No. 647,496. Patented Apr. 17, 1900.

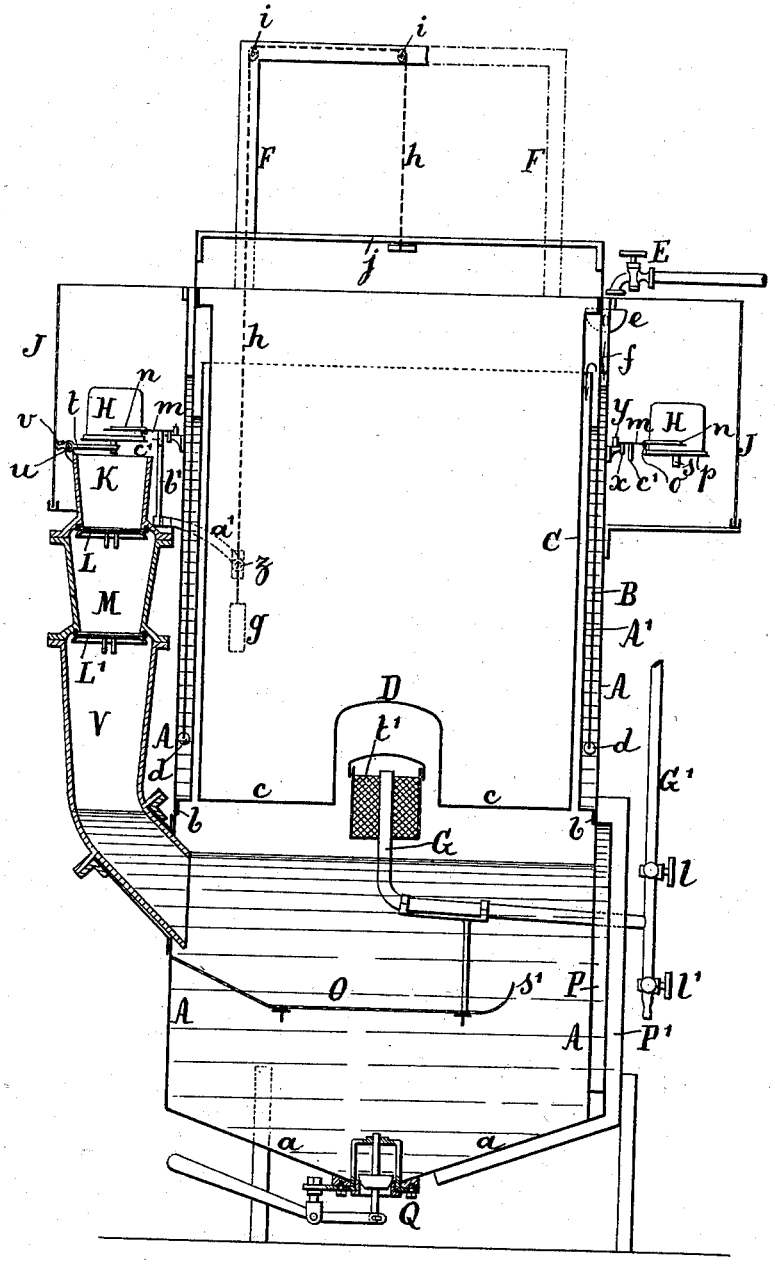
A. JAVAL.

ACETYLENE GAS GENERATOR.

(No Model.) (Application filed May 13, 1898.)

4 Sheets—Sheet 1.

FIG. 1



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No. 647,496. Patented Apr. 17, 1900.

A. JAVAL.

ACETYLENE GAS GENERATOR.

(Application filed May 13, 1898.)

(No Model.) 4 Sheets—Sheet 2.

