into the holder or receptacle is required, as is ordinarily the case. The gas so existing in the holder has a suitable pressure upon it, and being allowed to escape to the atmosphere through a suitable burner will burn with a brilliant flame. Of course it may be in some other vessel beside the holder, provided the pressure is suitable in order to perfect the combustion of the gas.

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 carbid. 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 holder is full. After an experiment the amount of calcium carbid 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.

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.

Under the conditions named, using a one-foot burner of the Bray type, two small streams of acetylene are projected against each other from two openings inclined toward each other. The result is to make a thin sheet of gas moving at comparatively high velocity, thereby enabling its rapid appropriation of the full amount of oxygen necessary for its combustion. I do not limit myself to this special type of burner, though I have found it the best in practice.

I do not in this application claim the burning of acetylene gas when mingled with air, an application for said process having been patented by me on February 25, 1896, No. 555,198, of which this application is a division.

I do not in this application claim the process of producing a smokeless illuminating-flame of high luminosity, which consists in forcing a stream of acetylene gas through a burner, whereby the said acetylene in burning is enabled to appropriate the full amount of oxygen required for its combustion before cooling below its kindling temperature, having filed a divisional application therefor on the 29th day of May, 1896, Serial No. 593,660, which was patented December 15, 1896, No. 573,377.

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 producing acetylene gas, collecting the resulting gas and allowing it to expand into a suitable receptacle to a pressure approximating to but above atmospheric pressure, and forcing a small stream of the acetylene gas so produced through a burner, under conditions substantially as specified, whereby the said acetylene in burning is enabled to appropriate the full amount of oxygen required for its combustion before cooling below its kindling temperature, substantially as described.

2. The process of producing an illuminating-flame of high luminosity, which consists in producing acetylene gas from calcium carbid and water, collecting the resulting gas in a receptacle under its own pressure of generation and allowing it to expand into a second suitable receptacle to a pressure approximating to but above atmospheric pressure, and forcing a small stream of acetylene gas

so produced through a burner, under conditions substantially as specified, whereby the said acetylene in burning is enabled to appropriate the full amount of oxygen required for its combustion before cooling below its kindling temperature, 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:

H. COUTARD,

W. LAIRD GOLDSBOROUGH.