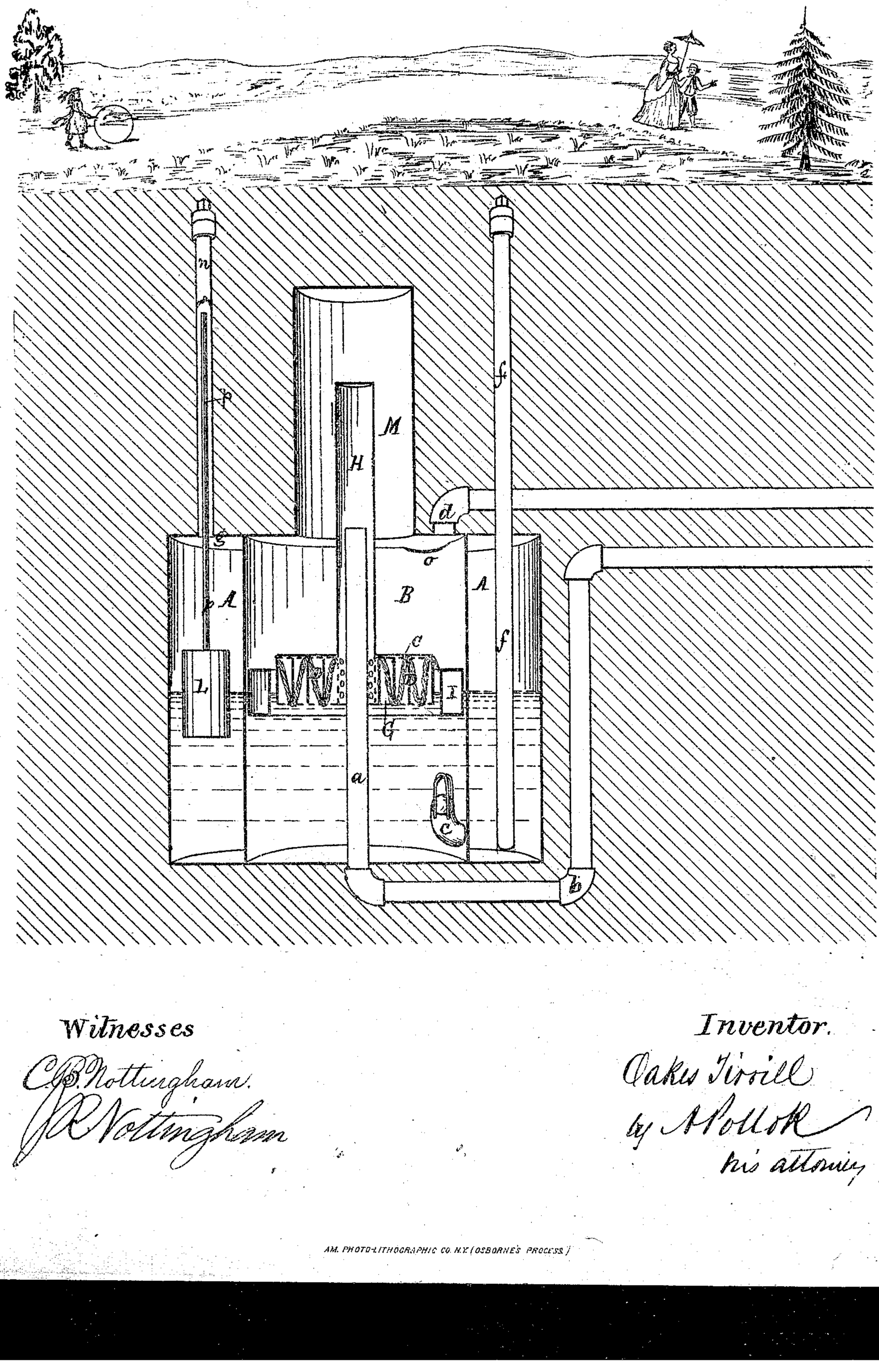
OAKES TIRRILL.

Improvement in Apparatus for Carburetting Air and Gas.

No. 118,302. Patented Aug. 22, 1871.



Witnesses

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UNITED STATES PATENT OFFICE.

OAKES TIRRILL, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN APPARATUS FOR CARBURETING AIR AND GAS.

Specification forming part of Letters Patent No. 118,302, dated August 22, 1871.

To all whom it may concern:

Be it known that I, OAKES TIRRILL, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements for Carbureting Air and Coal or other Gas; and I hereby declare the following to be a full and clear description of the same:

In order to understand what is accomplished by this invention, as well as the advantages gained by the present apparatus over any other heretofore invented or constructed for the purpose named, it becomes necessary to understand its mechanical construction and the principles involved in its operation.