FIG. 2

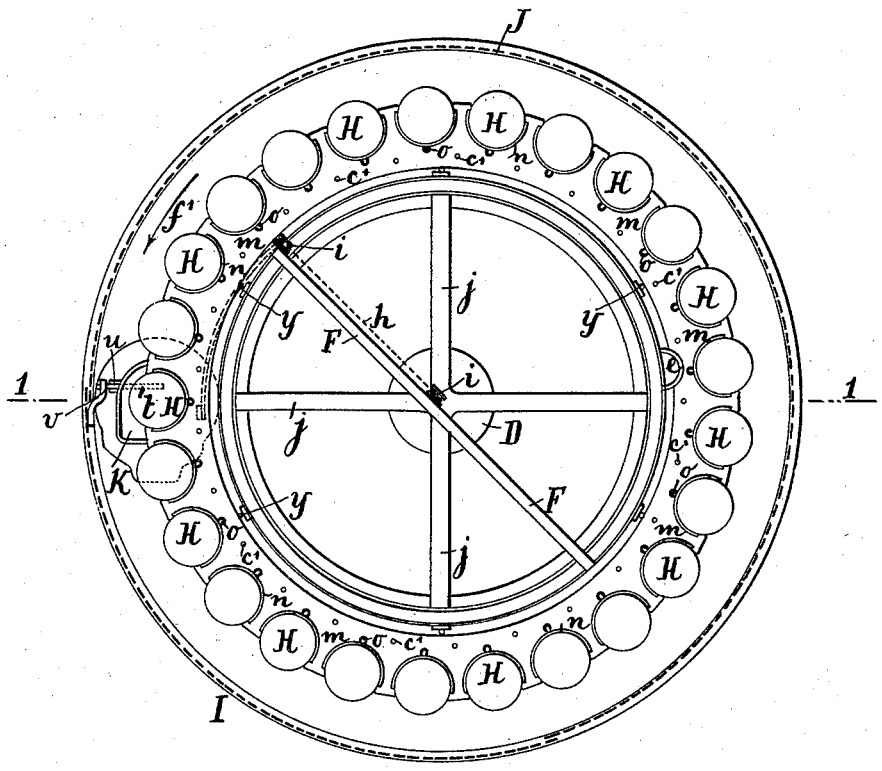


FIG. 3

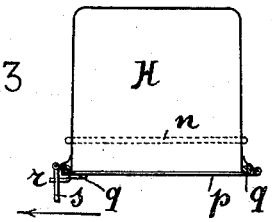


FIG. 4

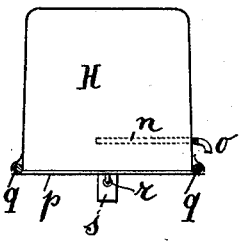
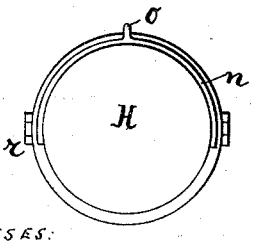


FIG. 5



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(No Model.) 4 Sheets—Sheet 3.

