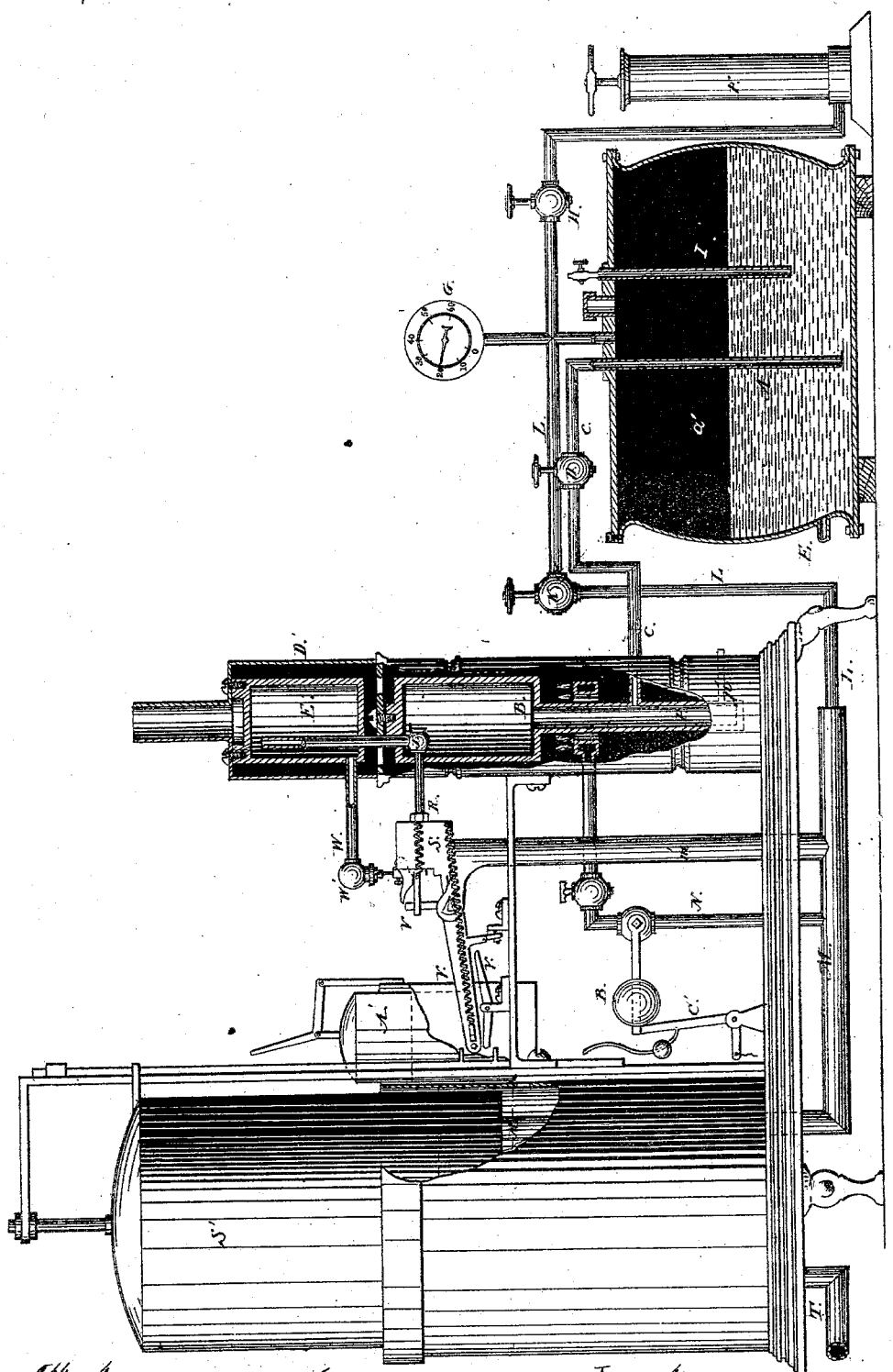
THOMAS B. FOGARTY.

Improvement in Gas-Machines.

No. 115,595. Patented June 6, 1871.



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THOMAS B. FOGARTY, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN GAS-MACHINES.

Specification forming part of Letters Patent No. 115,595, dated June 6, 1871.

I, THOMAS B. FOGARTY, of Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Gas-Machines, of which the following is a specification:

Nature and Objects of the Invention.

