No. 667,178. Patented Feb. 5, 1901.

C. S. BARTHOLF.

ACETYLENE GAS GENERATOR.

(Application filed Apr. 30, 1900.)

(No Model.) 3 Sheets—Sheet 1.

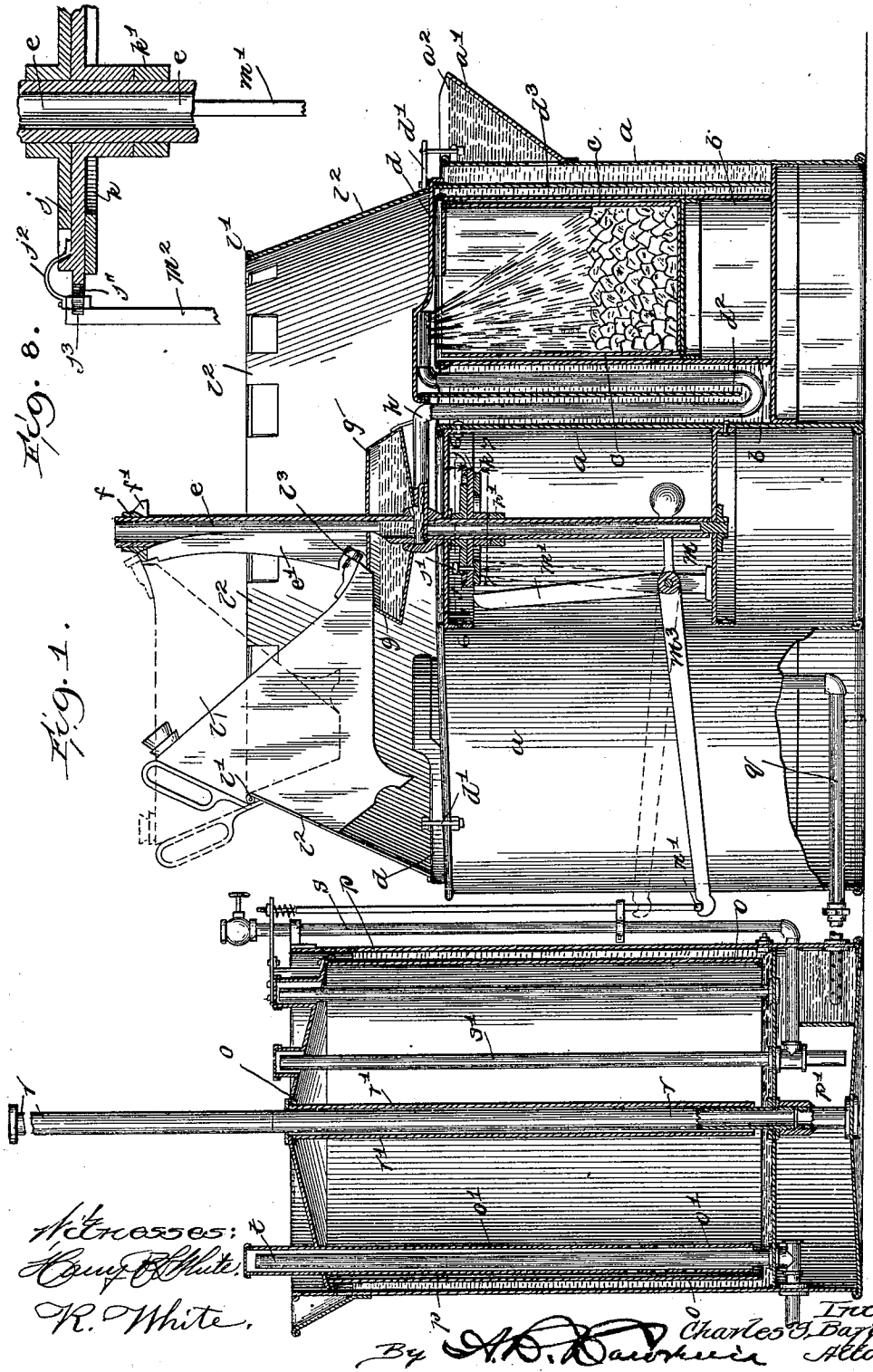

Fig. 1.

