No. 862,527. PATENTED AUG. 6, 1907.

F. C. WILSON, DEC'D.

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ACETYLENE GAS GENERATOR.

APPLICATION FILED APR. 7, 1904.

2 SHEETS—SHEET 1.

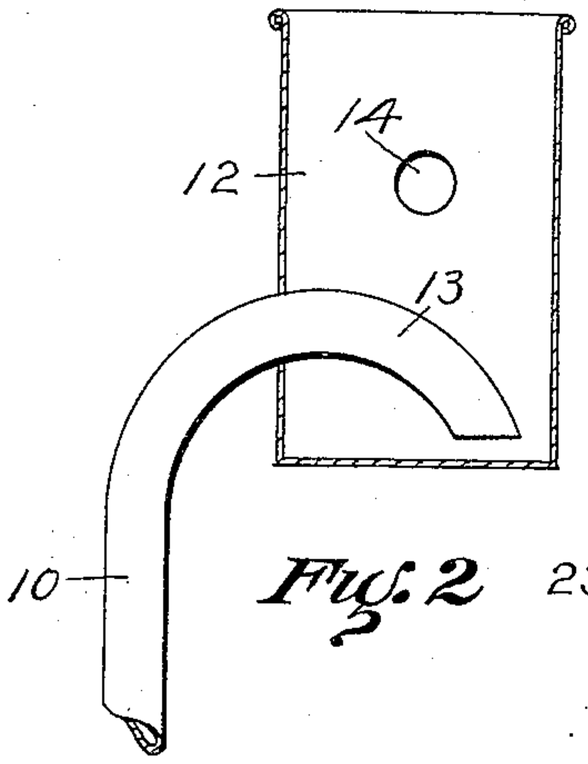

Fig. 2

Fig. 1

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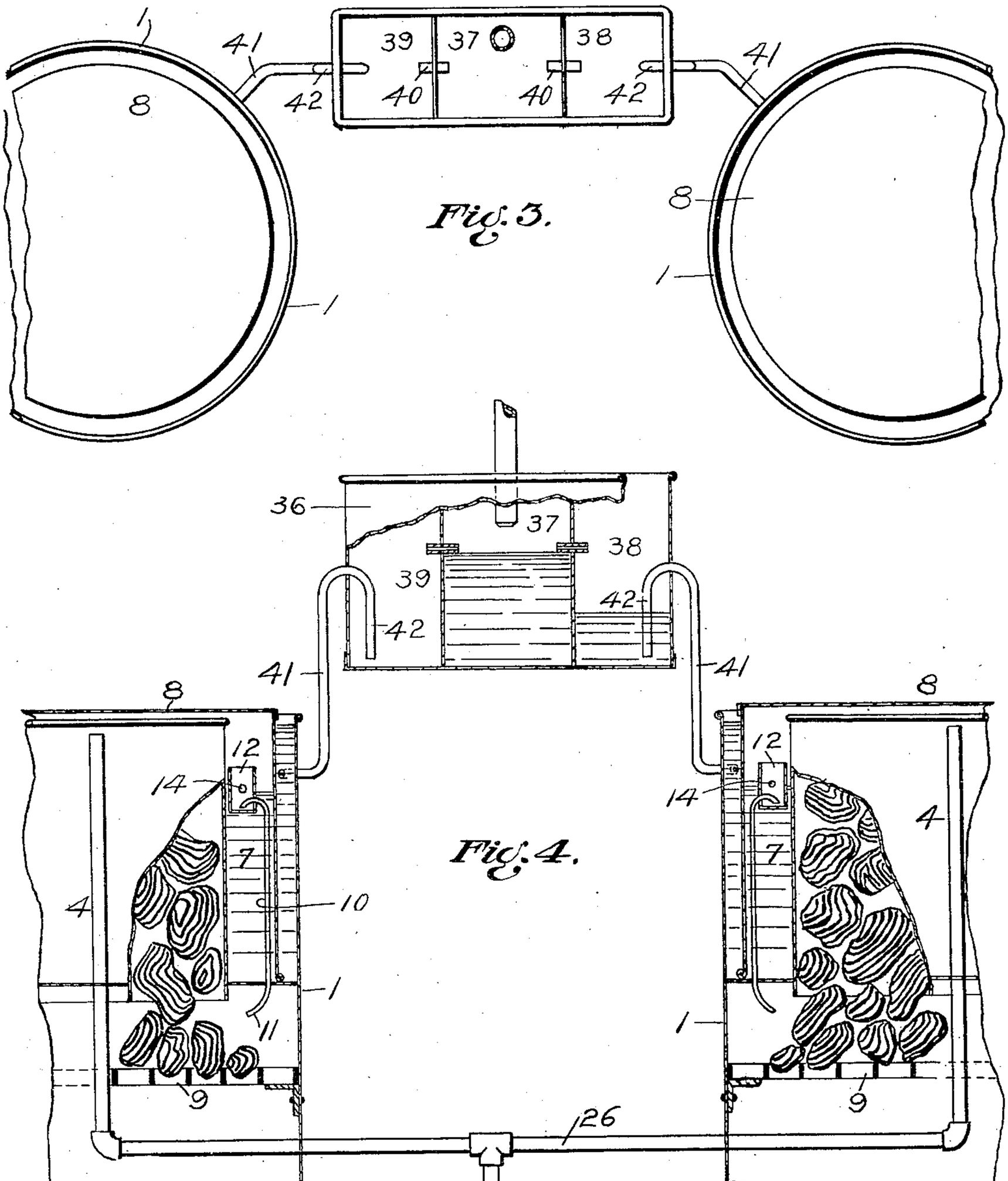