My invention relates to that class of gas-machines in which volatile hydrocarbon liquid is vaporized, under pressure, in a retort heated by the combustion of part of the gas manufactured by itself, and in which a proper supply and admixture of air are induced and maintained by the inductive power of the escaping gas or vapor, the manufacture and supply of gas being regulated and controlled automatically by the rising and falling of a gas-holder floating in a tank of water or other suitable liquid, or its equivalent, a flexible diaphragm. The object of my improvement is to simplify the action of such machines and to render them more definite, positive, and reliable in their functions, and less liable to accident; and this I effect by the addition and combination of certain devices, of which some are new and some have already been described and claimed by me at various times, and others again are old and well known, they having been in use for very many years, and having been frequently described in printed publications both in the United States and foreign countries.

I will now proceed to describe my improved gas-machine, and the manner of its construction and operation, which will be more readily understood by referring to the accompanying drawing, which represents a complete gas apparatus.

The material from which I manufacture gas in my machine is a volatile product of the distillation of petroleum, commonly known as naphtha. All the grades of naphtha may be used in my improved gas apparatus, but in preference I use what is commonly known as gasoline, or naphtha of specific gravity below .670, and above 80° Baumé hydrometer. I place the hydrocarbon liquid in a suitable tank or reservoir, A, which I connect with the retort B of my machine by a suitable pipe, C, provided with the stop-cock D. Whenever the location admits of my doing so I place my tank or reservoir at such an elevation that the pressure of the column of liquid in the pipe C will be equal to about fifteen pounds at the retort B, more or less, according to circumstances; in which case, instead of connecting the supply-pipe C at the top of the tank, as shown in the drawing, I connect it at or near the bottom, as shown by the broken pipe E, and allow the liquid to flow into the retort by its own gravity, only taking care to leave a small air-vent in the upper part of the tank. In most situations hydrostatic pressure cannot be made available for forcing the liquid from the tank into the retort, and in such cases I apply the well-known device for forcing liquid by pneumatic pressure, represented in the drawing. I do not fill the tank A entirely with liquid, but always leave an empty space, a', into which I force air by means of the air-pump F until I obtain the desired pressure, as indicated by the gage G connected with the tank or air-pipe. I now shut the cock H so as to close the communication between the tank and air-pump. The elastic force of the compressed air acting upon the surface of the liquid in the tank will now cause it to rise in the pipe C and flow into the retort whenever a passage is made for it by opening the cock D. The part of C within the tank, and the tank itself, are shown in sections. The pipe I, which is also shown in section, extends down into the tank, but so that there is a considerable space between the end of the pipe and the bottom of the tank. This pipe I serves as a test or gage-pipe by which to learn when the liquid in the tank is nearly exhausted, for, as shown in the drawing, I provide it at top with a small cock, by opening which I can learn whether the liquid in the tank has been exhausted to below the end of the pipe; for if the cock throws out a jet of liquid I know that the end of I is still immersed in liquid, but if it throws out a stream or jet of air I know that the liquid has been exhausted to below the end of the pipe, and that it is time to look after a fresh supply.

I have now shown the means by which I supply the hydrocarbon liquid to my retort, viz., hydrostatic pressure where I can, and, where I cannot avail myself of that, pneumatic pressure. In the former case I require only an ordinary tank or reservoir, with an eduction-pipe or outlet at bottom and an air-vent

at top; but in the latter case I require a tank absolutely air-tight, and it ought to be capable of standing from within a pressure of at least fifty pounds, and I use, in combination with it, and as a means of forcing liquid to the retort, and for the other purposes described, the several pipes and cocks and the air-pump as described. I do not, however, claim that there is anything new in the use of compressed air for forcing liquids, or even for supplying hydrocarbon liquids to gas-machines, for compressed air has been long known and used, and has been often described as a means of raising and forcing liquid. It has been applied to the analogous purpose of supplying oil to lamps for very many years, especially in France, where it has received some very elegant applications. In his English patent No. 9,195, 1841, Newton describes it as a means of supplying oil to his apparatus. He says: "My invention consists of certain lamps, burners, and apparatus for the production of light and heat for domestic and other useful and ornamental purposes, from substances which, to the best of my knowledge, have never been brought into general use * * * * coal-tar oils or liquids, and the liquid obtained from the distillation and rectification of the resins, schistus, petroleum, &c." Even so far back as 1844 Le Sieur Santard, of Paris, patented in France what he called a fluiduct or device for raising liquids by compressed air, and described an enormous number of applications; and in the United States, Riddle and others, Nos. 46,266 and 57,299, have patented devices for supplying liquid to vapor-lamps by means of compressed air; and later still, Maxim and Radley have described and claimed an apparatus for the supply of hydrocarbon liquid to their gas-machines—number of patent, 89,588. I consequently make no claim to the apparatus which I have described for the same purpose, except in combination with other parts of my apparatus hereafter to be described, in which connection and combination I do claim them.