Fig. 8.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2

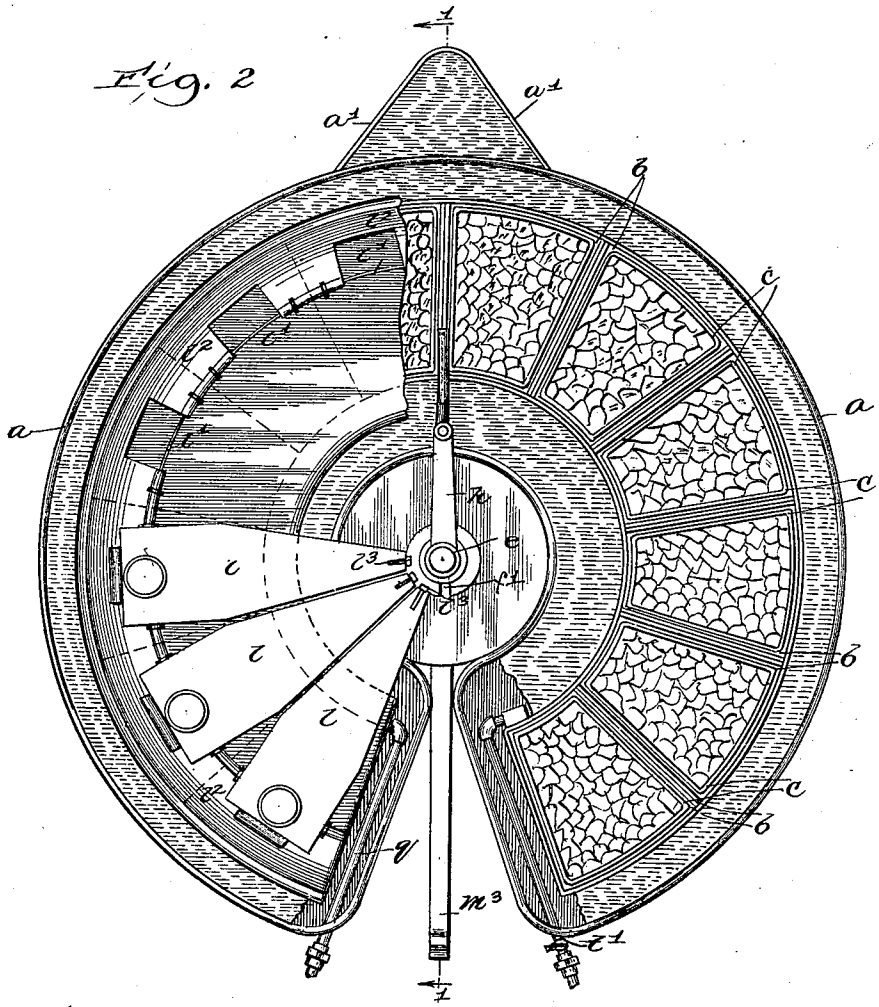


Fig. 3

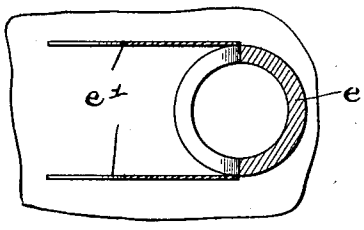


Fig. 4.

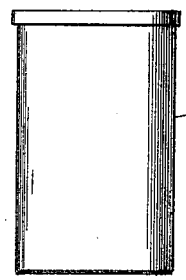
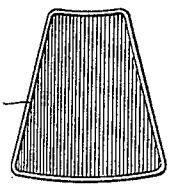


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

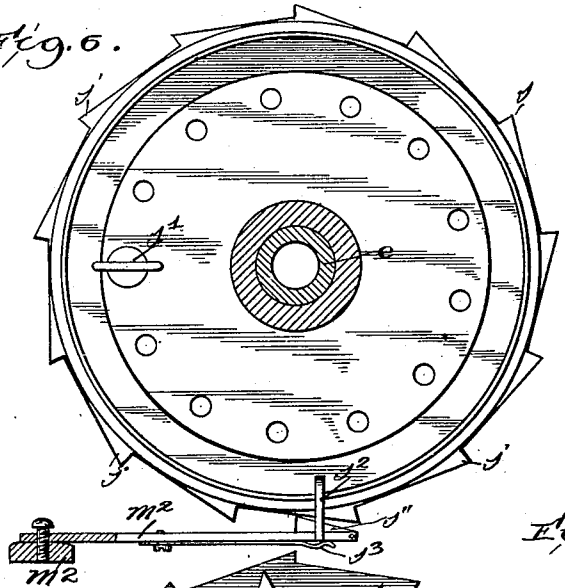


Fig. 10.

