H. W. JACOBS & H. H. LANNING.
ACETYLENE GENERATING APPARATUS.
APPLICATION FILED DEC. 7, 1911.

1,050,139. Patented Jan. 14, 1913.

3 SHEETS—SHEET 1.

Fig. 1.

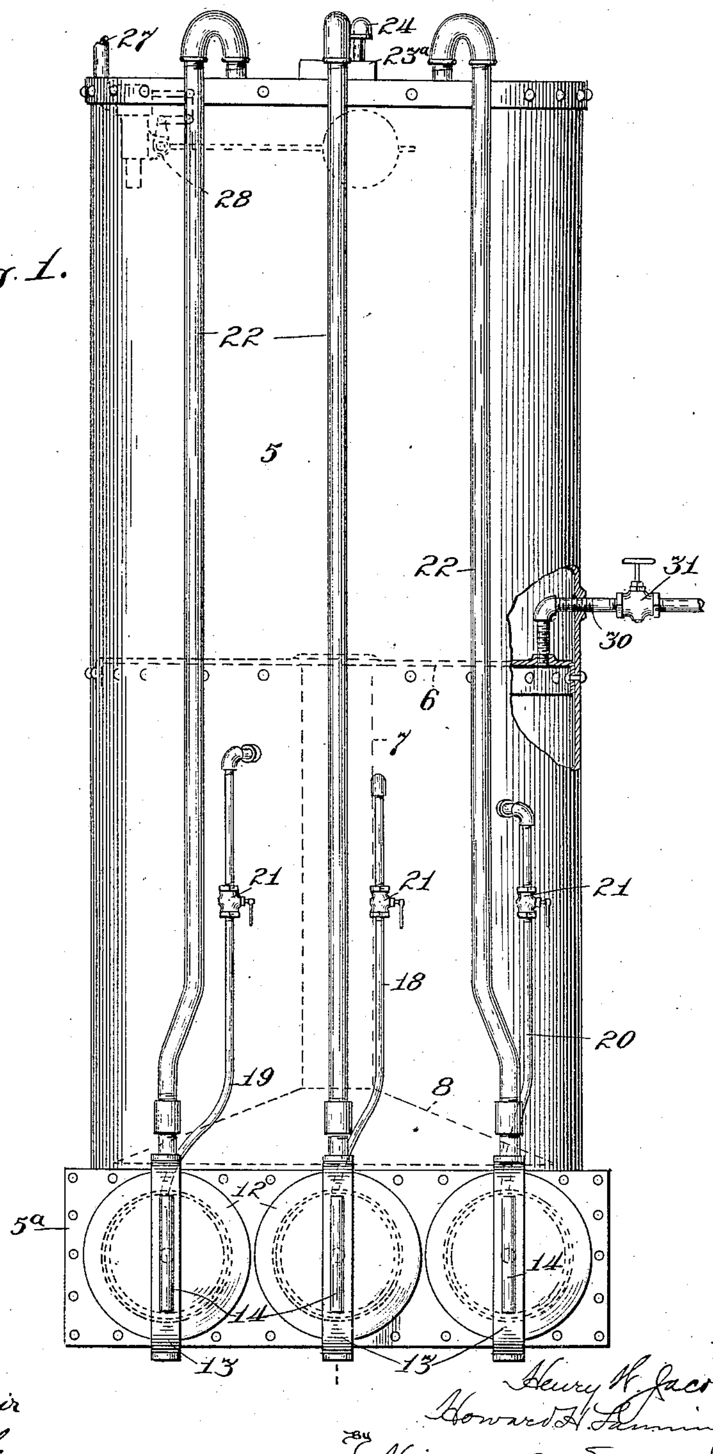

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Fig. 2.

