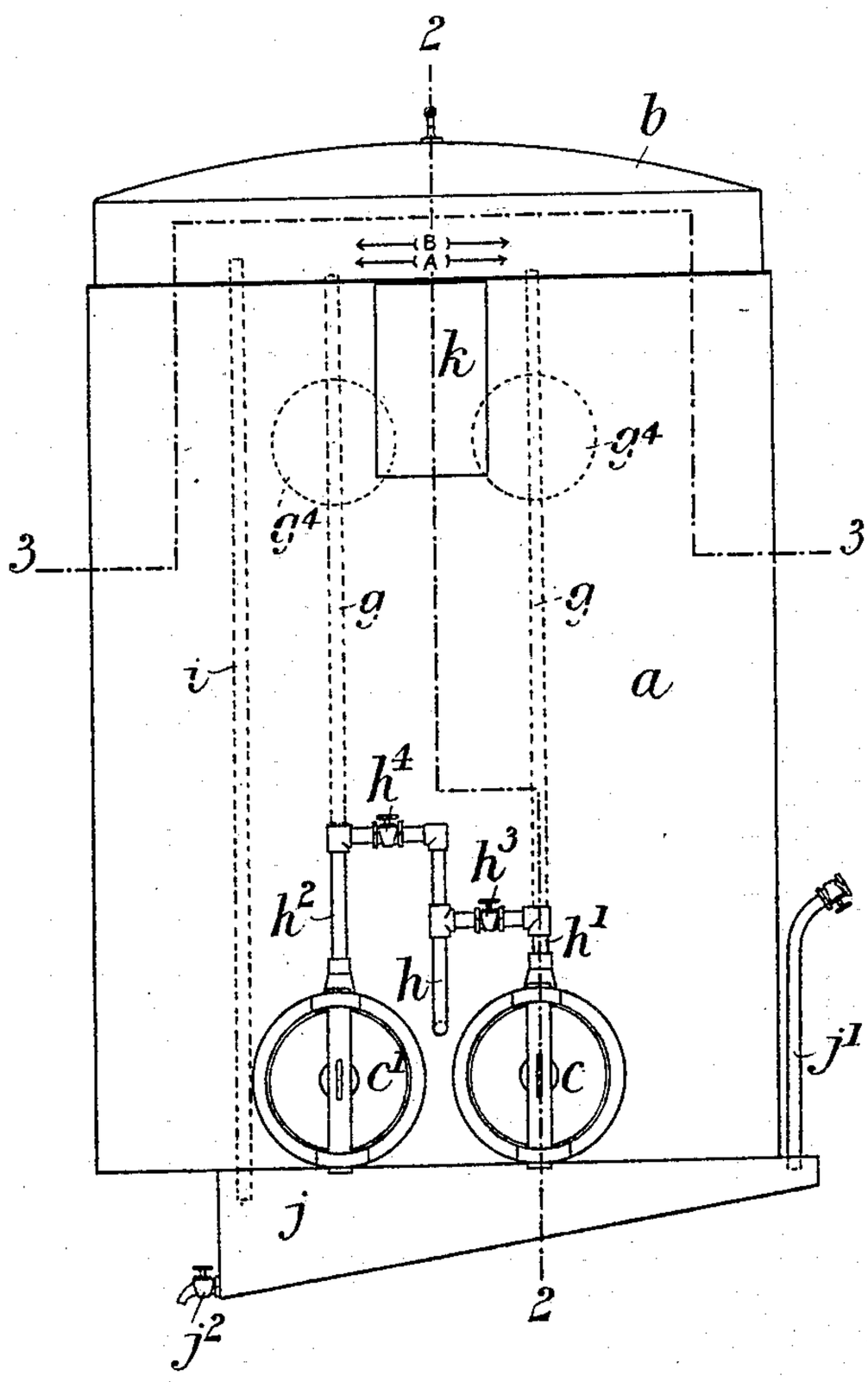
(No Model.) 3 Sheets—Sheet 1.