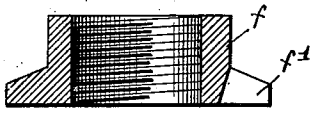


Fig. 11.

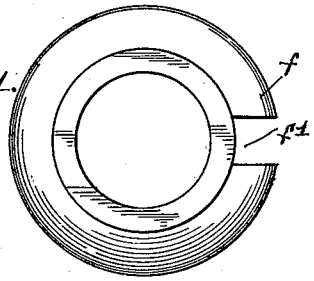


Fig. 12.

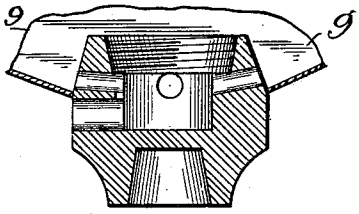


Fig. 7.

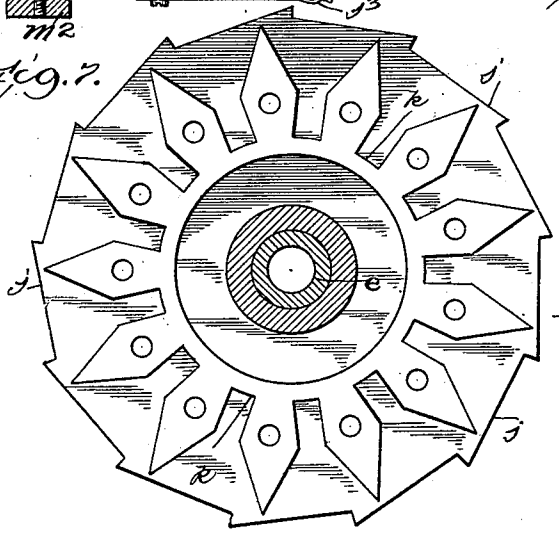


Fig. 13

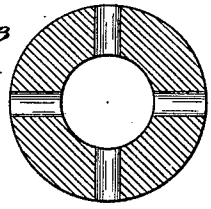


Fig. 9.

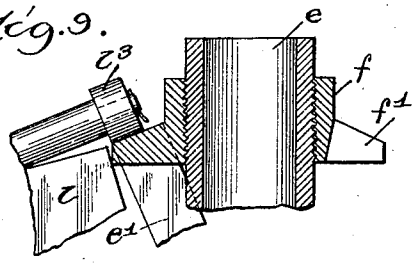
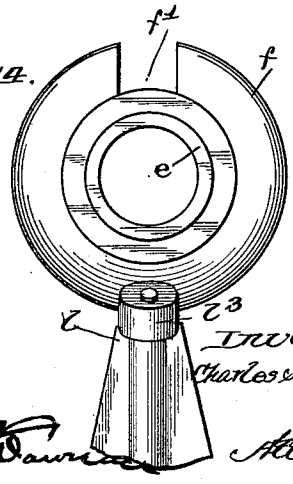


Fig. 14.



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UNITED STATES PATENT OFFICE.

CHARLES S. BARTHOLF, OF CHICAGO, ILLINOIS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 667,178, dated February 5, 1901.

Application filed April 30, 1900. Serial No. 15,001. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. BARTHOLF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Gas-Generators, (Case No. 1,) of which the following is a full, clear, concise, and exact description.

My invention relates to improvements in gas-generators, and more particularly to such apparatus peculiarly designed for the generation of acetylene gas, the object of my said invention being the production of an automatically-controlled type of generator of simple construction insuring the greatest safety in its operation. Various safeguards have previously been devised in this class of apparatus designed to reduce the liability of accident; but in none of these of which I am aware is the same degree of safety and economy of operation secured with as little complication and multiplication of parts as in my present device.