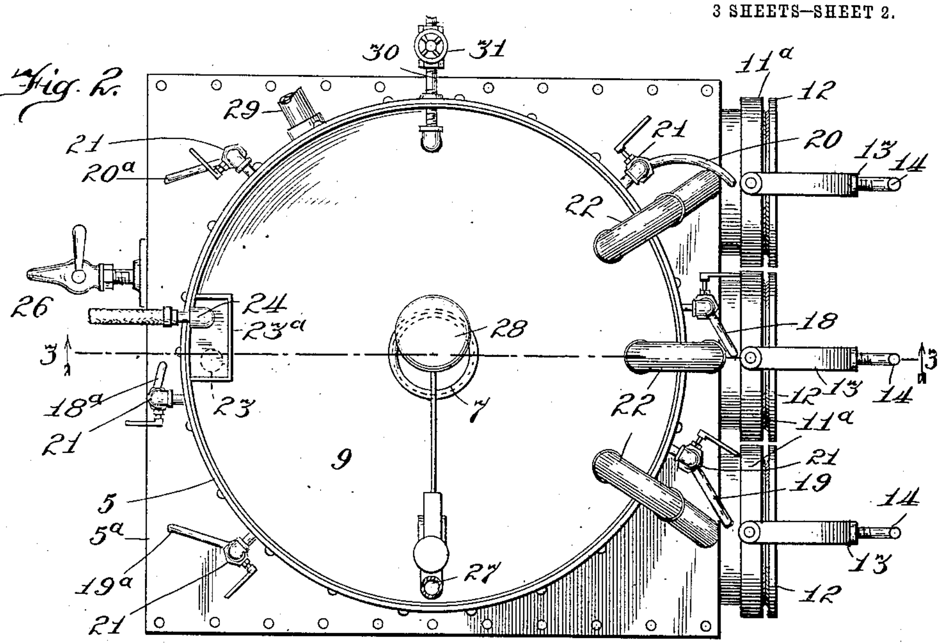
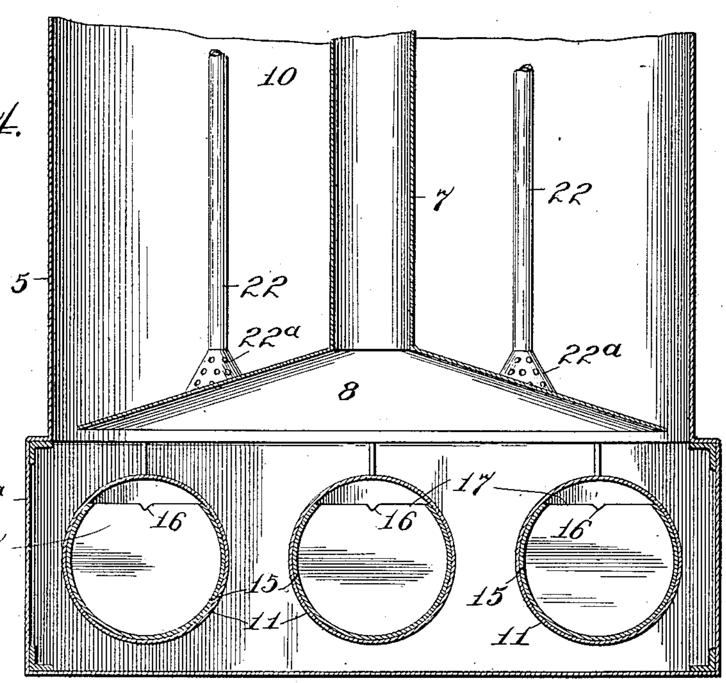


Fig. 4.