FIG.6

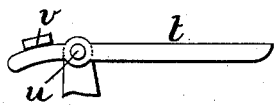


FIG.7

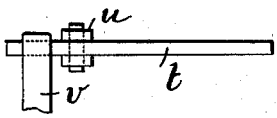


FIG.8

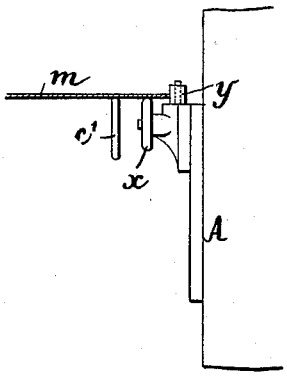


FIG.10

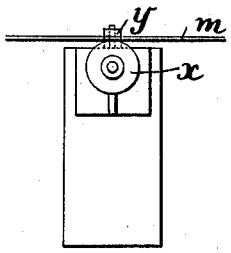


FIG.9

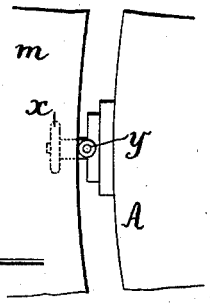


FIG.11

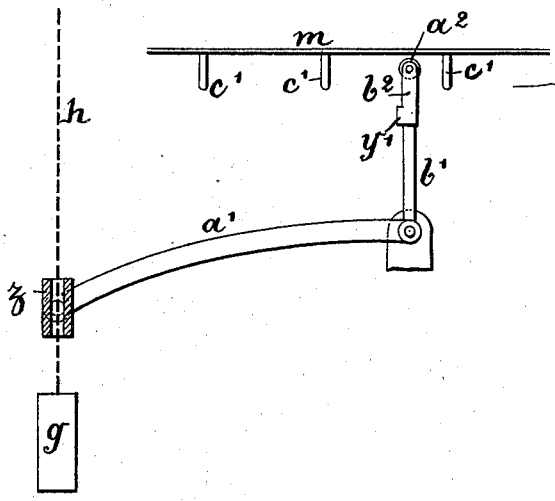
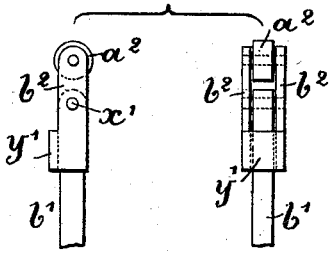


FIG.12



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No. 647,496. Patented Apr. 17, 1900.

A. JAVAL.

ACETYLENE GAS GENERATOR.

(Application filed May 13, 1898.)

(No Model.) 4 Sheets—Sheet 4.

FIG.13

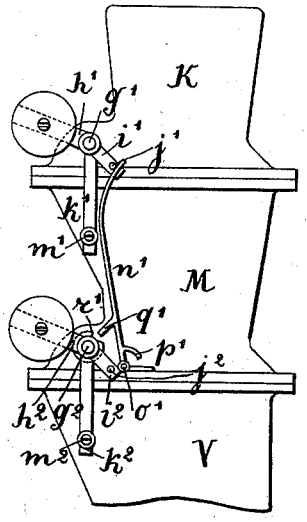


FIG.14

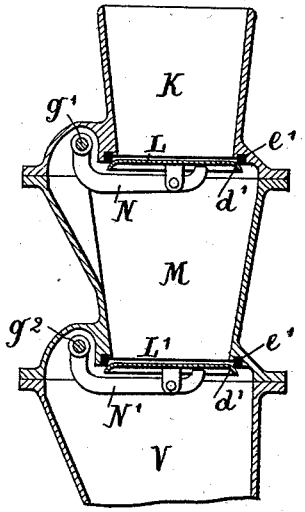


FIG.15

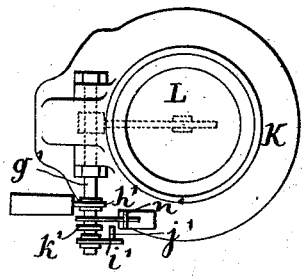


Fig. 17.

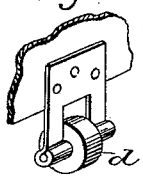
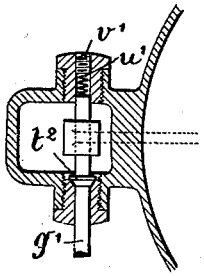


FIG.16



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UNITED STATES PATENT OFFICE.

ALFRED JAVAL, OF PARIS, FRANCE.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 647,496, dated April 17, 1900.

Application filed May 13, 1898. Serial No. 680,550. (No model.)

To all whom it may concern:

Be it known that I, ALFRED JAVAL, a citizen of the Republic of France, residing in Paris, France, have invented new and useful Improvements in Apparatus for the Production of Acetylene Gas, which invention is fully set forth in the following specification.

This invention relates to an apparatus for producing acetylene gas; and it is designed to provide a generator which works continuously and which it is not necessary to stop, either for supplying water, introducing charges of carbid, or removing the residues.

My improved apparatus is of that kind or class in which the calcium carbid falls into an excess of water; but from this point of view it has the peculiarity that the successive charges of carbid are introduced automatically in proportion as the gas produced is consumed. Condensation and evaporation of the gas are likewise automatic. Furthermore, there is always absolute protection of the charges of carbid carried by the distributer of the apparatus until the moment that these charges are introduced into the gas-generator. Finally, the number of unused charges of carbid which remain in the apparatus at any time can be readily ascertained.

The various advantages of my improved apparatus, which I have just set forth, will be readily understood from the following description with reference to the accompanying drawings.

