No. 658,033. Patented Sept. 18, 1900.

J. W. WEEKS.

ACETYLENE GAS GENERATOR.

(Application filed July 1, 1899.)

(No Model.)

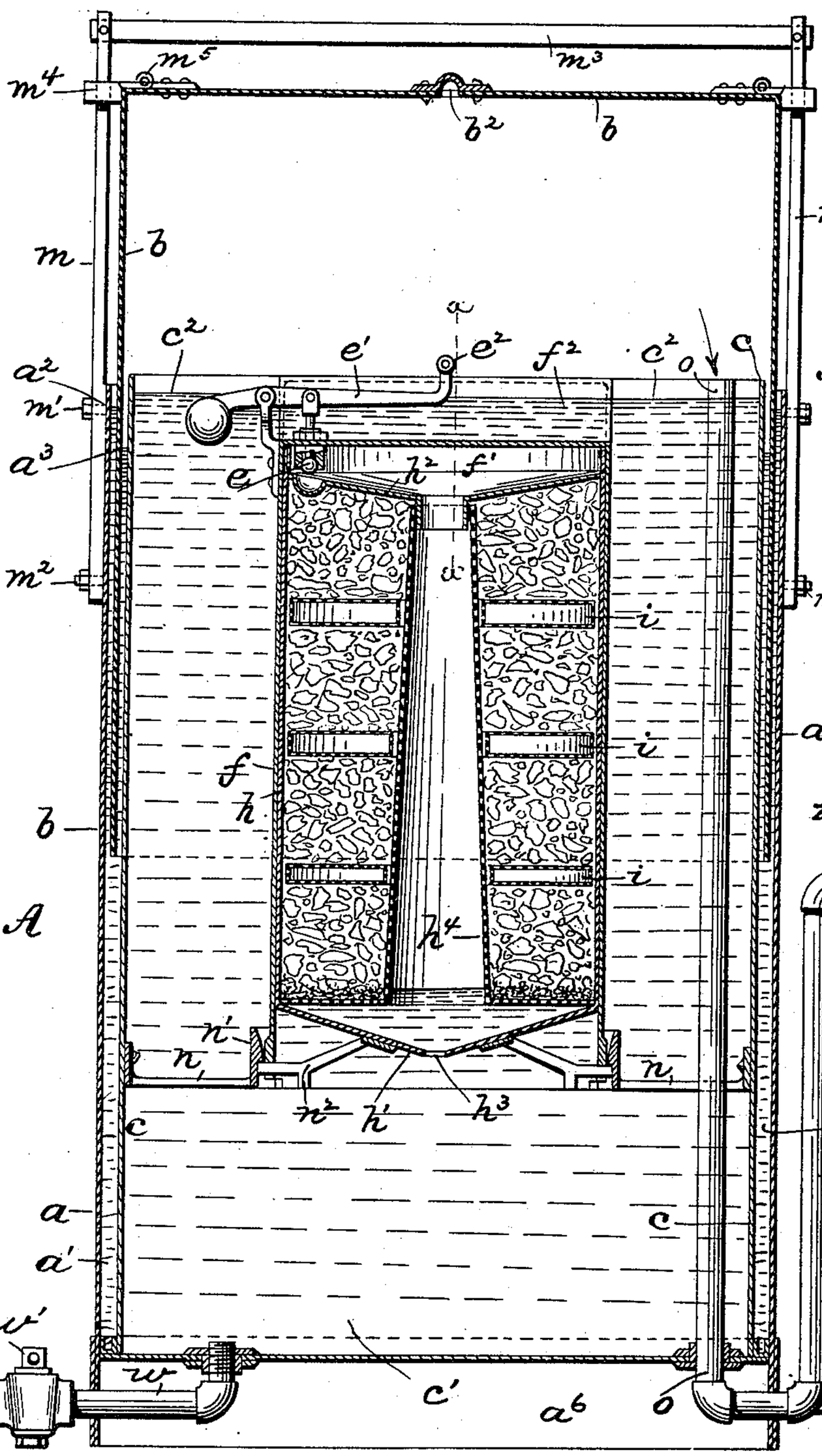

FIG. 1.