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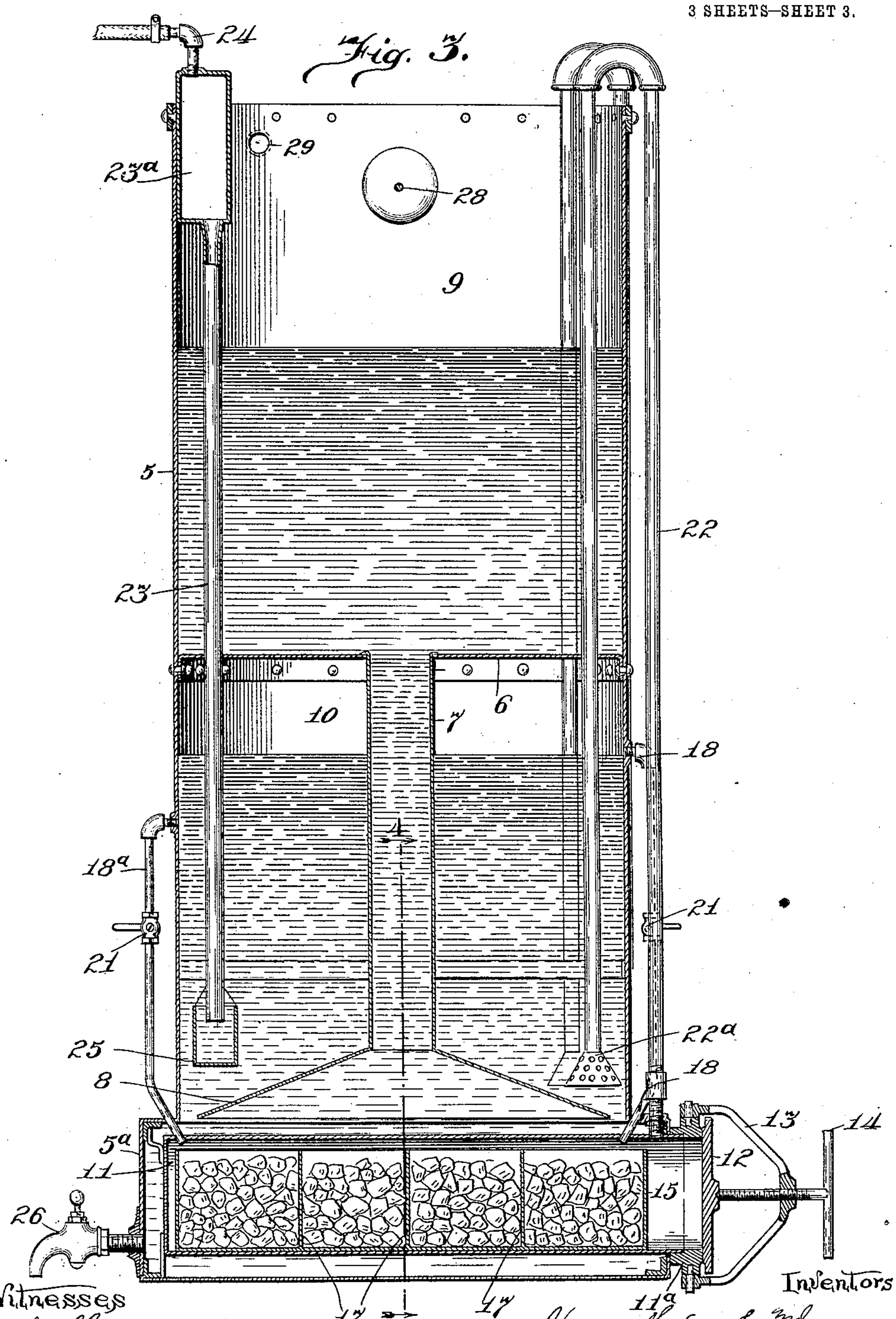
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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ACETYLENE-GENERATING APPARATUS.

1,050,139. Specification of Letters Patent. Patented Jan. 14, 1913.

Application filed December 7, 1911. Serial No. 664,344.

To all whom it may concern:

Be it known that we, HENRY W. JACOBS and HOWARD H. LANNING, citizens of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Acetylene-Generating Apparatus, of which the following is a description, reference being had to the accompanying drawings, which form a part of our specification.

The invention relates more particularly to apparatus wherein acetylene is generated from calcium carbid through the action of feeding water to the calcium carbid.

The object of the invention is the production of a single or unitary structure suitable for portable or stationary generators, wherein the generation of acetylene will be automatically controlled by the rate of consumption of the acetylene, so that the gas will be delivered at a constant predetermined pressure under all conditions of service. The operation of the apparatus is such that the quantity of gas stored up within the apparatus, in order to provide for a continuous flow equal under all conditions of service, will be reduced to the minimum.

A further object of the invention is the production of apparatus whose operation will be absolutely continuous, and which is so constructed that escape of an undue amount of acetylene, as well as the introduction of an undue amount of air into the apparatus, will be prevented during the removal of the spent carbid and the renewal of the charges.

Another object of the invention is the production of apparatus wherein it will be impossible to confine acetylene within any part thereof under more than normal pressure; and wherein the generation will be automatically controlled; thus eliminating mechanical regulating devices, except in places where the use of such devices would insure greater safety and reliability, but where their failure to act properly would in no way affect the safety of the apparatus.