Fig. 3.

Fig. 4.

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ACETYLENE-GAS GENERATOR.

No. 862,527. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed April 7, 1904. Serial No. 201,980.

To all whom it may concern:

Be it known that I, F CORTEZ WILSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Acetylene-Gas Generators, of which the following is a complete specification.

This invention relates to improvements in gas generating apparatus, more particularly intended for the generation of acetylene gas by the application of water to carbid of calcium.

The object of the invention is to provide an improved construction in gas generators of this character, and the invention consists in the matters hereinafter set forth and particularly pointed out in the appended claims.

In a generator constructed in accordance with my improvements, it is contemplated that the carbid will be provided in relatively large quantities in a container open at its lower end and constituting in fact a downwardly discharging magazize similar to that of a self-feeding stove. From the open lower end of this magazine the carbid will feed down upon a subjacent grating, beneath which ample space will be provided for the residuum to collect in as the carbid disintegrates under the action of the water. This latter, it is contemplated, will be supplied at intervals in limited quantities just sufficient to maintain the necessary rate of generation, and at points in proximity to the grating, so that the residuum formed by the decomposition of the carbid will quickly drop through the grating, and permit fresh carbid to feed down from the magazine above.

In an approved form of generator, herein illustrated, the carbid magazine terminates some little distance above the grating, and the area of the latter is made considerably larger than the discharge opening of the magazine, so that the carbid, as it expands under the action of the water, is free to spread out as much as may be necessary to avoid its clogging or offering noticeable resistance to the subsequent feeding down of the carbid. The water is then conveniently supplied between the open end of the magazine and the grating, at one or more points around the descending mass of carbid, through inlet pipes which terminate just below the mouth of the magazine in inwardly directed nozzles, and which are supplied with water intermittingly from any suitable water feed devices automatically controlled by the pressure of the generated gas. These water feed devices are approvedly such as to bring about the discharge of water from the inlet pipes or nozzles from time to time and ordinarily in alternation or succession, and in this instance include a main tank or reservoir, the flow from which is controlled by the movement of the gas receiving bell, and of a plurality of auxiliary reservoirs or water cups arranged to be filled from the main reservoir and to be emptied one after another upon the carbid through the inlet pipes.

The means by which the emptying of the water cups upon the carbid is accomplished at different times and in alternation or succession may include any suitable valve constructions, but as a further and important feature of the present invention, is of such a nature as not to require or involve any moving parts or devices likely to deteriorate, clog, or get out of order. Accordingly, each inlet pipe is herein shown as connected with its water feed cup by a siphon which will allow the cup to fill to above the height of the bend in the siphon before it begins to discharge, and will allow the cup to empty itself after the discharge once begins. And the cups themselves are arranged to be supplied from an intermediate water chamber which is itself supplied from the main reservoir, and from which the cups will be filled to their points of discharge at different times or intervals.