The apparatus embodying my invention, in connection with which the said invention is herein explained, may be briefly described as consisting of a common receiving-tank wherein are disposed a plurality of receptacles adapted to receive given charges of calcium carbid. These receptacles are maintained beneath a closure device providing a permanent water seal to prevent the escape of gas from the generating-chamber thus formed. A water-supply appliance is provided in connection with the generating-chamber, which preferably is equipped with a rotating or traveling discharge-pipe designed to deliver the requisite quantity of water successively to the several carbid-receptacles for the purpose of generating a given volume of acetylene gas.

This apparatus is associated with a gasometer of any approved type and through suitable actuating apparatus is automatically operated thereby.

My improved apparatus will be more fully explained in connection with the accompanying drawings, wherein—

Figure 1 is a vertical sectional view of the generator and associated gasometer. Fig. 2 is a plan view of the generator of my invention. Fig. 3 is a detail of the water-supply apparatus. Figs. 4 and 5 show the removable carbid-receptacles. Figs. 6 and 7 are sections, respectively, on the lines 6 6 and 7 7, Fig. 1, illustrating details of the mechanism for operating the water-supply apparatus. Fig. 8 is another detail thereof; and Figs. 9 to 14, inclusive, are details of said water-supply apparatus.

The same letters of reference are used to designate similar parts in each of the several figures of the drawings.

By referring to Fig. 1 the principal features of the apparatus of my invention and the relation of the several parts each to each will be readily understood. I have therein shown upon the right a vertical sectional view through an acetylene-gas generator constructed in accordance with my invention, while upon the left is a similar view of an approved type of gasometer or gas-holder, with which said generator is operatively connected. The gas-holder, I may here note, is shown upon a smaller scale merely for the purpose of exhibiting more clearly the features of my invention, no patentable improvement upon said gas-holder being herein claimed.

My improved generator is provided with a receiving-tank a of annular form, wherein are provided twelve partition-spaces b, adapted to receive a corresponding number of removable carbid-receptacles c. Upon the left side of the tank a segmental opening is provided corresponding to the thirteenth space thereof, through which opening the apparatus of the generator is easily reached for adjustment and control.

Opposite the segmental opening (shown in plan, Fig. 2) is a lip or spout a', through which water is supplied to the tank a, wherein it is normally maintained at the water-level a^2, above which extend the tops of the carbid-receptacles c. This supplies the water seal for the telescoping cover d, fitting within the tank and forming the generating-chamber, which cover is removably secured in place by hinged bolts d', adapted to engage slotted ears provided upon the rim of tank a. The inner side wall or depending rim d^2 of said cover is made somewhat shorter than the outer wall d^3 for the purpose of accommodating the rotating U-shaped water-supply pipe.

Journaled within the central opening in annular tank a is the tubular shaft e, which constitutes a part of and operates the water-

supply apparatus. The upper part of said shaft is longitudinally cut away and provided with side wings e', registering with the opening f' in the supporting-cone f, mounted on the upper end of said shaft. Situated beneath the said wings on the shaft is a funnel g, connecting with the U-shaped water-supply pipe k, which extends beneath the inner leg or depending rim of the cover d. The end of said pipe h is provided with perforations adapted to spray the water over the charge of carbid above which it is in position.

Beneath the upper bearing of the shaft are provided, respectively, the ratchet-wheel j and the locking-wheel k, which are temporarily secured in position to rotate together by means of the pin j', which is adapted to extend through registering openings provided in the respective wheels. The locking-wheel k is rotatably supported on the shaft by means of a collar k'.

Around the upper part of the tank are provided twelve water chambers or receptacles, which are adapted to receive the volumes of water necessary to act upon the twelve separate charges of carbid disposed in the tank. These vessels or receptacles l are rearwardly supported by means of hooks which engage a rod l', supported by the annular downwardly-flaring wall l^2. The inner ends of said vessels are provided with small rollers l^3, which normally ride upon the inclined surface of the supporting-cone f, carried at the upper end of the shaft. The opening f' in said cone is adapted to successively permit the passage of the supporting-rollers l^3, thereby causing the water-receptacles l, which are rearwardly supported in an overweighted position, to tilt downward and empty their contents into the upper portion of the hollow shaft and the funnel-shaped receptacle carried thereby.