The various advantages, together with other advantages inherent in the device, will be more readily understood from the following detailed description of the accompanying drawings, wherein:—

Figure 1 is a front elevation of the apparatus with a portion of the side wall of the tank shown broken away in order to more clearly illustrate the position of the discharge conduit or pipe. Fig. 2 is a top plan view of the apparatus shown in Fig. 1. Fig. 3 is a longitudinal vertical sectional view taken on the line 3—3 of Fig. 2, looking in the direction of the arrows. Fig. 4 is a longitudinal sectional view taken on the line 4—4 of Fig. 3, of the lower portion of the apparatus, and looking in the direction of the arrow.

In the exemplification of the invention as disclosed in the drawings, the apparatus comprises a tank 5 of suitable construction, which is divided into several compartments by the partition 6. This partition is provided with a central opening in which is secured the downwardly extending conduit 7 provided at its lower end with the hood shaped member 8, see Figs. 3 and 4. The hood shaped member 8 is preferably made of a size to extend almost up to the side walls of the tank 5, as clearly shown in the drawings. The lower part of the tank 5 is made of a convenient shape, preferably rectangular as shown at 5^a, so as to provide for the generating cells, hereinafter to be described. The upper part of the tank 5 constitutes a water supply compartment 9, while the portion beneath partition 6 constitutes the gas-receiving chamber or gasometer 10.

The lower part 5^a of the vessel is provided with the generating cells,—of which any sufficient number may be employed, the drawings for illustration showing three cells,—which consist preferably of the cylindrical shaped vessel 11, which is suitably supported within the tank so as to leave sufficient space beneath the bottom thereof, as clearly shown in Figs. 3 and 4, with one end of the vessel protruding out of the casing 5^a. This end of the cell is preferably provided with the metallic flange or member 11^a, which is intended to provide a seat for the cover 12. Pivotally secured to the portion 11^a is a yoke 13, so formed and secured to the cell that it may be swung to either side in order to clear the cover and permit of its removal as well as the contents of the cell. Extending centrally through the yoke 13 is a pressure applying device or screw member 14, the threads thereof mesh with threads in the central opening in the yoke, while the inner end of member 14 is preferably shown as entering a socket in the center of the cover 12. The cover and the pressure applying mechanism are intended to provide a gas-tight closure for the cell; if desired, the inner side of the cover may be provided with a gasket at the point where it engages the end of the cell. Each cell is provided with a calcium carbid-receiving tray or drawer 15, whose shape is preferably made to conform with the inside contour of the cell. The upper part of the tray or drawer is so formed as to leave a passage between the upper part of the tray and the wall of the cell, as clearly shown in Figs. 3 and 4.

The trays or drawers 15 are preferably divided into compartments which have communication with each other only at the top by means of a notch or cut-out portion, as shown in Fig. 4 at 16, provided in the upper part of the intermediate vertically extending partitions 17.

Leading from various points in the gas-receiving chamber or gasometer 10 are water conveying or feed pipes 18 and 18ª, see Fig. 3, whereby water is conveyed to the front and rear ends, respectively, of the generating cell 11.

It is understood, of course, that where a number of generating cells are employed, an additional number of water conveying pipes must be had, which are preferably arranged in the manner just described, that is, the pipes lead preferably to both ends of the cells. For example, the drawings show an apparatus provided with three generating cells, with pipe 18 leading to the front of the center cell, pipe 18ª leading to the rear of said cell, pipe 19 leading to the front of an adjacent cell, pipe 19ª leading to the rear part of said cell, and pipe 20 leading to the front of the third cell, with pipe 20ª leading to the rear part of said cell.

As clearly shown in the drawings, Figs. 1 and 3, the pipes connect with the gas-receiving chamber at points occupying different horizontal planes. Each water-conveying pipe is provided with a suitable valve, as at 21, so that flow of water therethrough may be shut off when desired.

The generating cells are each provided with a gas-conveying pipe or conduit 22 which is preferably made to extend up above the water level in the tank 5, over the top thereof and down inside the tank to a point near the bottom of the gas-receiving chamber, as clearly shown in Figs. 3 and 4. The lower end of each pipe 22 in the gas-receiving chamber 10 is provided with a perforated inverted funnel shaped member 22ª. A gas-tight connection is, of course, preferably formed between the pipes 22 and the partition 6 in the tank, so that gas will not be permitted to escape into the upper compartment at this point.