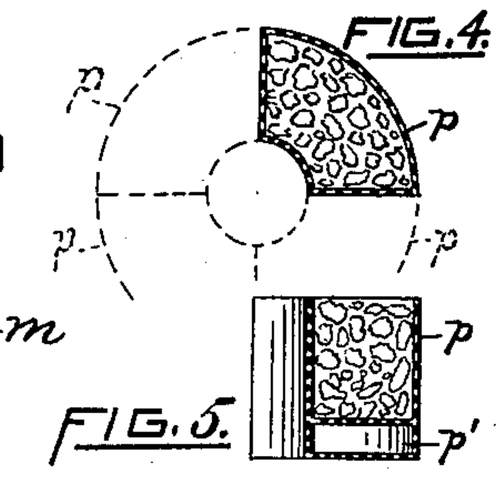

FIG. 4.

FIG. 5.

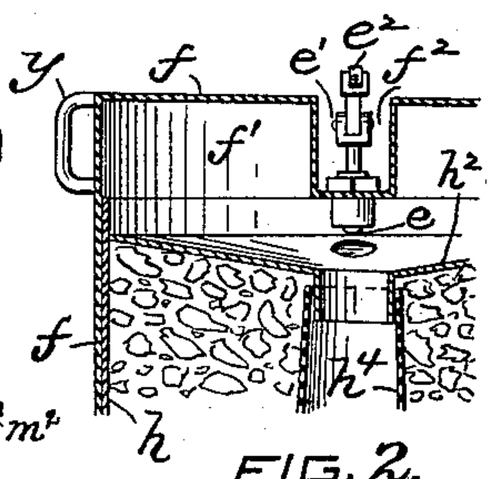

FIG. 2.

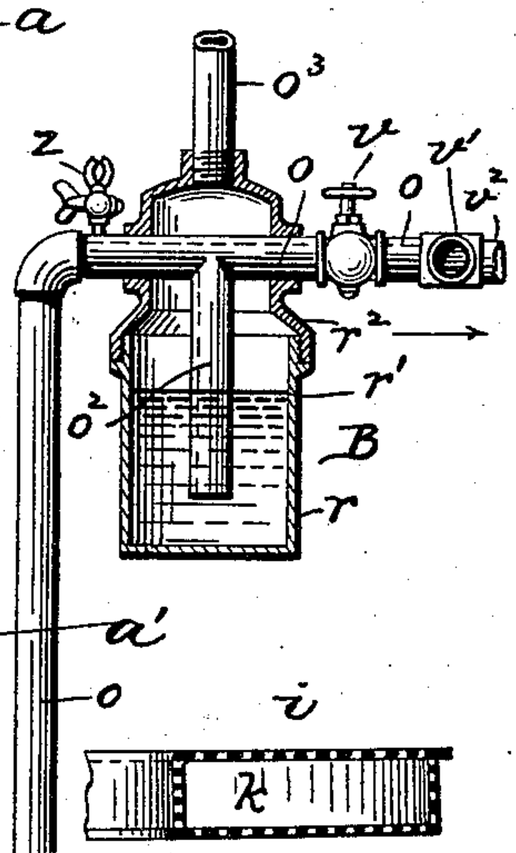

FIG. 3.

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ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 658,033, dated September 18, 1900.

Application filed July 1, 1899. Serial No. 722,567. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. WEEKS, a citizen of the United States of America, and a resident of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Acetylene-Gas Generators, of which the following is a specification.

My invention relates to improvements in portable self-contained machines or apparatus for generating acetylene gas; and it consists, essentially, in the combination of the removable perforated holder or receiver containing the calcium-carbid, or "carbid," as it is usually termed, closed at its upper end and having an opening in the lower end for the passage of water and the gas generated, a water-holding tank surrounding the said holder and in communication with the carbid through the said opening in the holder, a self-closing valve communicating with the interior of the holder, a vertically-movable water-sealed gasometer or reservoir surrounding and inclosing said tank, holder, and valve, arranged to open the latter when the supply of gas in the reservoir is nearly exhausted, thereby allowing the water to unite with the carbid, thus generating gas and charging the reservoir, and a water-trap or safety device in direct communication with the gas, arranged whereby in case the pressure exceeds the normal or working pressure the gas escapes automatically therefrom into the outer air, all as more fully hereinafter set forth and claimed.