I now close the vapor-valve J in the manner hereafter to be described, and, having opened the cock D, allow the liquor to enter and fill the retort B. I next open the cock K upon the pipe L, and by this means allow part of the compressed and highly-carbureted air in the tank to escape into the pipe M, and thence to the holder, whence it returns through the burner-pipe N to the burner O, which I light, and by means of which I heat the retort B. I do not make any claim here to the tank of compressed air for heating the retort, for I have already described and claimed it in my specification (case 2) filed by me May 1, 1871, and I describe it here only as a part of my apparatus and as a part of the general combination of parts which constitute the same. It will be remembered that the valve J was closed before allowing the retort to fill with gasoline; consequently the only outlet from the retort is the supply-pipe through which the gasoline entered it. Now, as soon as the retort attains sufficient heat, vapor will begin to form, and, as it forms, will displace the liquid in the retort and force it back to the tank; for, as communication is open between the retort and the tank, it is evident there must be a perfect equilibrium of pressure between them, for as soon as the pressure in the retort exceeds that in the tank in the slightest degree it will force its contents back to the tank and out of the influence of the heat, so that no more vapor can form until some of that in the retort is allowed to escape, when the pressure within it becomes reduced below that in the tank, which immediately forces back to the retort liquid for the formation of vapor sufficient to restore the equilibrium.

I do not claim that there is any novelty in the above method of regulating the supply of liquid to and the pressure in the retorts of gas-machines, for it has been long known and practiced, and has been often described in printed publications both in the United States and foreign countries. Newton describes and claims it in his English patent No. 9,195 of 1841, before referred to; and in France, Rouen and Marronnier, in their patent dated April 5, 1854, describe and claim it in the fullest and clearest manner; and it has also been described and claimed by Kidd in his English patent of 1866, No. 513, and in his United States patent No. 106,699, dated August 23, 1870. I refer to this method of supplying liquids to retorts, and describe it here only because such description is necessary to the proper understanding of the construction and operation of my machine, and make no claim whatever to it or the devices by which I carry it into effect except in so far as they are part of my apparatus and in combination therewith.

I should here state that the retort in which I convert the hydrocarbon liquid into vapor, as above described, may be composed of whatever metal may be found best adapted for the purpose, for I do not confine myself to any particular material or to any particular shape of retort, except that it should be of such construction and material as to enable it to stand a moderate degree of heat and pressure. Nor do I confine myself to any particular form or kind of burner. In the drawing the burner O shown is an Argand, but in many instances a Bunsen burner would suit equally well, perhaps better. I do not claim that there is anything new either in the retort or burner, for they have been often described.

Nor do I claim any novelty in the chamber P as a receptacle for heavy oils resulting from a sort of fractional distillation in the retort, or in the draw-off pipe p', for they are both the same as described by Newton in his patent, 9,195, before referred to; but it is necessary that I should be thus minute, and that I should describe them as an essential part of my machine, and for the better understanding of the same.

Having now described the method of sup-

plying liquid to my retort, and of converting it into vapor, as well as of regulating and controlling the supply to and the pressure within the retort, I shall now describe the process by which the vapor so formed is mixed in the proper proportions with atmospheric air, the devices by which such mixture is effected, regulated, and controlled, and also the method of regulating and controlling the manufacture of gas, and its supply to the burners as required for use, as well as the several devices and apparatus which I use for this purpose, reference being had to the accompanying drawing, and also to other drawings and specifications, in which the several parts and their mode of operation are illustrated fully and in detail.

The method by which I procure and maintain a constant and uniform supply and admixture of air is founded on what is known as the principle of induction, which is simply this: that when air, or gas, or other fluid is blown at a high velocity through a small jet into the mouth of another pipe and across an interposed body of air or other fluid, it induces—that is, carries in and along with it—a large volume of the interposed fluid.