The overweighted bell-crank lever m is operatively associated with the ratchet-wheel j and locking-wheel k, through the medium of which is imparted to the shaft e successive movements each corresponding to one-thirteenth of the arc of a circle, whereby the several charges of water contained in the vessels l are successively emptied upon the corresponding charges of the carbid within the generator. A common rocking shaft is provided for the arms m' m^2 m^3 of said bell-crank lever, the two former being substantially parallel and are separated upon the shaft by a distance represented by the radius of ratchet-wheel j, while the latter arm is disposed upon the shaft at right angles to the said arms m' m^2. The arm m' of the bell-crank lever is adapted to enter between the teeth of the locking-wheel k, normally maintaining the shaft against rotation, while the arm m^2, moving therewith, carries a pawl j'', adapted to move approximately one and one-half times the length of a tooth upon the said wheel j and actuate said wheel to rotate through the distance of one tooth. A U-shaped support j^2, riding within a groove on said wheel, maintains the pawl in its position before the teeth thereof, while a spring-actuated dog j^3 permits the passage of the pawl past the extended portion of the teeth, when the arm m^2 is actuated to move in the opposite direction to the rotation of the wheel. The relation of the arms m' m^2 to the locking and ratchet wheels will be clearly understood by referring to Figs. 1, 6, and 8, wherein are respectively shown in a sectional view through the generator the locking-arm m' clear of its locking-wheel k, an end view of the actuating-arm m^2 with its associated pawl mechanism and ratchet-wheel, and a detail, partly in section, at right angles to that of Fig. 1, illustrating the locking and ratchet wheels with their associated arms m' m^2. The long arm m^3 of the bell-crank lever extends beyond the tank in position to be engaged by an adjustable lug n', carried upon a spring-mounted rod, which is secured to the movable tank o and is actuated thereby to move up and down as the tank is filled and emptied.

The gasometer may be briefly described as consisting of an outer tank p, having a lower chamber p', wherein the inlet-pipe q, extending from the generator, is maintained beneath a body of water, securing a water seal and serving as well to wash the acetylene gas as it flows from the generator. The central rod r, surrounded by a gas-tight sleeve r', serves as a central supporting-standard, permitting the tank o of the gasometer to move up and down as the same is filled and emptied. A pipe t, extending above the top of the tank p, is surrounded by a perforated tube o', which when said perforations are raised above the water-line causes the gas to escape through the said pipe t, thus providing an automatic blow-off for the gasometer if through accident too great a volume of gas is generated. Said pipe t also extends to the generator, the extension thereof being controlled by a gas-cock t', which permits the gas under pressure within the generator to escape to the outside air when the generator is cleaned or charged. The service-pipe s is connected with a pipe s', extending above the level of the tank p.

Assuming that the twelve carbid-receptacles and the twelve water vessels have respectively been charged with the requisite amounts of carbid and water, the end of the bell-crank lever m^3 may be manually or otherwise depressed, causing the shaft, through the medium of the ratchet-wheel, to turn through a thirteenth of its rotation, thereby permitting the roller l^3 to drop through the opening f' in the supporting-cone and emptying the water contained in the first of the water vessels l into the funnel g. A rush of water is thereby secured through the U-shaped water-supply pipe to the first of the carbid-receptacles, and gas is immediately generated therein, seeking its escape through the pipe q and gradually filling the gasometer.

By reason of the fact that the water-level in the funnel is but slightly higher than the

perforated end of the water-supply tube the water is gradually sprayed over the contents of the carbid-receptacle through approximately a period of five minutes, thus causing a comparatively gradual generation of gas, although the mass of carbid is finally flooded with water. As in practice the charges of carbid are calculated to produce a volume of gas sufficient to fill nine-tenths of the tank of the gas-holder, it will be seen that a reserve space is provided therein sufficient to meet ordinary needs, and in the event of accidental generation of too great a volume of gas an automatically-controlled exit is provided in the pipe *t*, previously described.