Gas-generating apparatus of the type forming the subject of this invention have heretofore usually been provided with somewhat complicated mechanism and piping, thereby not only increasing the cost of the machines, but when put into service rendering them unsafe to a certain extent, while being more liable to get out of order.

The object I have in view is to produce an acetylene-gas machine or generator which is simple in construction and operation, comparatively inexpensive, and at the same time possessing a great degree of efficiency.

In a gas-generating apparatus embodying my improvements the carbid is kept cool at all times. The water is always admitted to the bottom and sides of the perforated superposed compartments forming the carbid-holder in such small quantities that the gas thus produced will not completely fill the reservoir. The slaked carbid or residue remains in the compartments, the water in the holder gradually rising corresponding with the volume of gas generated and used. The gas as fast as it is produced is automatically forced from the holder downward through the water. It then rises through the water in the tank into the reservoir. The water serves not only to cool and purify the gas, but adds moisture to it, thus increasing both its brilliancy and volume. The water used to slake the carbid does not form the seal for the gas-reservoir nor come in contact with the outer air. Neither does it have to be changed when the carbid-receiver is being recharged, thereby saving a considerable amount of carbid which the water absorbs from the first charge. The water completely surrounds the carbid-holder at all times. A comparatively-small initial vertical movement of the gas-reservoir permits the weighted valve to quickly close the inlet-passage to the receiver, so that the pressure of the gas generated in the latter operates to force the water away from the carbid and leaving instead its own dry gas. The difference in the levels of the water forming the reservoir-seal between the inside and outside of the casing or shell when the reservoir is partly or even wholly filled with acetylene gas under a normal pressure is somewhat less than the distance from the submerged end of the branch of the gas-supply pipe mounted in the water-trap to the water-level in the latter. This difference in the water-levels serves to practically maintain the gas at the required working pressure to the burners. In case the pressure in the reservoir exceeds the normal, such excess pressure operates to automatically force gas through the water in the trap and escapes into the outer air, the same being continued until the normal equilibrium is again effected. I would state here, however, that the manner of constructing and arranging the several parts constituting my improved genera-

tor are such that in practice the pressure of gas seldom exceeds the predetermined or normal pressure. Therefore the amount of gas discharged into the air is comparatively small, and even then the duration of the trap action is short.

In the accompanying sheet of drawings, Figure 1 is a vertical section taken through the center of my improved acetylene-gas-generating apparatus, the parts being represented in the normal working relation. Fig. 2 is a partial transverse section of the carbid-holder, &c., taken on line $x\,x$ of Fig. 1. Fig. 3 is an enlarged transverse section taken through one side of one of the perforated annular partitions employed for separating the carbid into compartments; and Figs. 4 and 5 are plan and sectional views in reduced scale, showing a modified form of carbid-holder.

A, again referring to the drawings, indicates my improved acetylene-gas generator complete. The cylindrical outer shell a and inner shell c are open at the top and closed at the bottom, the same being arranged to form between them the annular space a', the latter containing water and forming a seal for the walls of the inverted gasometer or reservoir b, as clearly shown. The said inner shell c constitutes a water-holding tank, in which is mounted and submerged the vertically-arranged carbid holder or receiver.