In a further development of the invention, also, means are provided for connecting up several such generators with a single gas holder, through intermediate water feed connections by which the water released from the main tank or reservoir each time the gasometer becomes emptied and the bell descends beyond a predetermined point, will be discharged first into one generator and then into another, so as to bring them successively into action and give time for the heat of the generation to be radiated or conducted away, thus preventing any such excessive heating as will polymerize or otherwise deteriorate the gas. And as herein shown such intermediate water connections are of the same general character as those heretofore described for causing successive discharges of the inlet pipes leading to the carbid, *i. e.*, they will include separate water chambers each of which communicates with a separate generator through a siphon which allows the water chamber to become filled before it begins to discharge and to empty itself when once the discharge begins, these several water chambers being themselves supplied from a common chamber into which the water is fed from the main tank or reservoir and from which it enters the several chambers through inlets in such manner that the chambers become filled and empty themselves into their connected generators at different times.

All of these general features and various more specific improvements, constituting my invention in its entirety, will be fully understood from the following description of the construction illustrated in the accompanying drawings, in which,—

Figure 1 is a sectional side elevation of an acetylene generator constructed in accordance with my improvements. Fig. 2 is an enlarged sectional detail of one of

the water pockets of the generator and the siphon of its connected discharge pipe. Fig. 3 is a top plan view showing the manner in which two or more generators may be connected up together, it being understood that the gas holder and main water tank in this case will be common to both generators and similar to that shown in Fig. 1, for example. Fig. 4 is a fragmentary side elevation of the pair of generators shown in Fig. 3.

As shown in Fig. 1 of said drawings, 1 designates the generator proper, 2 the gasometer, and 3 the main water tank or reservoir of the apparatus. As herein shown the generator 1 comprises an outer cylindric casing provided in its upper portion with a concentric carbid container or magazine 4. This latter is shown as connected to and supported within the outer cylindric casing by a horizontal partition 5, down through the center of which the lower end 6 of the magazine projects. The annular space 7 above the partition 5 and between the carbid magazine and the outer casing is utilized as a water chamber intermediate between the main tank 3 and the feed devices hereinafter described, and the water in this intermediate chamber also serves as a seal for the lower edges of a bell like cover 8 which is inverted over the carbid magazine and water feed devices, as shown in Fig. 1.

The lower end 6 of the carbid magazine is left open, and a little distance below it there is provided a carbid support, in this instance a grating 9, which serves to support the carbid above the residuum chamber as it feeds down by its own weight from this open mouth of the magazine. As herein shown the carbid support or grating 9 extends entirely across the cylindric outer casing of the generator, and is consequently somewhat larger than the magazine itself, so that, as the carbid feeds down toward the grating from the magazine, it is free to spread out and to expand as much as may be necessary when the water is applied to it, and is prevented from arching over or otherwise clogging and stopping its downward feed. Other forms of carbid supports may be substituted without materially changing the result.

The water for decomposing the carbid is, in this improvement, applied to the carbid close to the grating 9, so that the most active decomposition of the carbid will occur in immediate proximity to the support, and the residuum formed will at once drop into the residuum chamber and make room for the fresh carbid which will immediately feed down by its own weight from the magazine above. To this end one or more (preferably a considerable number) of water feed pipes 10 are shown as brought down from water feed devices above, and as terminating in inwardly turned nozzles 11 at points between the lower end of the magazine and the grating, so that water entering through the pipes 10 is discharged against the lower edges of the mass of carbid descending from the magazine and resting upon the support.

In practice the discharge tubes from one or more water feed cups are turned outwardly, in order that a sufficient amount of water may escape the carbid upon the support and pass down into the residuum to moisten same and decompose any small lumps that may fall through undecomposed.