It may be thus described, referring to the accompanying drawing, which represents a vertical central section of an apparatus made and arranged in accordance with my invention.

A represents a tight cylindrical vessel, made of copper, iron, or other metal, capable of holding, say five barrels of the gas-making fluid. B represents another vessel similar to A, but capable of holding only some small proportion of the contents of A, say one barrel. The smaller vessel B, which is of the same height as A, is set inside of A, in its center, and is there securely fastened. A tube, *a*, is set perpendicularly in the center of the generator B, passing through the bottom of vessel A, thence turning at a right angle and running on the outside of the bottom until it projects an inch or two beyond the circumference, far enough to allow a connection to be easily made at *b* with the pipe communicating with the blowing apparatus. The top of the tube is cut off even with the top of the vessel. It is always open, and is of any suitable size for the required capacity of the apparatus. This pipe *a* is a part of what may be called the air-service or supply-pipe, for this kind of gas may properly be termed air-gas, since it is generated by forcing air into contact with naphtha, the resulting mixture of air and vapor being the illuminating compound or gas. This air-pipe being now set, the next thing to be explained is the carbureter, the contrivance in which and by which the air is charged with vapor. This consists of two principal parts: first, the actual carbureter, in which the gas is made; and, second, a metal float, surrounding the carbureter or otherwise attached to it, by means of which the carbureter and float together are kept floated on the surface of the naphtha. The carbureter may be somewhat varied in construction without materially changing its efficiency or general application. The one here described has proved perfectly successful, and may be thus constructed. C is a thin circular brass or other metal plate, say, for purposes of description, twenty-four inches in diameter. D is a strip of like metal, say seven or eight feet long and five inches wide, bent in the form of a scroll, which may be covered with cotton-flannel or like cloth, and is soldered by one edge securely on the plate C, as represented in the diagram, in such manner as to make a continuous channel, say, two or three inches wide, and of course as deep as the strip is wide from the circumference to within two or three inches of the center. The plate C is perforated with holes through the entire length and width of the channel just described in such manner as to admit of being closely threaded with, say, ordinary wicking. G represents a plate, the exact duplicate of C, the use of which will be presently explained. H represents a tube of metal three or four inches in diameter, tight at the top, open at the bottom, and having five inches (in this case) of its lower end perforated with holes. The size of this pipe corresponds with the circular aperture in the center of C and G. Calling C the top and G the bottom of the carbureter, we now fill the spiral channel with wickings by threading them through the corresponding holes in F and G, beginning at either the center or circumference. The bottom G is only necessary to keep the wickings straight in suspension, and therefore may or may not be fastened to the rest. The wicking itself will hold it firm enough. This being done, the five perforated inches of the tube H are now inserted through the center of the carbureter, (as thus far constructed,) reaching just through the bottom G, and the pipe is kept tight and firm in its place by being soldered on the top C, and by suitable braces. This part of the carbureter is now complete, but it must float on the surface of the fluid in order to perform its office. The most convenient way to effect this is to surround the carbureter with a tight metal ring or float, sufficiently large when fastened to the carbureter to buoy it on the surface, as required. Such a ring is represented by I. The complete contrivance in actual use should be so adjusted as to sink into the fluid about one inch.

It now takes its proper place in the apparatus by merely setting it into the center of the generator. The pipe *a* stands there, and the tube H of the carbureter serves as a sleeve to allow the pipe *a* to enter it far enough to enable the body to rest on its own bottom in the generator. Between the tank A and the generator B there is only a thin partition. In the lower part of this, within an inch or so of the bottom, a small hole is perforated, or a valve, *c*, is located. When the tank is first filled, the generator will, of course, be filled to the same level through this orifice or valve. The gas is made in the generator only, and the fluid is consumed in the generator only; and since there is now a communication between the two vessels, the level of the fluid must always be the same in both—or, in other words, the generator will always be fed by the fluid in the tank. It is obvious, also, that when the vessels are full the carbureter will float to the surface and the tube H will rise by its entire length above. To accommodate this tube, when the vessels are so filled a dome or sleeve, M, is raised on the cover or top of the vessel, as shown in the drawing. An orifice, *o*, similar to that which feeds in the fluid from the outer to the inner vessel, should be made close to the top of the same partition for a vent, allowing the pressure to be at all times equal in both vessels. Instead of mere orifices, such as are mentioned, valves might be used, by means of which the liquid could pass from the tank to the generator, but not back. Under some circumstances this might be advantageous. One of such valves is shown at *c*.

The carbureter being supposed in place, and the internal arrangement explained, the cover of the whole apparatus with the dome upon it may now be carefully soldered or otherwise thoroughly fastened over the top of the combined generator and tank.

