(No Model.)

T. L. WILLSON.

PROCESS OF GENERATING GAS.

No. 552,027 **Patented Dec. 24, 1895.**

FIG. 1a.

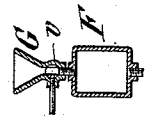
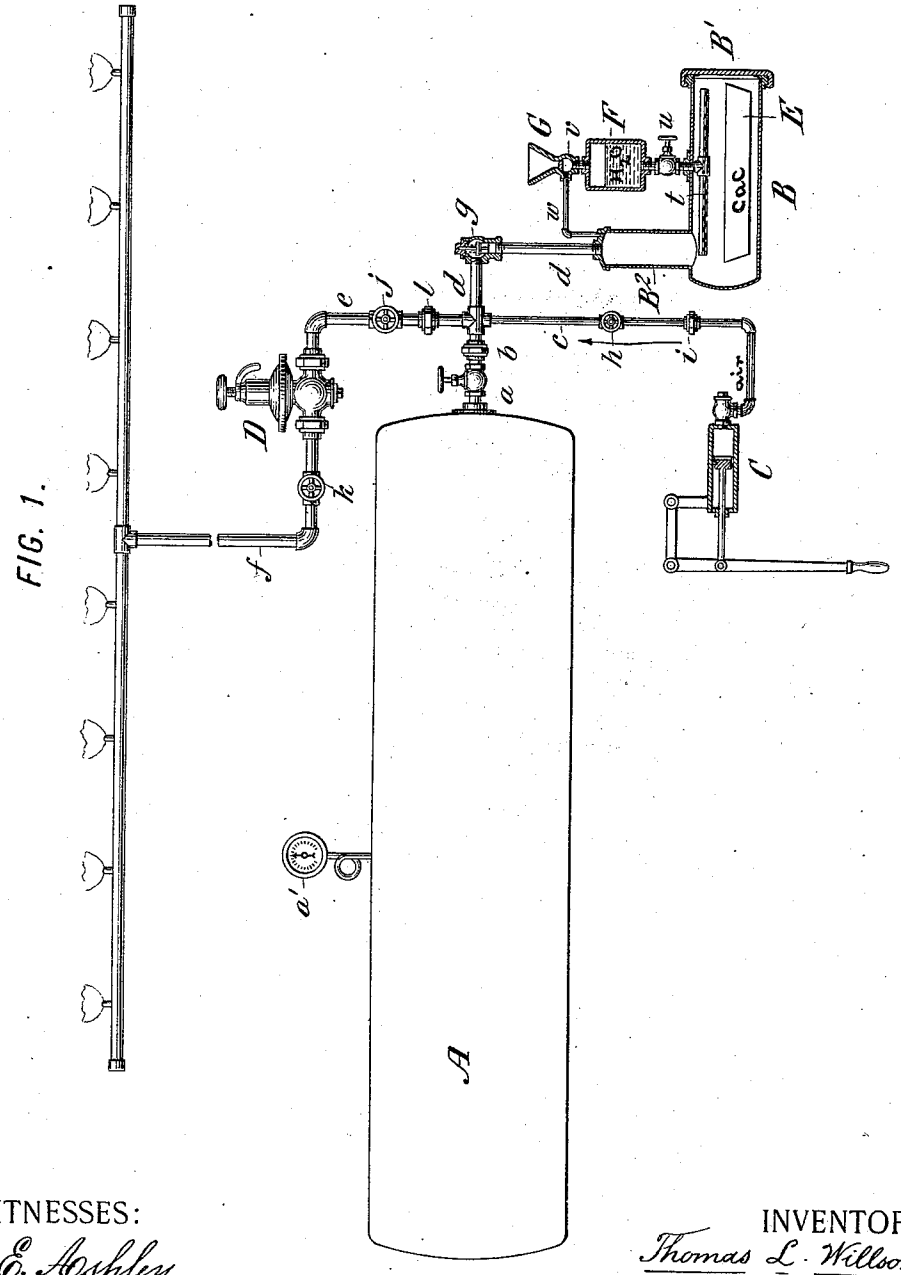


FIG. 1.



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PROCESS OF GENERATING GAS.