The water feed devices desirably and in this instance include a plurality of relatively small cups or water pockets 12 that are partially submerged within the intermediate water chamber 7 beneath the cover 8 which incloses the magazine. From these cups the pipes 10 are shown as leading downwardly through the partition 5 into the generating chamber just above the grating, as heretofore described, and the upper end of each pipes is shown as bent to enter its cup in the form of a siphon 13. Each of the cups 12 (which are in this instance shown as two in number) is furthermore provided with an inlet aperture 14 and when the water in the chamber 7 rises to the level of these apertures it begins to run into the cups, and when a sufficient height is reached a siphon begins to flow and having once started, continues so to flow until the contents of the cup are so completely exhausted as to uncover the open end of the siphon within the cup, the action of the device in this respect being that characteristic of all siphons, as will be readily understood. The rising of the water in the chamber 7 to fill the water feed cups in this manner is designed to occur from time to time and whenever the amount of gas stored in the gas holder becomes reduced below a certain predetermined minimum. To this end the main reservoir 3 is shown as provided at its lower end with an outlet 15 that is normally closed by a valve 16. This valve may be of any suitable construction and is in this instance secured to the lower end of a stem 17 which projects up through a weighted lever 18 fulcrumed at 19 on the top of the tank, the weight 20 on said lever serving to keep the valve firmly sealed. The free end 21 of this lever, however, is arranged to project beneath a weight 22 that is suspended from a standard 23 secured to and rigid with the bell 24 of the gas holder, and the proportions of the parts are such that when the gas in the holder is drawn off to such an extent as to permit the bell to descend nearly to its lower limit of movement, the weight 20 is lowered upon the lever 18 and the latter is oscillated to open the valve. This allows water to escape from the tank and flow down through a pipe 25 into the intermediate water chamber 7 of the generator, and to there raise the level of the water so that it flows over into the cups and fills them to their points of discharge, as before described. The flow of water from the reservoir 3 into the chamber 7 of the generator in this manner, however, will continue but for a brief interval, since the ensuing discharge of water from the feed cups 12 down against the carbid will immediately generate a new volume of gas, which, being conducted into the bell through any suitable pipe 26, will cause the bell to rise again and lift the weight 22 from the lever 18, thereby permitting the weight 20 to shift the lever and close the valve 16 once more.

The filling of the cups 12, moreover, while it will be due in each instance to the rise of water in the chamber 7, is designed to occur successively or in alternation in the several cups, instead of simultaneously, so as to still further limit the amount of water discharged against the carbid in the generating chamber at any one time. And to this end the inlet apertures 14 of the cups 12 are shown as made of different areas, so that one cup will fill more rapidly than the other and consequently will begin to discharge sooner, with the result that the ensuing generation of gas will act in the

manner described to stop the further rise of water within the chamber 7 and for the time being stop the filling of the other cups 12. Then when the drawing off of the gas from the gas holder has again caused the bell to descend to the point where more water is admitted from the reservoir 3 to the chamber 7 of the generator, the feed cup 12 which is already partly filled from the previous inflow of water, will become completely filled and discharge its contents against the carbid and liberate another volume of gas before that cup just previously discharged fills up again. The delicacy of this operation is furthermore greatly enhanced by the fact that the sudden increase in the volume of gas generated, due to the discharge of water from any one of the feed cups 12, will cause a slight increase in pressure in the generator sufficient to force down the level of the water in the chamber 7 around the feed cups and stop the flow into the latter almost instantly, and before the inflow of water from the tank 3 will have been cut off by the closing of the tank valve 16, due to the rising of the bell as the volume of the gas within it increases. On the other hand, the restoration of normal pressure within the generating chamber, due to the equalization of pressure between the gas holder and generator, may produce a slight rise in the level of the water within the chamber 7, which at times may be increased to an extent by whatever inflow of water may have occurred between the first response of the apparatus to the increased generation, and the subsequent closing of the valve 16. And this rise in water level may be sufficient to cause another inflow of water into the feed cups 12 and bring about the emptying of another of these cups, and the consequent evolution of another volume of gas, so that a number of separate feedings of water to different parts of the mass of carbid may occur in this manner with but a single feeding of water from the main reservoir into the generator, this being especially true where a considerable number of feed cups, six or more, for example, are provided in the water chamber 7.

The amount of water discharged from each feed cup at one time will be relatively very small, desirably only about a spoonful in a generator of considerable size, so that the active generation set up in any one part of the carbid does not continue long enough at any one time to enable the reaction at this point to develop a temperature high enough to injure the gas. And the gas evolved escapes from the generating chamber by passing directly up through the mass of carbid into the magazine and is thereby largely relieved of its undesirable moisture, which latter is absorbed by and serves in turn to slake a portion of the carbid that has not been directly reached by the water from the nozzles. The upper end of the magazine is furthermore herein shown as closed by a removable pan-shaped cover 27, the bottom of which is perforated and which is filled with any suitable material designed to act as a scrubber for the gas, this arrangement being particularly desirable in this apparatus, since it at once relieves the gas of those minute particles of lime and other impurities which would otherwise be carried over and deposited upon the surface of the water within the chamber 7 and perhaps cause the water feed devices to clog or act irregularly.