Leading from a point near the bottom of the gas-receiving chamber 10 is a pipe 23 whose upper end is provided with a chamber or enlargement 23ª, see Fig. 3, from which chamber pipe 24 extends to any suitable point in the atmosphere. The lower end of pipe 23 is shown provided with a cup or vessel 25, whose upper edge is somewhat above the lower orifice of pipe 23, as clearly shown, so as to provide a water seal for pipe 23, whereby the gas, under normal conditions, will be prevented from escaping up through pipe 23 and out through pipe 24.

The lower part 5ª of the tank may be provided at a suitable point with a cock as at 26, see Figs. 2 and 3, whereby all the water in the tank 5 may be discharged when it is desired to clean the tank.

The upper part of the tank 5 is provided with a water supply pipe 27 which is controlled by the ball valve 28; and at a suitable point in the upper part of the tank, an overflow pipe 29 is provided, so as to prevent water overflowing the top of the tank.

At a suitable point, leading from the upper part of the gas-receiving chamber 10, is a discharge pipe 30 provided with a suitable valve, as at 31. In Fig. 1 this discharge pipe is shown extending out through the side of tank 5 at a point above the horizontal partition 6, which partition is shown provided with an opening into which the end of discharge pipe 30 is secured. The pipe 30 is intended to convey the acetylene to the point of consumption.

The operation of the apparatus is as follows: Water is permitted to enter through the supply pipe 27 into the water supply compartment 9, from whence it will flow down through the conduit 7 into the lower part of the tank where it will submerge the generating cells 11 and rise within the gas-receiving chamber or gasomter 10. As the water rises in chamber 10 it will be brought to the points where the water-supply pipes for the respective generating cells communicate with chamber 10; that is, the water will first reach a level where it will flow through the pipe whose connection with the gasometer is at the lowest horizontal plane; for example, in Fig. 3, the water will first enter pipe 18ª and be discharged into the rear part of generating cell 11; it being understood, of course, that the valves 21 in the different feed pipes have first been opened. As soon as the water is discharged into the cell it is evident that generation will take place in the last compartment of tray 15 and the generated gas will flow upward through pipe 22 and be liberated in bubbles through member 22ª in the lower part of the gas-receiving chamber or gasometer 10. The liberated gas is compelled to rise through the water in chamber 10 and be cleansed thereby. As the quantity of gas accumulates in the upper part of chamber 10, pressure will be exerted on the water in this chamber until the accumulated gas has been consumed. As soon as the water in the last compartment of the tray rises to the top of the partition 17, it will be permitted to flow through the notch 16 into the adjacent compartment and induce generation of gas in said compartment. If the water continues to rise in the gas-receiving chamber 10 it is evident that water will successively flow through the different pipes leading from said chamber to the different cells or parts of the cells, so that by the time the water has reached a point in proximity to the top of the chamber or gasometer 10, water will be discharging into all of the cells and at both ends thereof, thereby inducing generation in all the cells. The gas generated in the different cells will be conducted therefrom through the pipes 22 to the bottom of the gas-chamber or gasometer 10. The accumulation of the gas in the upper part of chamber 10 will, as previously stated, displace the water in the chamber and force it to return through the conduit 7 to the upper compartment 9. As the water recedes in the gasometer, by reason of the gas accumulating therein, the water will successively reach levels below the points of connection between the gasometer and the different feed pipes leading to the generating cells. With the water supply thus successively cut off from the various generating cells, it is evident that generation of acetylene will also be gradually diminished.

It is evident from the construction shown and described, that if the consumption of gas is less than the amount of generation, the chamber 10 will become so filled with gas that the water will be displaced to a point beneath the lowest connection, thus automatically stopping entirely the feeding of water to the cells and hence preventing generation of acetylene.