Figure 1 is a vertical section of my apparatus on line 1 1 of Fig. 2. Fig. 2 is a plan of the apparatus. Figs. 3, 4, and 5 are views, on a larger scale, of one of the carbid-holding pockets detached, being, respectively, vertical sections at right angles and a plan view. Figs. 6 and 7 are a side elevation and a plan of the lever *l*, as hereinafter described. Figs. 8, 9, and 10 are respectively a transverse section, a side elevation, and a plan of the annular carbid-distributer, showing the means for mounting and guiding the same. Fig. 11 is a fragmentary elevation showing the means for intermittently rotating this distributer. Fig. 12 includes two detail views of the lever-arm *b'* of Fig. 11. Fig. 13 is an elevation of the feeding-hopper, Fig. 14 being a vertical section thereof, Fig. 15 a plan thereof, and Fig. 16 an enlarged horizontal section through one of the spindles thereof. Fig. 17 is a perspective view of one of the guiding-rollers *d* for the gasometer-bell.

My improved apparatus consists of a cylindrical chamber or vat A, open at the top and slightly conical at the bottom. In the upper half of this chamber is an inner wall A', which is riveted at its lower edge *b* to the walls of the said chamber A in such a way as to form an annular space for receiving water, which space is made as narrow as possible. Into the water in this space dips the wall of a bell-cover, or rather a cylindrical outer wall B, which forms part of an inverted cover C, inserted into the chamber A A'. This inverted bell-cover C is open at its upper part, and its lower part *c* has in its center a small dome, in which accumulates a part of the gas produced by the reaction of the water on the calcium carbid. With this arrangement there is at the moment of starting only a very narrow empty space between the bottom of the bell-cover and the level of the water. The large surface presented by the bottom of the bell-cover, which is in contact with the outside air, insures the condensation of the water which may be carried off by the gas.

At the lower part of the outer wall of the cover B are arranged rollers *d*, (see Fig. 17,) the axles of which are secured to the said wall B. These rollers *d* (for which projections might be substituted) serve a double purpose. They guide the said wall in the annular water-space A A', and, furthermore, they prevent the lower edge thereof from resting on the bottom *c* of such space, and thus stopping the communication of the water from one side to the other of this wall when the bell-cover C is in its lowest position. This communication of the water in the annular space from one side to the other of the outer wall B is, in fact, necessary when the bell-cover is lowered—that is to say, when no gas is enclosed in the apparatus for feeding water into said apparatus. A tap E for supplying water is arranged over a funnel *e*, which terminates in the upper part of the annular space. This water descends in said space outside said wall, as shown by the arrow *f*, flows around its base, rises inside said wall B, flows over the top of the inner wall of the chamber, and finally descends between this

latter wall and the cover C into the lower part of the chamber A.

The bell-cover C, which, as shown, works in the chamber A in the manner of a plunger-piston, is suitably weighted, so as to be balanced for the pressure which I desire to give the gas—say, for example, from fifty to one hundred and twenty millimeters of water. This may be done by placing weights on the bottom *c* of the bell.

At the upper part of the bell-cover C is fixed a cross-piece *j*, to which is attached a small chain *h*, passing over return-rollers *i*, carried on a suitable frame F and terminating in a counterweight *g*.

The mouth of the outlet-tube for the gas is arranged in or below the small dome D, in which part of the acetylene gas collects in proportion as it is formed. This outlet-tube terminates outside the apparatus in a vertical tube G′, provided with two cocks *l l′*, of which one serves to cut off the distribution of the gas and the other to clear the apparatus of the air inclosed therein before it is put into action, and in addition to provide for the outflow of any condensed water which may have been carried into said tube by the gas. The mouth of this gas-outlet tube G is arranged in the center of a perforated guard or cage *t′*, which incloses the substance intended to purify the acetylene. The upper part of this guard is of solid metal and forms an additional means of securing condensation.