# F. S. THORN & C. HODDLE.

## APPARATUS FOR GENERATING ACETYLENE GAS.

No. 604,199. Patented May 17, 1898.

*Fig. 1.*

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(No Model.) 3 Sheets—Sheet 2.

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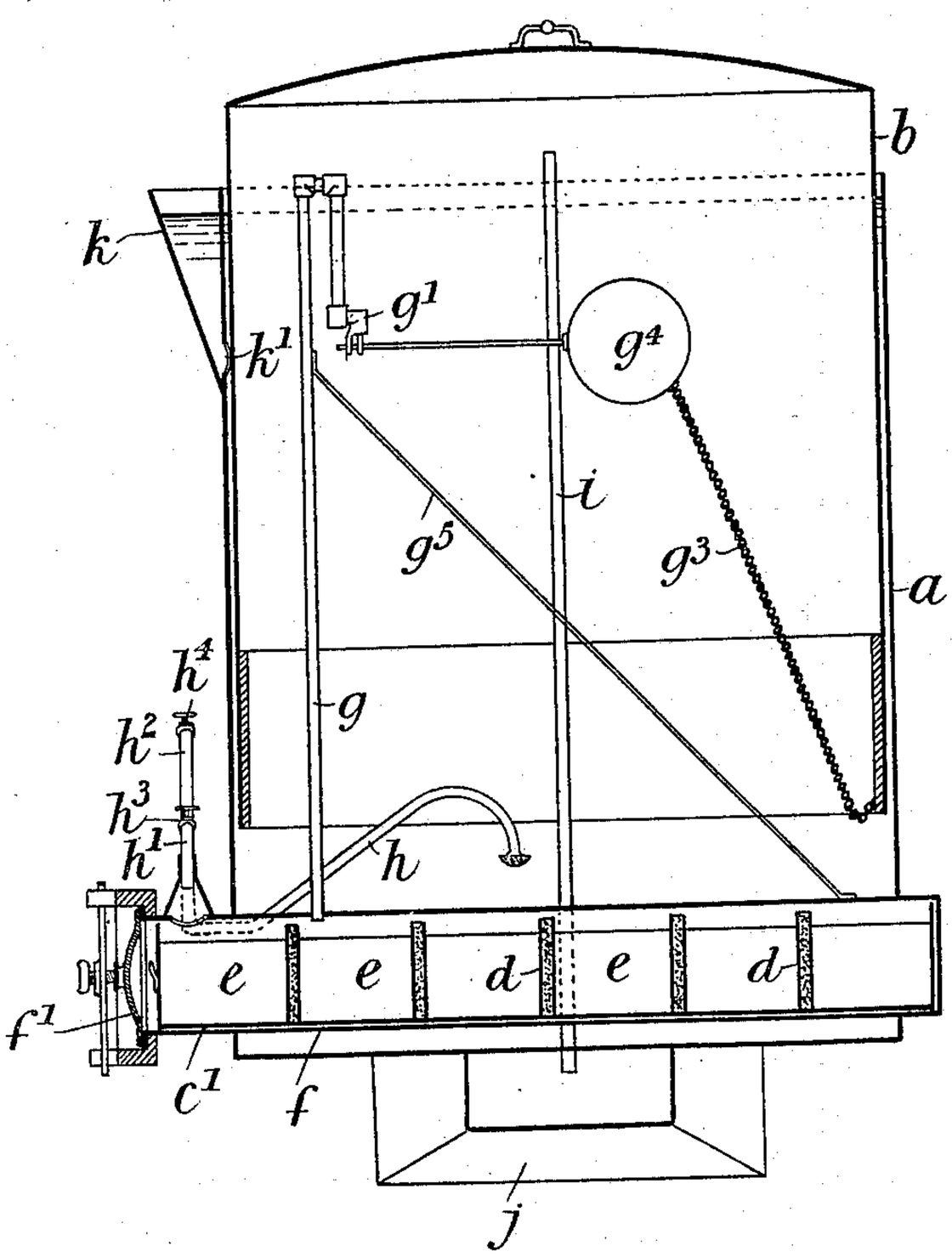
## APPARATUS FOR GENERATING ACETYLENE GAS.