In the event that the generation of acetylene is beyond the capacity of the gasometer, the water will be forced out of the gasometer and up through the conduit 7 until the level of the water in the chamber 10 reaches the trap or seal 25 at the lower end of blow-off pipe 23; the pressure of the gas will then cause the water seal in vessel 25 to become broken and allow the excess gas to escape from the gas chamber 10 through blow-off pipe 23. Any water that may be carried out through pipe 23 with the gas will be trapped in chamber 23ª and be allowed to flow back into the gas chamber 10 as soon as the pressure of the escaping gas diminishes. When a sufficient quantity of gas has been blown off to reduce the pressure within the gasometer or chamber 10, it is evident that water will again begin to flow into the chamber 10 until its level is above the top of vessel or seal 25 and thereby automatically restore the water seal and prevent the further escape of gas. As the gas contained in chamber 10 is drawn off through pipe 30 and consumed, the water level in chamber 10 gradually rises, and as the orifices of the feed pipes leading therefrom are successively submerged, a resumption of generation of acetylene is again automatically brought about in the respective generating cells 11.

It will be readily understood from the foregoing description that merely the requisite number of generating cells, or the requisite number of compartments in any one cell necessary to supply the amount of acetylene required will be brought into operation; that is, if the gas generated by one cell, or by one compartment of a cell, is sufficient to meet the demands, the water level in the gas chamber 10 will not rise above the lowest pipe, or set of pipes, as the case may be, leading from the gas chamber, but will remain stationary at this point until all the carbid in the cell, or in the compartment or compartments of one or two cells fed by the lowest set of pipes, has become exhausted, or until the rate of consumption of the gas increases to such an extent that said cell, or one or two compartments of one or more cells, cannot meet the demand. When this situation arises, the decreased pressure of gas in the gasometer on the water will allow the water to rise to a higher level, causing the water to flow through an additional feed pipe or set of pipes, whereby generation in one or more cells will be induced as may be required to supply the demand. It is perfectly apparent, therefore, that the operation and control of the generating apparatus is entirely automatic, and the generation is automatically adjusted to suit the rate of consumption within the limits of the capacity of the apparatus. If the volume of water displaced by the accumulated acetylene in the gas chamber 10 induces a supply in chamber 9 beyond its capacity, the excess water will be allowed to discharge through over-flow pipe 29, and the rising water will compel valve 28 to shut off supply pipe 27. As the water supplied from chamber 9 also submerges the generating cells in the lower part of the apparatus and acts as cooling water for the cells, the lower part of the conduit 7 is provided with the hood shaped member 8 for the purpose of directing most of the warmed water which will rise from around the cells and compel it to flow upward through conduit 7 into water supply compartment 9, instead of allowing the warmed or heated water to accumulate in the upper part of gas-receiving chamber 10 beneath the body of gas stored therein.

As the calcium carbid in any one or more of the generating cells becomes consumed or spent, said cell or cells can be replenished without in any way interfering with the operation of the apparatus, because the cells are all independent of each other, being separately connected with the gas-receiving chamber 10. When it is desired to replenish the carbid in a cell, the valves 21 in the feed pipes leading from the gas-receiving chamber to said cell, are first closed so as to shut off a flow of water therethrough, after which the cover 12 of said cell may be opened by releasing pressure mechanism 14 sufficiently to permit the yoke 13 to be swung to one side out of the way. This will permit the tray 15 of the cell to be withdrawn, the spent carbid removed therefrom and a fresh supply of calcium carbid placed in the different compartments of the tray. The tray may then be reinserted in its cell, the cover firmly clamped in place, and the valves 21 in the respective feed pipes of said cell opened, whereby the cell will be placed in condition for generation as soon as it is automatically brought into play in the manner previously described.

When it is desired to clean out the apparatus, the valve or cock 26 in the bottom of the apparatus is opened, allowing all the water to escape from the entire tank 5, it being understood, of course, that inlet valve in pipe 27 has first been shut off.

It is apparent from the construction shown and described, that the capacity of the apparatus may be increased or diminished without the necessity of altering the upper portion of the tank 5, as generating cells of different capacities may be used interchangeably, and the generator units may either be increased or diminished to suit the demands and requirements. For example, the same result can be acquired by either increasing or decreasing the number of generator units or cells, or by increasing or decreasing the size of the generating cells and their calcium carbid-retaining trays. When the number of generating cells is either increased or decreased, it will be understood, of course, that the number of feed-water pipes leading from the gas chamber must be either increased or decreased, respectively; it being understood also that the pipes should be arranged so as to connect with the gasometer at points occupying different horizontal planes, whereby they will become effective with different levels of water in gas-receiving chamber 10, as has been previously described.