The charging of the generator, thus described, is accomplished by drawing down the water in the chamber 7, by means of any suitable waste cock 28, to a point below the level of the inlet opening 14 in the water feed cups. The cover 8 may then be lifted off and the scrubber 27 removed to permit the magazine to be recharged. The residuum which has collected in the lower portion of the generating chamber beneath the grating 9, is then removed through any suitable door 29, and can be the more readily handled from the fact that the limited quantity of water supply to the carbid leaves the residuum only slightly moistened and capable of being shoveled out like ordinary ashes. The generator may now be closed again, and is ready to resume operations as soon as the water from the tank 3 is replenished.

A check valve 30 is herein shown as provided in the pipe 26, to prevent a back flow of gas from the holder while the generator is being charged, and pet cocks or valves 31 are shown in this pipe and in the service pipe 32 leading from the gas holder, which enable them to be drained of any condensation. In practice, however, these valves will ordinarily be replaced by a trap acting automatically to accomplish these desired results.

As a precautionary measure, also, for the purpose of preventing any leakage or accidental discharge of water from the tank 3 from entering the generator and causing an unnecessary increase in generation, means are herein shown for diverting any water falling from the outlet 15 of the tank away from the inlet pipe 25 of the generator, except at such times as it is needed in the generator. Such means, in this instance, comprises a pivoted funnel 33, which is located between the outlet 15 of the tank and the mouth of the inlet pipe 25 of the generator (Fig. 1), and is weighted or otherwise so hung that its nozzle normally projects to one side of the mouth of the inlet pipe. A rigid arm 34 is then attached to the funnel or its pivot and projected beneath a rod 35 fastened to the bell of the gas holder, the parts being so designed that as the bell descends this rod strikes the arm 34 and oscillates the funnel so as to point its nozzle down into the pipe 25 just before the weight 22 comes in contact with the valve lever 18 of the tank. By this arrangement, therefore, the funnel is always ready to direct the water from the tank down into the generator whenever the valve 16 is opened by the descent of the bell, but at all other times the funnel occupies such position as to divert any water falling or leaking from the tank to one side of the pipe 25, and thus prevents over generation.

In cases where the number of lights supplied by the generator is so large as to give rise to a serious danger of over heating the gas, if a single generator is employed, owing to the fact that the demands upon the single generator would keep it in action so constantly as to prevent a sufficient dissipation of the heat of generation between the intervals at which the water is fed to the carbid, my invention contemplates the coupling up of several generating chambers, of the construction thus described, to a single gas holder, and the provision of an intermediate water feed device by which the discharge of the water from the main tank is diverted to the generators in alternation or succession, leaving the other generator or generators temporarily idle and giving time for the head of generation therein to become dissipated.

Thus in Figs. 3 and 4 I have shown a pair of generators 1, which will be understood as discharging their gas into a single gas holder 2, common to both generators, as receiving their water supply from a single main tank, or reservoir 3, arranged in connection with the gas holder 2 in the same manner as heretofore described, and as shown in Fig. 1. Instead of receiving the feed water direct from the tank 3, however, the water inlet pipe of each of these generators leads from an intermediate feed tank 36 having three compartments, one of which, 37, is supplied with water directly from the tank 3, while the end compartments 38 and 39 each receives its water supply from the middle compartment 37 through openings 40 herein shown as of equal size and arranged at a same level. Each of these compartments 38 and 39 is then connected with one of the generators by a pipe 41 which leads into the compartment through a siphon 42.

In the normal operation of the machine the discharge of water in the middle compartment from the tank 3 when the valve in the latter is opened by the descent of the bell as the gas supply becomes exhausted, will cause it to flow through into both compartments 38 and 39 and to fill these latter to the point where they begin to empty themselves into the generator through the siphons 42. This emptying action, however, is prevented from occurring simultaneously by a preliminary partial filling of one of the end compartments, 38, so that this compartment will fill before the other and will discharge into its connected generator and start the latter, in the manner hereinbefore described, to generate a new volume of gas. This gas will immediately enter the gas holder and, by raising its bell, cause the valve of the main tank 3 to close and shut off the flow of water into the intermediate tank. The other compartment 39 of the feed box will in the meantime have become partially filled so that the next discharge of water from the main tank 3 will raise the water level in this compartment to the point of discharge before the first compartment 38 is more than partly filled, and will consequently throw the second generator into operation, while the first generator remains, for the time being, at rest.