As will be understood, the gas will be stored in the tank *o* of the gas-holder until required by ordinary use through the service-pipe *s*. When a predetermined amount of gas has been used out of the gas-holder, preferably a volume corresponding to nine-tenths of its capacity, the lug *n'* will be brought into engagement with the extended end m^3 of the bell-crank lever, serving to release the locking-wheel from arm *m'* and actuating the pawl through the medium of arm m^2 to move forward another notch, causing a repetition of the action previously described in connection with the first of the twelve water-receptacles and carbid-chambers with respect to the second set of the said devices. Thus the action of the generator will be automatically controlled by the use of gas from the gas-holder until each of the twelve charges of carbid has successively been flooded with the corresponding charges of water.

By increasing the number of carbid-chambers and water-supply vessels it will be seen that a machine of any desired size may be constructed. I have found, however, that one providing for twelve charges is sufficient to meet ordinary demands.

By reason of the constant maintenance of a water seal in my improved generator there is no likelihood of accident from explosion or escape of the gas therefrom, and because of the immersion of the several carbid-receptacles the tendency of the carbid to heat under the action of water is largely overcome.

The bell-crank lever by providing a locking-arm prevents the accidental overturning of any of the water-charges upon a new charge of carbid until by reason of the consumption of the gas from the previous charge the said lever is actuated to unlock the shaft and simultaneously move it forward sufficiently to supply another charge of water to the next charge of carbid, as fully described. Moreover, the manner of supplying the water to the said carbid permits it to gradually flow into the carbid-chamber against the gas-pressure after the first rush of water caused by emptying the vessel into the funnel *g*, this at first serving to spray a considerable quantity of water over the carbid and to start the generation of gas.

When all of the charges of carbid have been exhausted, the generator is recharged by first removing the empty water vessels *l*, releasing the cover *d*, and raising the same from the tank *a*, when the several removable carbid-receptacles may be taken from the tank and respectively emptied, dried, recharged, and placed in the tank. The shaft is released from the locking-wheel by removing the pin *j'* and is turned to secure the registration of the opening *f'* with the segmental space in tank *a*. The pin is then replaced, the cover lowered into the tank and secured in place, after which the several water vessels *l* are placed in position as before and the generator is again ready for use.

From the above description of my improved device it will be seen that the same is simple both in construction and operation and provides against accident in a manner rendering it safe, as well as economical to operate.

Having now described a generator embodying my invention, I claim—

1. In a gas-generating device, the combination with a generating-chamber, of a plurality of receptacles within the generating-chamber, adapted to receive predetermined divided charges, a liquid-supply appliance associated therewith, which with the receptacles are stationarily mounted in the generator, a traveling liquid-discharge pipe adapted to be operatively connected with said liquid-supply appliance and each of the receptacles, positively-acting automatically-locking mechanism associated with the liquid-supply appliance, and means for actuating the said appliance and its traveling discharge-pipe whereby predetermined volumes of liquid may be successively delivered to the receptacles, substantially as described.

2. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles within the generating-chamber, of a plurality of liquid-receptacles corresponding thereto, the said receptacles being adapted respectively to receive predetermined divided charges of calcium carbid and of water, which receptacles are stationarily mounted in the generator, a traveling liquid-discharge pipe adapted to be operatively connected with the liquid-supply appliance and the carbid-receptacles, and means for actuating the traveling discharge-pipe to operatively connect the corresponding liquid and carbid receptacles in turn, whereby predetermined volumes of water may be successively delivered to the carbid-receptacles, substantially as described.

3. In an automatically-operated gas-generator, the combination with a plurality of carbid-receptacles within the generating-chamber, of a plurality of liquid-receptacles associated therewith, a traveling liquid-discharge pipe adapted to be operatively connected with corresponding receptacles, and means for emptying in turn the said liquid-receptacles and for actuating the traveling discharge-pipe, whereby predetermined vol-

umes of liquid may be successively delivered to the first-named receptacles, substantially as described.

4. In a gas-generating device, the combination with a generating-chamber of a plurality of liquid-receptacles, a movable supporting device adapted normally to sustain the receptacles in position to retain their contents, a positively-acting locking appliance associated with and adapted automatically to lock and release the movable supporting device, and means for actuating said supporting device whereby the receptacles are successively emptied of their contents into the generating-chamber, substantially as described.