The introduction of the carbid of calcium into the apparatus is effected in small successive charges in the following manner: These charges are placed in removable metal buckets H, one of which is shown separately in section on a larger scale in Fig. 3, in side view in Fig. 4, and in plan in Fig. 5. These buckets, which are filled outside the apparatus, are arranged in an inverted position on an annular distributing table or wheel *m*, of sheet metal, to which table is given at the requisite moment an annular movement through the space between two buckets for the purpose of effecting the introduction into the apparatus of a charge of carbid. The distributing-table *m* has approximately semicircular notches cut in it to receive the buckets. For this purpose each of these buckets, Figs. 3, 4, and 5, has a semicircular projection *n*, provided at *o* with a hook adapted to enter a small hole in the distributing-table *m*. The buckets are thus securely held in their notches in the distributer *m*. Each bucket is hermetically closed, being provided for this purpose with a lid *p*, hinged and resting on a strip of india-rubber fixed in a circular recess at the edge of the bucket H. The lid *p* is provided at *r* with a finger, the end of which enters a hinged flap *s*. It will be understood that the bucket being inverted, as seen in Fig. 1, it will suffice, in order to cause the charge of carbid which it contains to fall, to turn the flap *s* in the direction of the arrow shown in Fig. 3, so that the finger *r* is freed, whereupon the lid swings down and allows the carbid to fall. The flap *s* is struck when the distributing-table moves in the direction of the arrow *f″*, Fig. 2, by a lever *t*, which resists, and the movement of the table continuing said flap *s* is caused to turn on its pivot and to liberate the finger *r*, which produces the effect explained above. The lever *t* itself is mounted on an axle, and it occupies a raised position—that is, in the path of the flap *s*—only when its short arm is depressed by a tappet *v*, carried by a sliding door I, which closes an opening in an external protective grating J, which surrounds the distributing mechanism, the arrangement being such that when the door is open the lever *t* is lowered and the buckets cannot drop their contents into the apparatus, but the closing of the door causes the tappet to press down the short arm of the lever *t* to bring it up into operative position. I thus insure that even in the event of careless manipulation two or more charges of carbid cannot be emptied one after another, because the distributer *m* would have to be turned by hand.

It may happen that it is required to introduce into the apparatus a charge of carbid when the door is open, in which case, the lever *t* being then lowered the bucket will have gone by without opening. In such case it is only necessary when the bell descends to the lowest position to open by hand the bucket which is above the feeding apparatus.

The distributing-table *m* is supported (see the detail to larger scale in elevation Fig. 8, in plan Fig. 9, and in side view Fig. 10) by rollers and is guided and maintained in a concentric position by other rollers. Both these sets of rollers are mounted on one piece common to both of them, which is suitably secured on the outside of the chamber A. The advance of the distributing-table is intermittent. It takes place when, the production of gas ceasing, the bell-cover C approaches its lower position. The above-mentioned counterweight *g* on the small chain (see Fig. 1 and the front view of this detail, Fig. 11) then comes in contact with a socket *z*, through which said chain *h* freely passes. To this socket is hinged the end of a double lever *a′*, the other arm *b′* of which is vertical and acts on one or other of a series of fingers or pins *c′*, arranged below the table. The end of the vertical arm *b′* has at its end (see Fig. 12) a small roller a^2, the axle of which is carried by two small cheeks b^2, pivoted at *x′* on the said arm *b′*. A small heavy piece *y′*, which unites the two cheeks b^2, returns these into line with said arm *b′* when this arm is moved back. When the arm advances, it forms an abutment which keeps the cheeks b^2 and the arm *b′* in line, so as to act on one of the said fingers *c′*. The carbid issuing from the bucket, which is opened when the bell-cover has descended, falls into a hopper K, situated under the feeding apparatus proper. This is shown separately on a larger scale in an ex-