No. 604,199. Patented May 17, 1898.

*Fig. 2.*

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(No Model.) 3 Sheets—Sheet 3.

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## APPARATUS FOR GENERATING ACETYLENE GAS.

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*Fig. 3.*

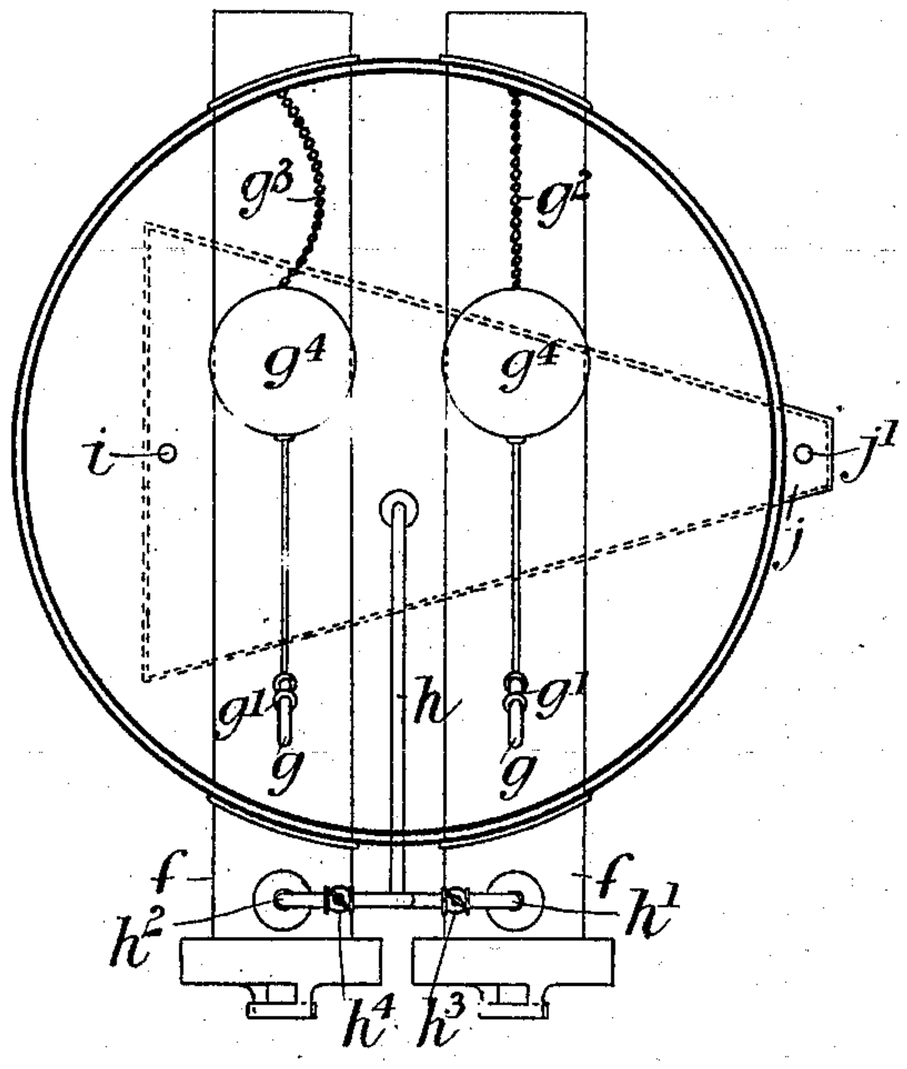



*Fig. 6.*

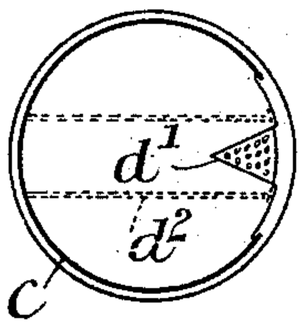



*Fig. 4.*

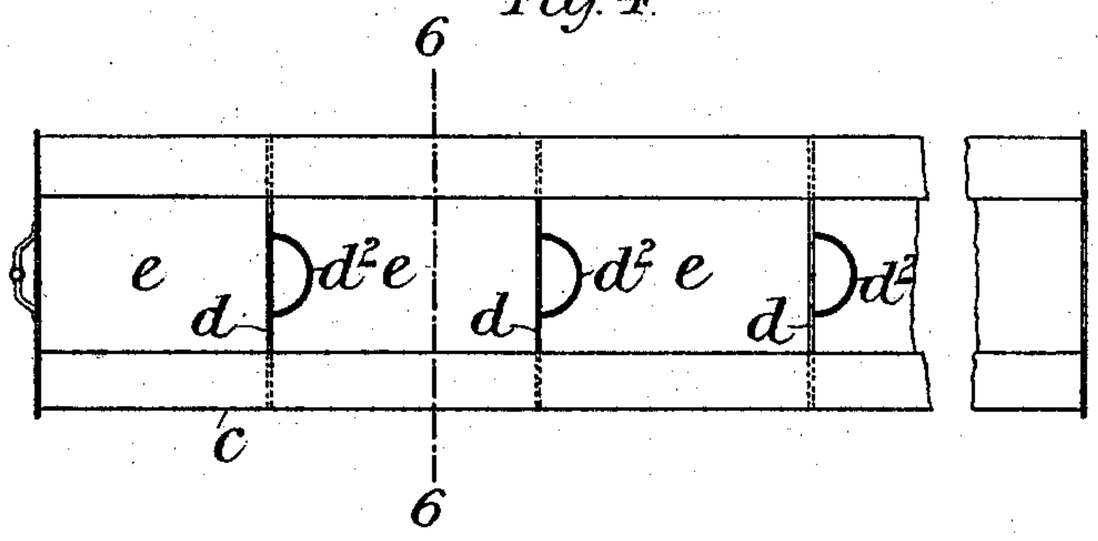
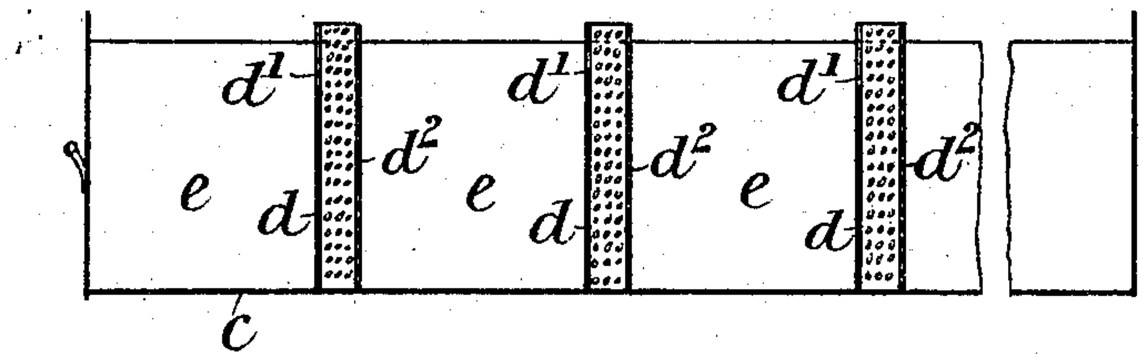



*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

FREDERICK SANSOM THORN AND CHARLES HODDLE, OF LONDON, ENGLAND.

## APPARATUS FOR GENERATING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 604,199, dated May 17, 1898.

Application filed November 21, 1896. Serial No. 612,988. (No model.) Patented in England July 18, 1896, No. 15,962; in France March 22, 1897, No. 265,252; in Belgium June 2, 1897, No. 128.632, and in Canada December 1, 1897, No. 58,234.