The number of the compartments 38 and 39, and of the separate generators connected therewith by siphons, may obviously be increased to any extent desired, and by filling the several such compartments to different levels in the first instance, the working of their several generators may be made to take place in succession in the same manner as though but two are employed. It will also be obvious that the automatic working of these intermediate feed devices by which the water is directed to the several generators in succession, is much the same in principle as that of the water feed devices in each generator, by which its feed cups are made to discharge into the generating chamber through the separate nozzles in succession, and obviously either construction may be substituted for the other with generally similar results. That is to say the filling of the end compartments of the intermediate feed tank to their points of discharge at different times may be accomplished by making their inlet pipes or openings 40 of different sizes, so that the one will fill up more rapidly than the other, or on the other hand, the inlet openings 14 of the several feed cups of the generator may be made of the same diameter and the filling of the cups to their points of discharge at different times secured by a preliminary partial filling of the cups to different levels. In either case, also, the common compartment or chamber from which the several siphons or feed cups are filled, need not necessarily be closely associated with them, but may, if required, be separated from them by a considerable distance and connected with each by a suitable length of pipe.

The size of the gas holding bell provided in connection with any generator should be large enough to receive the entire volume of after generation occurring during intervals of idleness, and the amount of this after generation is found to be closely related to the maximum requirements of consumption, *i. e.*, a load of thirty lights results in an after generation largely in excess of that resulting from a load of ten lights, for example. It is therefore frequently desirable to provide different sizes of gas holders for the same size of generators. That is to say, a generator capable of receiving, for example, one hundred pounds of carbid at a charge, may be wanted to supply a normal load of ten lights, in which case a comparatively small gas holder would suffice, or may be wanted to supply a normal load of several times that number of lights, in which case a much larger gas holder would be needed, it being understood that the question of expense and difficulty of installation makes it always desirable to use as small a gas holder as is practicable under the circumstances, without regard to the actual gas producing capacity of the generator proper.

Where a relatively small gas holder is provided, however, the amount of water admitted to the generator at each descent of the bell should be correspondingly small, as compared with the amount of water admitted when the connected gas holder is large. And to this end the present improvement contemplates a restriction of the valved outlet or water passage leading from the main tank to the generator, by which the quantity of water discharged into the generator each time the valve 16 opens, will be limited as desired to accord with the size of bell provided in connection with the generator. Such restriction may be brought about in any suitable manner, but is herein shown as accomplished by means of a removable cap 44 secured over the outlet 15 leading from the tank and provided with a restricted outlet opening of greater or less diameter, as the case may be. Such a cap having an opening of any desired size may then be readily applied to any generator, and will adjust the same for use with the desired size of gas holder.

In as much as the quantity of water fed into the generating chamber of this apparatus is exactly proportionate to the quantity of carbid to be decomposed, the amount of the carbid remaining undecomposed will correspond in all cases to the amount of water remaining in the main reservoir. A gage glass 43 and scale 45 are to this end provided in connection with the reservoir 3, and by observing the level of the water with reference to the scale, the amount of unconsumed carbid within the generator may be determined at a glance at any time.

I claim as my invention:—

1. An acetylene gas generator comprising a downwardly discharging carbid magazine open at its lower end, a sub-

jacent support upon which the carbid in the magazine rests, and a plurality of independent water feed devices arranged around the descending mass of carbid exterior thereto and independently discharging water in limited quantities to different portions of said carbid, substantially as described.

2. An acetylene gas generator, comprising a downwardly discharging carbid magazine open at its lower end, a subjacent support upon which the carbid in the magazine rests and down upon which it feeds, a plurality of water feed devices for supplying water to different portions of the carbid, and means for discharging limited quantities of water through first one and then another of said feed devices, substantially as described.

3. An acetylene gas generator, comprising a downwardly discharging carbid magazine, a subjacent grating upon which the carbid feeds from the magazine, a plurality of water feed devices terminating in proximity to the grating and supplying water to different portions of the mass of carbid, and means for discharging limited quantities of water through first one and then another of said feed devices, substantially as described.

4. An acetylene gas generator, comprising a downwardly discharging magazine, a subjacent grating upon which the carbid feeds from the magazine, a plurality of pipes arranged around the mass of carbid, and means for feeding limited quantities of water through first one and then another of said pipes, substantially as described.

5. An acetylene gas generator, comprising a downwardly discharging carbid magazine, a grating below and of larger area than the discharge opening of the magazine and down upon which the carbid feeds from the magazine, a plurality of inwardly directed pipes arranged around the mass of carbid in proximity to the grating, and means for feeding limited quantities of water through first one and then another of said pipes, substantially as described.