ternal front view, Fig. 13, in vertical section in Fig. 14, and in plan in Fig. 15. This hopper K is closed by a valve L, arranged at the upper part of a sluice-chamber M, the bottom of which is likewise furnished with a valve L'. Both the valves L L' have a falling disk or bottom which bears against an india-rubber ring e'. The upper-valve disk is held at its center by a stem hinged to an arm N, carried on an axle g', on which is keyed, outside the sluice-chamber M, a counterweight-lever h', one arm i' of which is provided with a pin or finger j'. Furthermore, the said axle g' has freely suspended upon it another lever k', on which is a weight m', forming a pendulum. The lower valve L' is supported in the same manner. The same pieces are indicated by the same letters of reference, with the addition of the index-figure 2. Each arrangement of valve L, arm N, and counterweight-lever h' is balanced. When the valve-disk commences to tilt under the weight of a charge of carbid just fallen into the hopper, the center of gravity of the arrangement, which is above the horizontal plane passing through the axle g', inclines toward the vertical and would finally tend to pass it and to open wide the valve, which would not automatically close again; but at this moment the pin or finger j' meets the pendulum k', which until then remained vertical and raises it, thereby keeping the center of gravity of the system on one side of the vertical line and moderating without shock the speed of the opening. The carbid falls, and the valve being no longer loaded is closed by the counterweights. At the side of the sluice-chamber M is arranged an arm or rod n', which is adapted to fix the axle g^2 of the lower valve L', if the upper one is not closed, the said arm or rod n', which is pivoted at o', carrying a projection p', which prevents it from passing the vertical position toward the right, Fig. 13, and a tooth q', intended to enter a notch r' in a small disk fixed on the axle g^2 of the lower valve. The said arm or rod is operated at its upper end by the finger j' of the counterweight-lever i'. When the upper valve L is open, this finger j' is removed from the arm or rod n', and the latter, compelled by its weight, engages the said notch r' by means of its tooth q'. The lower valve L' is then fixed and cannot open. When the upper valve L is closed, the finger j' turns the arm or rod n', the tooth of which, q', liberates the axle g^2 of the lower valve, which can then open. The carbid after having passed through the upper valve L, and after the same has closed through the lower valve L', descends through a conduit into the water contained in the apparatus. It is received on a grating of galvanized iron wire O, the edge of which is bent up at s', so as to retain the carbid. There is of course a small quantity of acetylene gas above the level of the water in the conduit. There is likewise some in the sluice-chamber M after the lower valve L' has been opened. This small quantity of gas might suffice to exercise a slight excess of pressure below the valves L and L', which would hinder their opening. To avoid this inconvenience, I make the stuffing-box of the two axles g' and g^2 imperfectly air-tight for the purpose of rendering the internal pressure under the valves equal to an atmospheric pressure by means of the following arrangement (shown separately to a larger scale in horizontal section in Fig. 16: Each axle g' has a conical metal collar or ring t^2, not polished and, furthermore, preferably covered with leather, so as not to close hermetically against its recess or opening in the gland. The inner end of the axle g' is pressed by a spring u', the tension of which is regulated by a screw v'.

The apparatus is provided at its lower part with a special overflow consisting of a vertical tube P, the lower end of which opens into the chamber A at the height where the lime produced by the decomposing carbid is situated. This tube P is open at its upper end and communicates with another tube P', likewise open at its upper end and of which the lower part opens above the emptying or waste trough or channel. The point of communication of the two tubes P and P' at their upper ends determines the height of the level of the water in the chamber or in that part in which it is highest—as, for example, the conduit V. As stated above, when the water is introduced through the funnel e it enters the lower part of the chamber A by flowing over the inner wall A' of the seal-chamber, and when its level has reached the height of the point of communication of the aforesaid two tubes P and P' the water charged with lime, which is at the bottom of the chamber, rises through the first tube P, overflows into the second tube P', and flows away outside in the form of a milk of lime. In this manner there is an automatic rising of the residue produced by the decomposition of the carbid. The result is that it is only at rare intervals that it is necessary to open the lower discharging or emptying valve Q, which, however, presents no special features. When the production of gas is taking place and when the level of the water falls within the chamber A to rise again in the conduit V and the first overflow-tube P, the surplus water again flows away through the overflow-tubes P and P', it being the pressure of gas which determines the difference of level of the water in the chamber and in the contiguous conduit V and tube P. Furthermore, this overflow prevents there being at any moment an excess of water in the apparatus.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. An acetylene-gas generator comprising a generator proper provided with a chute for the delivery of carbid thereto and an expansible gas-holder in combination with a device for feeding carbid in measured quantities to

said generator, said carbid-feeding device consisting of the following parts: an annular frame surrounding the gas-holder, and intermittingly rotated thereby, separate carbid-buckets each provided with a hinged bottom retained in place by a latch and carried by said annular frame and means to release said latch as each bucket is brought in succession over said chute.

2. The combination with a gas-generating chamber, of a movable distributer for the carbid, rotating intermittently around a vertical axis, detachable inverted buckets H carried thereby containing the charges of carbid, a hinged lid p for each bucket, a catch device for such lid, and means for disengaging said catch device to release the lid and dump the bucket.