*To all whom it may concern:*

Be it known that we, FREDERICK SANSOM THORN and CHARLES HODDLE, subjects of the Queen of Great Britain, residing at London, England, have invented new and useful Improvements in Apparatus for Generating, Storing, and Cooling Acetylene Gas, (patented in Great Britain, No. 15,962, July 18, 1896; in France, No. 265,252, March 22, 1897; in Belgium, No. 128,632, June 2, 1897, and in Canada, No. 58,234, December 1, 1897,) of which the following is a specification.

This invention relates to improvements in apparatus for generating, storing, and cooling acetylene gas of the kind wherein a gas-holder or gasometer is used, and has for its object to provide simple and efficient apparatus whereby the supply of the gas is automatically regulated in accordance with the consumption.

According to our invention we provide, in connection with the gas-holder or gasometer, one or more calcium-carbid containers. These carbid-containers are in the form of trays, which slide and can be hermetically closed in cylindrical or other holders and which are divided transversely into a number of adjacent compartments by partitions in such a manner that when water has filled the first compartment it flows over into the second, and in order that the water shall be evenly distributed and fill the said second and following compartments we provide gauze or perforated funnels or tubes, into which the water flows from one compartment to the next. The sliding cylinder of the gas-holder is connected by a chain or other suitable means to a ball-cock or other suitable valve fitted to a pipe inside and near the top of the gas-holder and in communication with the carbid-container, and a second pipe, with stop-cock attached, passes through from the outside of the said container into the bottom of the gas-holder. A gas-pipe which acts as a condenser passes down from the inside of the top of the gas-holder, through the water in the same, into a cooling-chamber preferably secured to the bottom of the apparatus, which cooling-chamber is provided with an outlet-pipe for the gas and an outlet-cock for draining off the condensed water.

In the accompanying drawings, Figure 1 is an elevation of apparatus constructed according to our invention. Fig. 2 is a vertical section on the line 2 2 of Fig. 1. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a plan of the calcium-carbid container. Fig. 5 is a longitudinal section of the same, and Fig. 6 is a transverse section on the line 6 6 of Fig. 4.

*a* is the gas-holder or gasometer, and *b* the sliding cylinder of the same.

*c c'* are the calcium-carbid containers, (in the drawings two of these containers are shown, although it will be obvious that any suitable number can be used,) in the form of trays of a cylindrical shape, and *d d* are the partitions which divide the said containers into a series of adjacent compartments *e e*. The trays *c c'* do not form complete cylinders, as shown clearly in Figs. 4, 5, and 6, and the upper end of each circular partition *d* is provided with a V or other suitably shaped notch or opening *d'*, the lower end of which is just below the upper edges of the tray *c*, so that when the water which flows into the first compartment *e* has risen to the level of the lower end of the notch *d'* in the partition separating this compartment from the next it can flow through the said notch into the next compartment, as hereinafter more particularly described.

$d^2$ are the gauze or perforated funnels or tubes, which in the drawings are shown of semicylindrical shape and which are arranged in front of the notched portion of each partition and extend to the bottom of the container, as shown clearly in Figs. 4, 5, and 6. These gauze funnels or tubes have for their object to cause the water which flows from one compartment to another to flow over the whole area of the calcium carbid in the said compartment instead of flowing over the surface alone, and thereby to distribute it evenly.

Each compartment *e* is made of such a size that it holds a quantity of calcium carbid sufficient to generate not more than enough gas to fill the gas-holder, and the carbid-containers *c* are, as shown, located in the bottom of the apparatus, so that they are surrounded and cooled by the water in the same.

*f f* are the cylindrical holders in which the calcium-carbid containers slide, the said hold-

ers being in the form of tubes passing through the gas-holder *a*. To insure that the calcium-carbid containers *c* shall be hermetically inclosed in the holders *f*, we provide air-tight covers *f'*, of ordinary construction, designed to be screwed tightly against the said holders *f*, as shown clearly in the drawings.

*g g* are the pipes passing up from the carbid-containers through the gas-holder to nearly the top of the same, and *g'* are the ball-cocks fitted to the upper ends of the said pipes.