I prefer to make the carbid-holder cylindrical, the same consisting of the outer shell f, closed at the top and open at the bottom, and the shell h, (mounted within the outer shell,) open at the top and having a beveled base h', terminating at the center in a small hole h^3. The carbid-holder is removably secured in any suitable manner to a supporting-ring n', having arms n, in turn rigidly secured to the said shell c. The base portion h' of the holder proper, h, has supporting brackets or arms n^2, arranged to engage or interlock with the said member n'. As drawn, the carbid-holder is provided with a removable perforated tapered central tube h^4, open at both ends, its lower end having a flat outer flange resting on the said beveled base h'. The upper end of the tube is surmounted by a closely-fitting beveled removable sheet-metal cap or cover h^2, having a central opening therein communicating with the tube. The annular space formed between the tube and inner surface of the cylinder h constitutes the chamber or receiver for the carbid. Instead of completely filling the chamber with the carbid I prefer to place it in superposed layers, as it were, the layers being separated by the annular hollow sheet-metal perforated partitions i. These latter to a certain extent facilitate the flow of water in combining with the carbid, while also serving to retain portions of the residue from the carbid. The perforations in the tube h^4 also permit some of the carbid residue to pass from the receiver to the base h' and thence through the hole h^3 thereof to the bottom of the tank c, where it may be blown out through the blow-off pipe w upon opening the cock w'.

The upper end of the outer shell f of the carbid-holder is provided with a transverse channel f^2, extending entirely across the shell, in which is mounted a self-closing air or water valve e, opening into the space or chamber f', communicating with the top of the central tube h^4. The inner or free end of the lever e' is bent at e^2 and extends above the tank c, the opposite or outer end of the lever being weighted, the arrangement being such that when the central or corresponding part b^2 of the gas-reservoir b in descending engages the valve-arm the latter will be depressed and open the valve, the weighted portion of the lever serving to instantly and automatically close the valve when the reservoir commences to move upwardly as the gas is generated. In order to provide ample movement for the valve e, the cover h^2 beneath it may have a depression or pocket formed therein, as shown in Fig. 1. It will be seen that the tank c extends a little above the outer water-seal chamber a', the water in the former completely surrounding the carbid-holder and valve e.

A service-pipe o extends downwardly from the top of tank c, thence through its bottom, and upwardly to a convenient height outside the tank, as clearly shown. At this point the pipe extends horizontally through the water-trap or safety device B. This latter consists, preferably, of a glass vessel r, having a suitably-shaped top or cap r^2 screwed thereto. The pipe o, as stated, extends through the cap r^2 and is provided with the downwardly-extending open branch pipe o^2 in direct communication with the main o, its lower end being submerged in the water contained in the vessel r. An air or waste pipe o^3 is screwed into the cap, the arrangement being such that whenever the pressure of gas in the reservoir slightly exceeds the working or normal pressure the gas is then forced through the water in the trap and escapes via pipe o^3 into the outer air until the normal pressure is restored.

The generators A may be arranged in series and having a main supply-pipe v', common to all, from which main the service-pipe v^2 extends. (See arrow direction.) In such case a stop-valve v may be interposed between the trap and main v', as indicated in Fig. 1. When thus arranged, the several generators—as, for example, a series of four—may be used collectively or singly, as desired or as required by the number of burners employed. The lower portion of the pipe o has an air or pet cock o', the pipe being also provided with a test-burner z, located at the inlet side of the trap, as shown.

A pair of vertical guides m are secured to the outer shell a, a tie-rod m^3 uniting them together at their upper ends. To the top of the reservoir b are secured oppositely-ar-

ranged hinged guide-brackets m^4, fitted to receive the guides m. This device forms a suitable guide for the reservoir throughout its range of vertical movement. Now in order to remove the reservoir b—say for the purpose of recharging the carbid-holder—the brackets m^4 are swung back on their hinges m^5, followed by withdrawing the pins or bolts m', after which the guides may be swung to one side on the pivots m^2. In order to facilitate handling the carbid-holder, &c., the outer shell f may be provided with suitable handles y. (See Fig. 2.)

In lieu of the carbid-receptacle shown in Fig. 1 the same may consist of a series of perforated quadrant-shaped holders p, open on top and having a chamber p' at the bottom. (See Figs. 4 and 5.) These may be arranged in superposed sections or layers, so as to practically fill the inner shell h. I may add that the several chambers p' not only permit the free passage of water, but are utilized to receive more or less of the carbid residue.