The practice of induction and the necessary devices are not new, and are not claimed by me as such, for they have been long known and often described. In his English and French specifications of 1855, (number of English patent 346,) Delabarre describes the theory and practice of induction at great length, and gives very many excellent and ingenious devices and plans for induction-tubes and apparatus, which he tells us are the result of thirty years' constant research and experiment. Since Delabarre there have been very many ingenious applications of the principle of induction, of which perhaps the best known and most widely used has been the celebrated Gifford injector for forcing water in steam-boilers. One of the most ordinary applications of the principle has, however, been the burner invented by Professor Bunsen, of Magdeburg, and called, from him, the Bunsen burner. The injecting devices of Newton and Rouen and Maronnier, before referred to, as well as those of Maxim, Kidd and Reid, and Strong, and that described by me in my specification No. 6, filed May 10, 1871, are identical in principle, and indeed in form, with the apparatus described by Delabarre, and differ from the Bunsen burner only in the devices and apparatus by which the supply of air and vapor is regulated and controlled, and those by which the manufacture and supply of gas are automatically regulated, according to the number of burners in use.

In the drawing accompanying my specification No. 6, before referred to, E is the vapor-tube leading from the retort, B the jet, and C the induction-tube or blow-pipe, into which a jet of vapor is blown at a high velocity across an interposed body of air, represented by the black space. In the drawing accompanying my present specification these parts are not given in detail, they having been already fully explained and described; but their arrangement in respect to and connection with the other parts of the apparatus is shown, J showing in elevation the bulb of the air-tube in which the jet is placed, and K the induction-tube or blow-pipe, from which the mixed air and gas pass into the chamber S, whence they pass through the pipes m' and M to the holder S'. In the drawing accompanying specification No. 6, before referred to, this chamber S is shown in section and on a large scale.

If, now, the volume of gas manufactured and entering the holder be greater than the consumption or the volume leaving it, the result will be that the holder will be inflated and raised out of the water at a rate proportioned to the difference between the manufacture and consumption; and if this inflation is allowed to proceed unchecked the holder will be blown quite out of the water, and the gas will escape into the room or house containing the machine. For this reason I provide the poppet-valve shown in section and in detail in the drawing of specification No. 6, before referred to, and marked A upon said drawing, and I connect this valve with the valve-gear V V V, which is fully described in the specification No. 4, filed by me May 5, 1871, and in the drawing accompanying the same, said valve-gear being connected with the holder as described, and shown in detail in specification No. 4 and the accompanying drawing just referred to, in such a manner that, whenever the holder becomes inflated to a certain point, the valve will be closed with a sudden and quick snap motion; and, vice versa, when the holder is lowered to a certain point the valve will be opened with the same snap motion and admit a fresh supply of gas to the holder, thus making the machine perfectly automatic and self-regulating, at least so far as the manufacture and supply of gas are regulated by the consumption.

It will be evident, on a moment's consideration, that while the vapor-valve is working the force of the inward current of air will suffice to overcome the pressure of the holder and to inflate it, but that, as soon as the vapor-valve closes, the induction of air ceases and the mixed air and gases are expelled into the room containing the machine, if the air-tube W is not provided with a back-pressure—a check-valve, which will open to admit air but will close against its exit. A valve for this purpose is placed in the angle bulb W', but is not shown in detail, as it and the device for operating it mechanically have been fully shown and described in my specification No. 3 and the accompanying drawing, filed by me May 3, 1871, said valve being so arranged that it will open for the admission of air whenever the vapor-valve opens, and will close when the vapor-valve closes, and by the same movement and at the same instant.

The float A is added to the machine as an

element of safety, and has been fully described by me in my specification No. 1, filed May 1, 1871, and in the accompanying drawing, and needs no further description here. The weighted arm B′, and the lever C′, and their construction, uses, and application have been described and claimed by me in my specification No. 5, before referred to, and in the accompanying drawing, and need no further description here.

Having now fully described my machine and its construction and mode of operation, I do not claim in this my present specification that any one of its parts is new or unknown, for they have all been described heretofore—some by others, and some by myself—in previous specifications; but I do claim that my apparatus presents several new and useful combinations not heretofore described, and that the combination of all the parts as described forms a gas-machine which is new and eminently useful.

Claims.

1. The combination of the holder S, float A, valve-gear V, levers B′ and C′, burner O, air-valve W′, injector J, and retort B, with their connecting-pipes and devices, constructed and operated as set forth.

2. A gas-machine, consisting of the subject-matter of the first claim, in combination with a pump, tank, and gage and their connecting-pipes and devices, constructed and operated substantially as set forth.

THOS. B. FOGARTY.

Witnesses:

C. E. MYERS,

WILLIAM ROUGER.