6. An acetylene gas generator, comprising a downwardly discharging carbid magazine, a subjacent support upon which the carbid feeds from the magazine, and means for feeding limited quantities of water in succession to different parts of the carbid in proximity to the support, substantially as described.

7. An acetylene gas generator, comprising a downwardly discharging carbid magazine, a subjacent support upon which the carbid feeds from the magazine, a plurality of water inlets terminating in proximity to the support, and adapted to supply water to different parts of the carbid, and means for discharging limited quantities of water through said inlets in succession, substantially as described.

8. An acetylene gas generator, comprising a downwardly discharging carbid magazine, a subjacent support upon which the carbid feeds from the magazine, a plurality of water inlets terminating in proximity to and above the support, and means for discharging limited quantities of water through said inlets in succession, substantially as described.

9. A water feed device for acetylene generators, comprising a water chamber, a plurality of feed cups, a siphon leading from each feed cup and serving to draw off the water from the feed cup whenever the latter is filled, and means for filling the feed cups in succession from the water chamber, substantially as described.

10. A water feed for acetylene generators, comprising a water chamber, a plurality of feed cups communicating therewith, siphons leading from each of the cups, and means for raising the water level in the water chamber to cause the feed cups to fill and discharge in succession, substantially as described.

11. A water feed for acetylene generators, comprising a water chamber, a plurality of feed cups arranged to be filled in succession from said water chamber and a siphon leading from each feed cup to the carbid, substantially as described.

12. A water feed for acetylene generators, comprising a water chamber in which the water pressure varies with the pressure of the generated gas, a plurality of feed cups having inlet openings communicating with said chamber, and arranged to fill in succession as the water level in the chamber rises, and a siphon leading from each feed cup to the carbid, substantially as described.

13. A water feed for acetylene generators, comprising a water chamber, water feed cups, a siphon leading from each feed cup to the carbid, and inlet openings of different sizes in the feed cups through which the water enters from the water chamber, substantially as described.

14. A water feed for acetylene generators, comprising a water chamber in which the water pressure varies with the pressure of the generated gas, a plurality of feed cups having inlet openings of different sizes communicating with said chamber and arranged to fill in succession as the water level in the chamber rises, and a siphon leading from each feed cup to supply water to the carbid, substantially as described.

15. A water feed for acetylene generators, comprising a water chamber, a plurality of feed cups receiving water from said chamber, a siphon leading from each feed cup to supply water to the carbid, a main water tank, and means for admitting water from the main tank to the water chamber when demanded to renew the generation, substantially as described.

16. The combination with a generating chamber and connected gas receiving bell, of a water chamber, a plurality of feed cups receiving water from said chamber, a siphon leading from each feed cup into the generating chamber, and a water tank having a valved outlet controlled by the position of the gas receiving bell and discharging into the water chamber, substantially as described.

17. The combination with a generating chamber and connected gas receiving bell, of a water chamber in which the pressure varies with the pressure of the generated gas, feed cups having inlet openings communicating with said chamber, a siphon leading from each feed cup into the generating chamber, and a water tank having a valved outlet controlled by the position of the gas receiving bell and discharging into the water chamber, substantially as described.

18. The combination with a generating chamber and connected gas receiving bell, of a water chamber in which the water pressure varies with the pressure of the generated gas, a plurality of feed cups having inlet openings of different sizes communicating with the water chamber and arranged to fill in succession as the water level in the chamber rises, a siphon leading from each feed cup into the generating chamber, and a water tank having a valved outlet controlled by the position of the gas receiving bell and discharging into the water chamber, substantially as described.

19. The combination with a generating chamber and gas holder, of a water supply controlled by said gas holder discharging into the generator through a restricted opening proportioned to the size of the gas holder, said restricted opening being provided in the form of a removable annulus adapted to be replaced by similar parts having different sized openings to correspond to the different water supply requirements of different sized gas holders, substantially as described.

20. An acetylene gas generator, comprising a downwardly discharging carbid magazine open at its lower end, a subjacent grating upon which the carbid feeds, water feed devices supplying water to the carbid in limited quantities, and a gas scrubber interposed in the upper end of the carbid magazine, substantially as described.

In testimony, that I claim the foregoing as my invention, I affix my signature in presence of two subscribing witnesses, this 19th day of March, A. D. 1904.

F CORTEZ WILSON

Witnesses:
HENRY W. CARTER,
K. A. COSTELLO.