5. In a gas-generating device, the combination, with a generating-chamber, of a plurality of liquid-receptacles rearwardly supported in an overweighted position, a slotted supporting part engaging the forward ends of said receptacles, positively-acting automatic locking mechanism associated with said supporting part, means for actuating said slotted supporting part successively to release the liquid-receptacles, and a discharge appliance adapted to deliver the liquid to the generating-chamber, substantially as described.

6. In a gas-generating device, the combination with a generating-chamber containing a plurality of receptacles, of a plurality of liquid-supply vessels, a rotating shaft carrying a dumping device adapted successively to actuate the liquid-supply vessels and a rotatable discharge-pipe adapted to be moved into position for discharging liquid into any of said receptacles, and means for effecting the rotation of the shaft, substantially as described.

7. In a gas-generating device, the combination with a generating-chamber containing a plurality of receptacles, of a plurality of liquid-supply vessels, a rotating shaft carrying a dumping device adapted successively to actuate the liquid-supply vessels and a rotatable discharge-pipe adapted to be moved into position for discharge into any of said receptacles, a locking device adapted normally to maintain the shaft against rotation, and automatic means for effecting the release of the locking device and the rotation of the shaft, substantially as described.

8. In a gas-generator, the combination with a water-filled receiving-tank, of a plurality of receptacles adapted to contain calcium carbid, a closure device extending beneath the water-level of the tank, a U-shaped traveling liquid-discharge pipe extending beneath the submerged wall of the closure device to the carbid-receptacles, a liquid-supply appliance associated with the pipe, and means for actuating said liquid-supply appliance and traveling discharge-pipe, whereby successive charges of liquid may be delivered by the traveling discharge-pipe to the several carbid-receptacles, substantially as described.

9. In an acetylene-gas generator, the combination with a water-filled tank, of a plurality of carbid-receptacles disposed therein, a cover or closure device extending beneath the water-level of the tank and forming a generator-chamber, a traveling water-supply pipe adapted successively to deliver predetermined volumes or charges of water to the several carbid-receptacles, and automatically-controlled means for actuating the traveling water-supply pipe and for delivering predetermined charges of water thereby to the carbid-receptacles, substantially as described.

10. In an acetylene-gas generator, the combination with a water-filled tank, of a plurality of carbid-receptacles disposed therein, a cover extending beneath the water-level of the tank forming a generator-chamber, a traveling discharge-pipe adapted successively to deliver predetermined volumes or charges of water to the several carbid-receptacles, a gas-holder associated with the said generator, and means controlled by the movement of the gas-holder for effecting the movement of the discharge-pipe and delivering predetermined charges of water thereby to the carbid-receptacles, substantially as described.

11. In an acetylene-gas generator, the combination with a water-filled receiving-tank, of a plurality of carbid-chambers disposed therein, a closure device or cover for the tank and receptacles forming the generating-chamber, the walls thereof extending beneath the water-level of the tank, a plurality of water vessels corresponding to the carbid-receptacles, a rotating shaft provided with a U-shaped traveling water-supply pipe and a dumping device adapted successively to deliver the charges of water in the water vessels to the supply-pipe, and means automatically controlled by an associated gas-holder for effecting the rotation of the shaft whereby the generator is automatically operated, substantially as described.

12. In an automatically-operated gas-generator, the combination with a generating-chamber, of a plurality of receptacles disposed therein about a central liquid-supply device, said receptacles being independent and adapted to receive divided charges, a rotatable discharge-pipe, an associated liquid-supply apparatus, a positively-acting automatic locking appliance provided in connection with the liquid-supply apparatus adapted to prevent its accidental actuation, means automatically controlled by the gas-holder, for rotating the liquid-discharge pipe and for operating the liquid-supply apparatus, whereby separate charges of liquid are successively emptied over the contents of the receptacles in the generating-chamber, substantially as described.

In witness whereof I hereunto subscribe my name this 28th day of February, A. D. 1900.

CHARLES S. BARTHOLF.

Witnesses:
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