SPECIFICATION forming part of Letters Patent No. 552,027, dated December 24, 1895.

Application filed August 9, 1894. Serial No. 519,798. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS L. WILLSON, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Processes of Generating Gas, of which the following is a specification.

This invention relates to the generation of illuminating or other combustible gas from chemical substances in the form of a solid which evolve gas when treated with water or other liquid, and also to the combination of gas thus evolved with atmospheric air.

My invention is most particularly designed for use in the making of illuminating-gas by treating calcium carbide or other metallic carbides with water.

In my application for patent for the manufacture of hydrocarbon gas filed February 28, 1894, Serial No. 501,763, I have described and claimed the production of an illuminating-gas by treating carbide of calcium with water and mixing the resulting gas with varying proportions of air. According to the process there specifically described the calcium carbide in lumps or powder was dropped into water.

According to my present invention I provide means for more conveniently and effectively generating the gas by reversing this process—that is to say, by placing the carbide in a chamber and after closing the chamber introducing water thereinto in contact with the carbide. The chamber in which the carbide is placed contains a greater or less quantity of air, and as the gas is evolved a mixture of gas and air results. According to the preferred mode of carrying out my invention, I employ a receiver or gas-reservoir for holding gas under pressure, the gas being compressed into this receiver by flowing over into it from a generating-chamber in which the reaction is effected. The required proportion of air is first introduced into the receiver, and a correspondingly-proportionate amount of carbide having been placed in the generating-chamber the latter is closed and water introduced therein, so that the gas generated therein passes over through a communicating pipe into the receiver and establishes a pressure therein, at the same time commingling with the air already introduced thereto.

Figure 1 of the accompanying drawings is a sectional elevation showing a gas-producing apparatus constructed according to the preferred form of my invention. Fig. 1ª is a fragment of Fig. 1.

Referring first to Fig. 1, let A designate the receiver or storage-cylinder, capable of withstanding any suitable or required pressure. Let B designate the generating-chamber. C is an air-pump. D is a reducing-valve.

The receiver A is fitted with a valve *a* and coupling *b*, to which are coupled pipes *c* leading to the pump C, *d* leading to the generator B, and *e* leading to the reducing-valve D. From the latter a pipe *f* leads to any point where the gas is to be used, a series of jets or burners being shown. From the generator B the generated gas may flow through the pipe *d* into the receiver A. This is closed and non-expansible. In this pipe is introduced a valve *g*, preferably a self-closing check-valve, as shown, the purpose of which is to prevent backflow of gas from A into B. From the pump C air may be forced into the receiver through the pipe *c*. A valve *h* is introduced in this pipe to enable it to be shut off in case the pump is to be disconnected, which may be done by unscrewing the coupling *i*. From the receiver A the gas may pass out through the valve *a* and pipe *e* to the pressure-regulator D, the flow being if desired controlled or restricted by adjusting a valve *j*. If necessary to disconnect the pipe *e*, this can be done by uncoupling the pipe *l*. From the pressure-regulator D the gas flows under reduced pressure through the pipe *f* to the place of use, the flow being regulated if desired by adjusting a valve *k* in this pipe.

The gas-generator B in the construction shown in Fig. 1 consists of a horizontal chamber or cylinder into which the carbide or other chemical may be introduced at one end—preferably by placing it in a pan or dish E, which may be an ordinary tin pan—the required quantity of the carbide being weighed or measured out and placed in this pan and then

slid into the chamber. To enable this to be done one end of the chamber is constructed to open, being formed with a removable cap B′.

Above the generator B is mounted a closed water-chamber F, from which a discharge pipe or passage extends down into the chamber B and terminates preferably in a sprinkler or perforated pipe *t* for introducing the water upon the carbide subdivided into jets. In this communicating pipe or passage is a valve or cock *u*. For filling the water-chamber F, a hopper G is provided, the communicating passage being closed by a three-way cock *v*.

The operation may now be understood.