By liberating the generated gas in the bottom of the gas-receiving chamber or gasometer 10,—which chamber under normal conditions is more or less filled with water,—it will be compelled to rise upward through the water to the upper part of the chamber; the passing of the gas through the water will necessarily clean it and compel any solids or impurities to remain in the water. The flow of gas from the gas chamber 10 is, of course, controlled by the valve 31 in discharge pipe 30.

Where the gas is to be led to or consumed at a point beneath the level of the gas-receiving chamber, the discharge pipe 30 may be provided with a trap or chamber similar to chamber 23^a in blow-off pipe 23, so that any water that may tend to pass out of the chamber with the gas will be collected in the trap and the gas be permitted to flow to the point of consumption.

The construction shown and described sets forth the invention in its simplest form, but it is apparent that a number of changes may be made in certain elements without departing from the spirit of the invention, and we do not wish to be understood, therefore, as limiting ourselves to the exact construction shown and described, but

What we claim as our invention and wish to secure by Letters Patent is:—

1. An apparatus of the class described, comprising a single tank provided with a water chamber and a gas receiving chamber having communication with each other, one or more calcium carbid receiving cells mounted in the lower part of said tank, a series of pipes leading from the gas receiving chamber to the cells for conveying water from the former to the latter, said pipes being arranged in pairs with one pipe leading to the front end of a cell and the other pipe leading to the rear part of a cell, the connections between the pipes of a pair and said gas receiving chamber being in different horizontal planes so that generation of gas at different points may be induced, and means for conveying the generated gas from the cells to said gas receiving chamber, said means being arranged to liberate the gas beneath the normal water level in said chamber.

2. An apparatus of the class described, comprising a single tank provided with a partition whereby the interior is divided into a water supply chamber and a gas receiving chamber, a conduit extending from the water supply chamber into the lower part of the gas receiving chamber for the purpose of delivering water from the water chamber into the gas receiving chamber, one or more calcium carbid receiving cells mounted in the lower part of the gas receiving chamber so as to be surrounded by the water in said chamber, means intermediate of the gas receiving chamber and said cells whereby water is conveyed from said chamber to different points in the cells, the relation between the means and said chamber being such that the pressure of the gas in the chamber will control the flow of water through said means, means whereby the generated gas is conveyed from the cells into the gas receiving chamber at a point be-

neath the normal water level therein, said means being so arranged that the flow of water from the gas receiving chamber to the cells is automatically prevented, and means whereby the water heated by the generating cells is directed through said conduit into the water supply chamber.

3. An apparatus of the class described, comprising a single tank provided with a gas receiving chamber and a water chamber, means whereby the water is allowed to flow from the water chamber into the gas receiving chamber, one or more calcium carbid receiving cells arranged in the lower part of said tank so as to be submerged by the water supply therein, a series of conduits whereby water is conveyed from the gas receiving chamber to the cells, said conduits being arranged in pairs and adapted to convey water to different points in said cells whereby generation of gas at different points in the cells may be induced, and means whereby the generated gas is conveyed from the cells to the bottom of the gas receiving chamber, said means being so arranged that the flow of water from the gas receiving chamber to the cells is automatically prevented.

4. An apparatus of the class described, comprising a single tank provided with a water chamber and a gas receiving chamber, a conduit extending from the water chamber into the lower part of the gas receiving chamber for the purpose of delivering water from the former to the latter, one or more calcium carbid receiving cells mounted in the lower part of the gas receiving chamber so as to be surrounded by the water in said chamber, means intermediate of the gas receiving chamber and the cells whereby water is conveyed from said chamber to different points in the cells, the relation between the means and said chamber being such that the pressure of the gas in the chamber will control the flow of water through said means, means whereby the generated gas is conveyed from the cells into the gas receiving chamber and so arranged that flow of water therethrough to the cells is automatically prevented, means whereby the water heated by the generating cells is directed into the water chamber, and blow-off means provided with an upwardly directed orifice at the lower end thereof whereby excess gas will be discharged from said chamber at a level sufficiently above the water in said chamber and prevent the mingling of water with the gas passing through said means.

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