On the cover are three sockets or flanged openings, allowing three pipes of different sizes to be screwed into them, as hereinafter explained. This tank and generator combined is now ready for its final coating of asphaltum, by means of which the metal, whatever it may be, will be entirely protected from corrosion, even if it were buried under water. This done, it is now ready to be sunk into its pit, and after the proper connections are made the hole can be filled up and the whole gas apparatus buried out of sight.

The following directions will enable any ordinary mechanic to set this apparatus ready for action: Dig the hole in the earth deep enough to allow the top of the dome to be a few inches under the soil after the machine shall have been buried up, and large enough in diameter to allow of loose earth, free from stone, being packed about it. Then set the vessel flat and level on its bottom in the pit. A trench is to be dug from the pit to the place where the pump is placed, and the air-pipe is then extended from *b* and carried to and connected with the air-outlet of the pump, which latter apparatus may be located in the cellar of the edifice to be lighted. The air-pipe having been completed, the gas-pipe is now run from the opening *d* (on the top of the generator) into the house or premises to be lighted, and there connected with the gas-main or "riser." Into opening or socket *f* screw a three-quarter inch pipe, cutting it off even with the top of the ground. This is to be closed with a plug or iron cap, and is to be used as the filling-pipe to charge the machine, and extends to the bottom of the tank, so that a pump attached to the top of the filling-pipe would exhaust the contents of the whole apparatus, if necessary. In the opening or socket *g* a pipe, *n*, like the other, but one inch in diameter, is to be screwed, this pipe surrounding a wire rod, *p*, of suitable length, (and which should be provided with a socket, so as to allow additional lengths to be attached to it according to the depth to which the apparatus is buried,) which is connected to a float, L, in the tank below, which rises and falls on the surface of the fluid. The wire rod should be long enough to reach to the top of the ground. Slip the inch pipe over the wire and screw it into the opening *g*. Thus sheathed the wire can freely move up and down, and become the indicator to show when the machine is full or empty. This pipe is also the vent while fluid is descending by the filling-pipe and displacing air or gas in the vessel below. When the tank is filled and the wire stands above the surface of the earth, it can be pressed down even with the top of the pipe, and a cap or plug will then close up this orifice. All the pipes being now properly set, the earth is packed around and on the whole apparatus until it is entirely buried up, leaving only at the surface of the earth the ends of the two pipes.

To charge this machine with fluid, roll the barrel or barrels over the buried vessel, open the filling-pipe, and connect a faucet in the barrel to the top of the pipe by a piece of hose, then open the vent-pipe and let the fluid in. Thus each of the pipes *f* and *n* serves a double purpose, the former allowing the vessel below to be filled and pumped out, and the latter inclosing the indicator-wire and at the same time serving as the vent.

The apparatus having been buried up and filled with naphtha, all the connections having been made, and the pump ready to operate, the practical working of the entire combination may now be explained and its advantages understood: The pump, being set in motion, at once forces the air into the under-ground generator, where it encounters the carbureter floating within it, in which and by means of which it is converted into gas. The generator is at once filled, as well as the gas-pipes connected with it, and upon opening a cock in the house and applying a lighted match the gas-light appears and the desired result is finally obtained. These are the conditions and circumstances under which this species of gas is generated in the apparatus described, and it remains to show the superior advantages of this peculiar process and of these particular conditions. It is well known that in all gas-machines or apparatus using hydrocarbon fluids two causes are constantly operating to prevent the production of an equal and