$g^2$ $g^3$ are the chains by which the balls or floats $g^4$ of the ball-cocks *g'* are connected with the sliding cylinder of the gas-holder. The chain $g^2$ is shorter than the chain $g^3$, so that when the sliding cylinder *b* descends the ball-cock $g^4$, to which it is attached, is opened first, as hereinafter described. The pipes *g g* are bent at their upper ends after the manner of a siphon and so that the bend is situated above the level of the water in the gas-holder. By this construction the gas in the gas-holder cannot flow down the pipes *g g* into the containers.

$g^5$ $g^5$ are struts for supporting the pipes *g g*.

*h* is the pipe by means of which the bottom of the gas-holder is put into communication with the first compartment *e* of each of the calcium-carbid containers *c c'*. This tube *h*, which at its inner end is funnel-shaped and covered with fine gauze, passes through the gas-holder and then divides into two branches $h'$ $h^2$ at different levels to supply the two containers *c c'*, respectively. The two branches $h'$ and $h^2$ are provided with cocks or valves $h^3$ $h^4$, respectively.

*i* is the gas-pipe which passes from the top of the gas-holder, above the level of the water, down through the water, and *j* is the cooling-chamber, into which the said pipe *i* opens and which is preferably, as shown, secured to the bottom of the apparatus. The pipe *i* as it passes down through the water serves as a condenser for the gas when it flows through it into the cooling-chamber *j*, in which the moisture condensed from the gas settles.

*j'* is an outlet-pipe from the condenser, the said pipe being provided with a cock for regulating the supply of the gas for consumption, and $j^2$ is the cock for draining off the condensed water.

*k* is a funnel or lip for filling the gas-holder with water and for indicating the level of the water in the same, and *k'* is an orifice in the side of the gas-holder *a*, through which the water flows into the gas-holder from the funnel.

The operation of the apparatus is as follows: The containers *c* and *c'* being filled with calcium carbid and the sliding cylinder *b* of the gas-holder being in its lowest position, the cocks $h^3$ and $h^4$ are opened, so that communication is opened between the interior of the gas-holder and the first compartment *e* of the carbid-containers *c c'* through the pipe *h* and branches $h'$ $h^2$. As before described, the sliding cylinder *b* opens the cocks *g' g'* when at the bottom of its course, so that water now flows through the tube *h* from the bottom of the gas-holder into the said first compartment *e* of the carbid-container *c* in the holder, the air in the same being forced out through the pipe *g* and cock *g'*. No water flows as yet into the container *c'*, as the branch $h^2$ is at a higher level than the branch $h'$. Acetylene gas is immediately generated in the container *c* and flows through the pipe *g* and ball-cock *g'* into the gas-holder *a*, whereby the sliding cylinder *b* of the same is lifted. When the sliding cylinder has been lifted to a certain height, the chain $g^2$, connected to the ball $g^4$, allows the said ball to rise sufficiently to close the cock, and thus prevent the gas generated escaping through the pipe *g*. As the outlet through the pipe *g* is closed, the gas forces its way through the pipe *h* and bubbles up through the water into the gas-holder. The inflow of water through this tube *h* is therefore stopped by the flow of the gas through the same until the sliding cylinder *b* again falls (as the gas is consumed) and opens the ball-cock, so as to allow the gas to again pass through the pipe *g* and enable more water to flow into the container. With this arrangement it will be obvious that the water, when it has used up all the calcium carbid contained in the first compartment *e* of the carbid-container, will flow through the V-shaped notch *d'* in the partition *d* dividing the said compartment from the next, and will thus commence to act upon the carbid contained in this next compartment, and so on until the whole of the carbid in the container has been used. When this is the case with the container *c*, the sliding cylinder *b* gradually descends until the ball-cock in connection with the container *c'* is opened, so as to allow the water to flow to the said container *c'* through the branch $h^2$. The container *c* can thus be removed from its holder and replenished after turning off the cock $h^3$ while the container *c'* is generating gas.

The gas stored up in the gas-holder passes down through the pipe *i*, where any moisture contained therein is condensed, and thence into the cooling-chamber *j*, where the condensed moisture is deposited and from which the gas is drawn off through the pipe *j'* for consumption as required.