The vertical distance between the outer and inner water-levels a^2 a^3 of the outer tank a' is slightly less than the distance from lower end of pipe o^2 to the water-level r' of the trap B, the normal or working pressure in the reservoir b being practically constant and uniform irrespective of the vertical position of the reservoir. Therefore the gas issuing from the burners will produce a steady flame. If from any cause the pressure should force the reservoir upwardly to its limit, the action of the trap B before described quickly reduces such excess pressure, the gas then flowing from the trap escaping into the atmosphere or outer air.

Whenever the small valve e is opened by means of the engagement of the nearly-empty reservoir with the valve-lever, the confined gas and air, forming a partial vacuum in the holder, escapes, thereby establishing a circulation and causing the water to flow inwardly for the time being through the opening h^3 in the holder-base, the water gradually rising until it forms a union with the bottom or lower side of the charge of unslaked carbid in the holder. The union of the carbid with the water instantly generates acetylene gas having a pressure equal to or exceeding the head of water surrounding the holder, thereby forcing the water downwardly and out of the holder through the opening h^3, followed by the gas itself. The thus-liberated gas rises through the surrounding water and is arrested and retained in the reservoir b. At the same time the latter in rising frees the weighted lever e', thus automatically closing the valve e, the pressure of gas in the reservoir then being considerably less than that in the carbid-holder. The pressure in the latter has no direct relation to the normal or working pressure maintained in the reservoir by means of the difference in water-levels before described. The degree of heat evolved in the holder while the gas is being generated, combined with the cooling influence of the water surrounding the holder, soon evaporates and expels the moisture from the carbid, leaving the latter in a comparatively-dry state, the operation being repeated automatically whenever the reservoir b again becomes practically empty and until the entire charge of carbid shall have been acted upon by the water and reduced to a slaked state or residue.

It may be noted that the tank-water c' surrounding the carbid-holder becomes saturated with acetylene by reason of the passage of the gas through it, although the water in the outer space a', forming the seal for the reservoir, remains practically unaffected by the gas.

I claim as my invention—

1. In an acetylene-gas-generating apparatus, the combination with the vertically-movable water-sealed gas-reservoir, of an inner water-holder tank, a carbid-holder mounted in said tank surrounded by and communicating through the bottom with the water in the tank, a water-inlet arranged to communicate with the interior of the carbid-holder, and a self-closing gas-outlet valve adapted to be opened by the movement of the said gas-reservoir, whereby the flow of water into the carbid-holder through said water-inlet is controlled, substantially as described.

2. In an acetylene-gas-generating apparatus, a carbid-holder closed externally but having an opening in its lower end through which water and gas may flow, the carbid being arranged in the holder in superposed layers having hollow perforated partitions between them, substantially as described and for the purpose set forth.

3. The carbid-holder p substantially as herein described, having perforated walls and further having a perforated chambered base communicating with the holder proper, for the purpose set forth.

4. In an acetylene-gas-generating apparatus, the combination of the removable perforated holder or receiver containing the calcium carbid, closed at its upper end and having an opening in the lower end for the passage of water and the gas generated, a water-holding tank surrounding the said holder and in communication with the carbid through the said opening in the holder, a self-closing valve communicating with the interior of the holder, a vertically-movable water-sealed gasometer or reservoir surrounding and inclosing said tank, holder and valve, arranged to open the latter when the supply of gas in the reservoir is nearly exhausted, thereby allowing the water to unite with the carbid to generate acetylene gas and recharge the reservoir, substantially as hereinbefore described.

5. In an acetylene-gas generator, a shell for containing water, a vertically-movable

gasometer, and a tank which is submerged in the water and provided with a valve in its top, and an opening through its bottom, combined with a carbid-holder placed in said tank, and means for operating the valve when the gasometer descends, substantially as shown.

Signed by me at Providence, Rhode Island, this 30th day of June, 1899.

JOHN W. WEEKS.

Witnesses:
GEO. H. REMINGTON,
ORLANDO L. JACKSON.