3. The combination with a gas-generating chamber, of a movable distributer for the carbid, inverted buckets H carried thereby containing the charges of carbid, each formed with a projecting support n resting on said distributer, and with a retaining-hook o engaging a holder in said distributer.

4. The combination with a gas-generating chamber A and a movable gas-holder bell C, of a carbid-distributer m having successive projections c', and means for intermittently advancing said distributer, comprising a lever having connection with said bell and tilted by the descent thereof, and an arm b' in connection therewith engaging said projections.

5. The combination with a gas-generating chamber and gas-holder bell, of a distributer rotating intermittently around a vertical axis over a hopper communicating with said chamber, means operated by the descent of said bell for intermittently advancing said distributer, a series of detachable receptacles carried by said distributer containing charges of carbid, a catch device for each receptacle controlling the dumping thereof, and a disengaging device t mounted adjacent to said hopper normally in the path of said catch devices to disengage them and cause the dumping of the successive receptacles, and movable out of the path thereof to throw the dumping mechanism out of operation.

6. The combination with a gas-generating chamber and gas-holder bell, of a distributer movable intermittently over a hopper communicating with said chamber, means operated by the descent of said bell for intermittently advancing said distributer, a series of receptacles carried by said distributer containing charges of carbid, a catch device for each receptacle controlling the dumping thereof, a disengaging-lever t mounted adjacent to said hopper normally in the path of said catch devices to disengage them, a casing inclosing said distributer and having a movable door I for gaining access thereto, and a projection carried by said door for engaging said lever t, adapted when the door is closed to retain said lever in its normal position, and when the door is open to move said lever out of the path of said catch devices.

7. The combination of a gas-generating chamber A, a receiving-hopper K communicating through a sluice-chamber M by a conduit V with said generating-chamber, two swinging valves L L′ on opposite sides of said sluice-chamber, and opening downwardly by the weight of carbid upon them, means for causing the alternate automatic action of said valves whereby carbid falling onto the upper valve is admitted through it into the sluice-chamber and retained therein on the lower valve until the upper valve is closed, whereupon the lower valve opens and admits the carbid into the generating-chamber containing water.

8. The combination of a gas-generating chamber A, a receiving-hopper K communicating through a sluice-chamber M by a conduit V with said generating-chamber, two valves L L′ on opposite sides of said sluice-chamber, each of said valves mounted on an axle carrying a counterweighted lever, with an auxiliary counterweighted lever freely hung from said axle, and a tappet projection adapted to engage said auxiliary counterweight during the opening movement of the valve, so that the latter may moderate its opening movement and assist in starting its closing movement.

9. The combination of a gas-generating chamber A, a receiving-hopper K communicating through a sluice-chamber M by a conduit V with said generating-chamber, two swinging valves L L′ on opposite sides of said sluice-chamber opening downwardly by the weight of carbid upon them, and a catch device adapted to engage the lower valve but normally retracted by engagement with the upper valve, and adapted when the upper valve is opened to engage the lower valve and hold it shut until the upper valve is again closed, whereupon it releases the lower valve and permits it to open.

10. The combination of swinging valves L and L′ opening downwardly, the former mounted on a counterweighted axle g' and having a tappet-arm i', the latter mounted on a counterweighted axle g^2 having a notch r', with a catch-lever n' having a tooth adapted to engage said notch and normally retracted therefrom by said tappet-arm i' when the upper valve is closed.

11. The combination with gas-generating chamber A and hopper K communicating therewith through chamber M and conduit V, of valves L L′ on opposite sides of chamber M, and means for relieving the pressure of gas beneath said valves, consisting of non-air-tight stuffing-boxes for the axles of said valves, such stuffing-boxes provided with a spring u' and means for regulating its tension.

12. The combination with a gas-generating chamber A and gas-holder bell C, of a distributer consisting of an annular carrier m

encircling said bell, guide-rollers supporting it, carbid-receptacles H H carried by it, means in connection with said bell for advancing it intermittently, a hopper K communicating with said chamber, and means for dumping said receptacles successively into said hopper.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

ALFRED JAVAL.

Witnesses:
EDWARD P. MACLEAN,
ALEXANDRE MATHIEU.