In practice we find it advantageous to mark on the sliding cylinder *b* two lines (shown at A and B in Fig. 1) in such a position that when the line A is coincident with the upper edge of the gas-holder *a* the sliding cylinder has descended sufficiently to open the ball-cock in connection with the container *c*, while when the line B is coincident with the said upper edge of the gas-holder the other ball-cock has been opened. By this means the attendant can ascertain when the first container has been exhausted.

It will be obvious that the ball-cock *g'* can be fitted to the tube *h* and the tube *g* made to open into the upper part of the gas-holder.

By our invention it will be seen that the

carbid is not fed to the generator by the rise and fall of the gas-holder, as has heretofore been done, such generator being always full of water, but, on the contrary, the converse takes place with our apparatus, the water being conducted into a chamber full of carbid, and this is done automatically. It will also be seen that by the construction in this our application the rise and fall of a gas-holder do not merely control the supply of gas to the same, but control the flow of gas by one inlet and make or cause the pressure in the generator to overcome the pressure in the water-supply pipe *h* and the gas entering the holder therethrough, so that the inflow is not completely stopped, as heretofore, and with the consequent important result that our apparatus does not generate pressure in the generator, because the gas always has one way or passage into the gas-holder.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In apparatus for generating storing and cooling acetylene gas, the combination with a gasometer or gas-holder, and with the gas-generator having a tray for carbids within the same, such generator being located in the bottom of the gasometer and surrounded by the water in the same, of two pipes in connection with the carbid-holder or generator, one of these pipes being in communication with the gasometer below the surface of the water, and the other with the gasometer above such surface, and of means whereby the latter is closed or opened by the movement of the gasometer, substantially as described.

2. In apparatus for generating and storing acetylene gas, the combination with a gasometer or holder, and with one or more generators having carbid-containers, and located in the bottom of the gasometer, of two passages or pipes within such gasometer or holder and in connection with each generator, one of which pipes places each generator in communication with the gasometer below the surface of the water therein, and the other being also in communication with the gasometer above the surface of the water therein, of a ball-cock within the gasometer fitted to the latter pipe and controlled by the rise and fall of the gasometer-cylinder, and whereby the flow of gas is controlled by one inlet, and the gas may enter by the water-inlet and into the gasometer, and pressure in the generator is avoided.

3. In apparatus for generating and storing acetylene gas, the combination with a gasometer or holder and with one or more generators located therein, of two pipes or passages within the gasometer and in connection with each generator, one of which pipes places each generator in communication with the gasometer below the surface of the water, and the other with the gasometer above the surface of the water, of a ball-cock within the gasometer and fitted to the latter pipe, and of a chain connecting the ball-cock float with the lower part of the sliding cylinder of the gasometer and whereby when the said cylinder descends the chain opens said cock, the other pipe or passage always permitting a free inflow of gas to the gasometer, all substantially as set forth.

4. In apparatus for generating, storing and cooling acetylene gas, the combination with a gas-holder or gasometer, of gas-generating chambers provided with sliding trays serving as the carbid-containers and located within the gasometer, and two pipes within such holder, one of which makes communication with the holder below the surface of the water, and the other of which is in such communication above its surface.

5. The described carbid containers or trays divided into a series of compartments by partitions *d*, each partition having a notch or opening at its upper end as described, in combination with perforated or gauze funnels or tubes $d^2$, as and for the purposes set forth.

6. In apparatus for generating and storing acetylene gas, the combination with a gasometer, of two or more hermetically-closed generators in the bottom of the gasometer and preferably surrounded by water, a carbid-container in the form of a tray within each of such generators and having a series of communicating compartments whereby the water passes from one compartment to another, the tray being adapted to be slid horizontally within its generator and to have the carbid in each compartment, means for admitting water to the carbid-container, a gas-outlet, a cooling-chamber beneath the gasometer-tank, and a gas-pipe leading from the upper part of the gasometer and through the water therein to this chamber, and a gas-outlet pipe from such chamber, all substantially as set forth.

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