Any desired quantity or proportion of air is first introduced into the receiver A, if necessary, by pumping it in by the pump C, the valves *h* and *a* being open, and the valve *j* preferably closed. The quantity introduced may be determined by means of a pressure-gage *a′*. The valve *h* should then be closed. The gas is then generated in the following manner: The cap B′ of the generating-chamber B is taken off, and the pan or tray E is charged with the proper quantity of carbide of calcium and then slid back into the chamber B, whereupon the latter is closed by fastening on the cap B′. The valve *u* being closed and the cock *v* being open—that is, turned to the position shown in Fig. 1ª—water is poured into the hopper G to fill the chamber F. The cock *v* is then turned as shown in Fig. 1, and the cock *u* is opened to permit the water inclosed within the chamber F to descend and trickle from the pipe *t* in small jets upon the carbide in the tray E. As the gas is evolved from the carbide it generates a pressure within the chamber B, and as this pressure exceeds that in the receiver A the gas will flow out through the pipe *d*, lifting the valve *g* and entering the receiver A. In order to enable the disengagement of the gas to be effective and prevent the carrying up of any particles of carbide with the gas so as to choke the valve *g*, it is preferable to construct the chamber B with an upward extension or dome B^2, from which the pipe *d* leads. As the pressure is generated in the chamber B and as soon as it exceeds the hydrostatic pressure by which the liquid enters this chamber through the openings in the pipe *t*, the flow of water would be stopped were not some means provided for admitting an equal pressure on top of the body of water in the chamber F. For this purpose I have provided a small tube *w* communicating between the top of the dome B^2 and the cock *v*, this tube being shut off when the cock is in the position shown in Fig. 1ª, but in open communication with the top of the chamber F when the cock is closed, as shown in Fig. 1. Accordingly as the pressure is generated within the chamber B the gas can pass through this tube *w* into the upper part of the chamber F, thereby communicating an equal pressure to the top of the column of water, so that the flow of water is not interrupted. The generation of gas will continue until all the carbide and water have been mutually decomposed, no further attention being necessary until the recharging of the apparatus with gas is again required. The only residue left is a quantity of lime resulting from the oxidation of the calcium carbide by the decomposition of the water, and this residue is easily removed at the next charging of the apparatus by taking off the cap B′ and sliding out the tray E, in which practically all of the lime will be found contained. To insure the complete conversion of all the carbide, it is preferable to use a slight excess of water.

The proportions shown in Fig. 1 are adapted to give good results for use in making gas under considerable pressure from carbide of calcium and water mixed with air in the proportion of one volume of air to two volumes of the gas resulting from the action of the carbide with water. The required proportions of carbide and water necessary to effect a complete reaction are approximately sixty-four parts by weight of calcium carbide to thirty-six parts by weight of water.

My improved gas apparatus is well adapted for the lighting of railway-cars, steamboats, steamships and sailing-vessels, buoys and private residences—in short, all locations where what is called an "isolated gas-plant" can be feasibly applied. By a more extended application of my invention, it may be useful in connection with existing city gas-works, either for replacing existing gas processes or for generating gas of high illuminating value for enriching or carbureting water-gas or other gas of no or low illuminating power.

The air-pump C need not be a permanent part of the apparatus. Any pump or air-compressor may serve for a great number of gas apparatus, being united thereto by the coupling *i* whenever it is desired to pump in air.

I claim as my invention the following-defined novel features or improvements, substantially as hereinbefore specified, namely:

1. The process of generating an illuminating gas in an apparatus having a closed non-expansible receiver and a generating chamber communicating therewith, which consists in filling said receiver with air, placing a metallic carbide in said generating chamber, closing the latter, and subsequently introducing water thereinto, to react with said carbide and generate gas under pressure which gas passes over into said receiver and commingles with the air therein.

2. The process of generating illuminating gas in an apparatus having a closed non-expansible receiver and a generating chamber communicating therewith, which consists in forcing air under pressure into said receiver, placing a metallic carbide in said generating chamber, closing the latter, and subsequently introducing water thereinto to react with said

carbide and generate gas under pressure in excess of the pressure of air in said receiver, whereby the gas passes over into said receiver and commingles with the air therein, and the resulting gas is compressed to higher pressure than that at which the compressed air was introduced.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

THOMAS L. WILLSON.

Witnesses:
GEORGE H. FRASER,
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