uniform mixture or quality of gas. From the moment that any one of these machines is started the air which evaporates the fluid is constantly less and less charged with its vapor, thus making the compound or air-gas variable, and thinner and thinner the longer the operation is continued. One of the causes producing this result is that naphtha, not being of a homogeneous nature like water, any remainder becomes more dense and less evaporable as any portion is vaporized. The other is that the changing of a fluid from a liquid to a gaseous state always involves the absorption of more caloric than was contained in the liquid evaporated, and this difference or additional quantity required was in a great measure borrowed from the fluid left behind. Constantly abstracting this heat by continual evaporation may at last leave the remainder of the fluid so cold, or, in other words, with so little heat remaining, that vapor can no longer be formed. To these two causes or influences—viz., the changing temperature of the gas-making fluid, and its constantly becoming denser while evaporation is going on—is due the unreliability of this class of gas-machines; and to modify, or if possible overcome, their effect has been the aim of many ingenious devices and inventions. Except under the application of direct heat, which is on many accounts objectionable, these causes are still the prime sources of all objections to gas-machines. The present invention does so modify the influences explained that they need no longer be regarded as obstacles; for the fluid in the apparatus, if of proper quality when put in, will grow neither too cold nor too dense for the use intended, and the reasons which operate to prevent these processes from being detrimental will now be explained. Imagine, then, this under-ground apparatus, consisting of a tank inclosing within it the generator, to be filled with naphtha to any given height. At the first filling of the machine the fluid will, of course, be of the same quality in both the generator and tank, and will also stand at the same level in each. Now, suppose the air-pump started and the lights turned on; the instant this is done, whether perceptible at first or not, the inevitable tendency is to degrade the fluid and lower its temperature. But it must now be observed that the fluid is actually evaporated and consumed in the inner vessel or generator; while being thus consumed the gravity of the fluid must at first fall; but the fluid in the reservoir outside and surrounding it, not being subject to evaporation, will maintain its character without change. As the level falls, therefore, in the generator it must also fall in the reservoir, the former being fed by the latter through the orifice in the bottom, as described. Now, although the naphtha in the generator will never, after the machine is put into operation, be of so high a gravity as that in the reservoir, yet it can never, on the other hand, be so low to be unfit to use, because it is prevented from falling to so low a point by being continually replenished from the fluid in the reservoir. By this means an average will be maintained which will insure the practicable working of the machine when assisted by the other combination to be considered.

Whenever the machine is started the temperature of the fluid will begin to fall, also, as the gravity of the fluid did; but in this case, as in the other, the effect is modified by the conditions under which this apparatus is operating. For, let us suppose that the temperature of the fluid in the generator has fallen from 60° to 40° Fahrenheit under the action of evaporation; the fluid in the reservoir is then 20° warmer than that in the generator, because in the former, there being no evaporation, there is no loss of temperature. The generator is now actually immersed in a fluid warmer than itself, and, of course, a current of heat begins at once to pass from the outer to the inner fluid through the thin partition which separates them. At the same time a current of heat will be passing from the earth in which the reservoir is buried into the fluid within it; and thus an effort is continually being made to restore the lost caloric and establish an equilibrium. The temperature of the fluid in the generator is thus prevented from descending to a point where the evaporation would be too slow to produce the desired results.

In lieu of using a floating carbureter a stationary carbureter may be employed; in such case there should be some device to preserve the proper level of liquid in the generator. A float-valve, opening communication with the tank when the liquid should have fallen to a certain point in the generator, might be used for this purpose.

The mechanical structure of this apparatus and its practical workings having been explained, its superiority and advantages over anything yet constructed for this purpose may now be stated: First, it is actually and entirely buried up in the earth; the earth is in contact with the vessel, and hence the external temperature of the air has no effect. Second, it requires no gas-house, vault, cellar, or any inclosure to protect it, thereby saving a considerable outlay. Third, without much additional expense the tank capacity may be increased so as to furnish a year's supply or more. Fourth, the insurance question is no longer an obstacle to the introduction of such a gas-machine. No intelligent person or company can doubt its absolute safety. Fifth, many lives have been lost by accidents in gas-houses. No personal danger can be associated with this buried machine. Sixth, the generator is fed with fluid without the aid of valve or any machinery whatever. Seventh, the temperature of the fluid is sufficiently maintained without the application of heat, its use being only advantageous when a low grade of naphtha is employed. Eighth, it is the simplest gas-machine which has in it the elements of success, having no valve, cock, regulator, or any other of the commonly-used contrivances. Ninth, there is no part of it which can wear out or get out of order. Tenth, it can be located under ground, or under water, or above ground by surrounding it with an embankment of earth.

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

1. An apparatus for carbureting air or gases, so constructed that it may be literally buried up in the earth without vault or gas-house to inclose

it, incapable of being seen, touched, or visited without being unearthed, requiring no repairs, or periodical adjustment, or attention except occasional filling, and receiving the necessary current of air from some distant air-forcing apparatus, substantially as shown and described.

2. In carbureting apparatus, the combination, with the generator and carbureting devices proper, of a fluid-holding tank or vessel surrounding the generator and supplying the latter with fluid, substantially in the manner shown and described.

3. The combination, with the generator and carbureting devices proper, of the fluid-holding tank, surrounding and communicating with the generator, as specified, and provided with air and gas-service connections, and with devices for filling the tank and indicating the level of the liquid therein, as described, all of said parts being so arranged that the apparatus may be buried in the ground or water without inclosing the same is a gas-house or vault.

4. The combination, substantially as herein shown and described, of a floating carbureter with a generator, capable of being buried beneath the earth, the necessary current of air being obtained from some distant air-forcing apparatus, as described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

OAKES TIRRILL.

Witnesses:
TIM. L. HOLTON,
WALTER HEUGH.