No. 681,168. Patented Aug. 20, 1901.

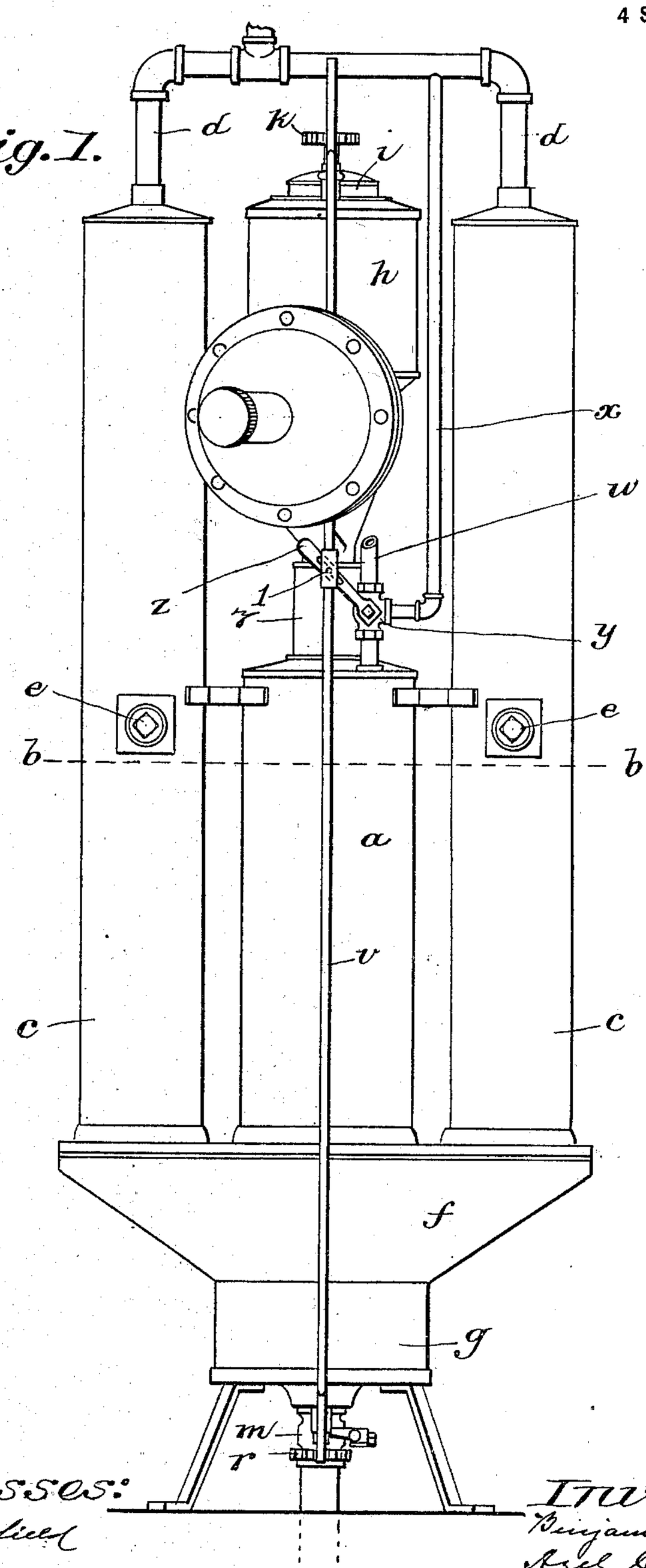
B. J. GRAHAM, A. C. BUELL & H. L. SALISBURY.

ACETYLENE GAS GENERATOR.

(Application filed Mar. 6, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses:
J. D. Garfield
K. D. Clemons

Inventors:
Benjamin J. Graham,
Alex C. Buell and
Robert L. Salisbury.
by Chapin & Co
Attorneys.

No. 681,168. Patented Aug. 20, 1901.

B. J. GRAHAM, A. C. BUELL & H. L. SALISBURY.

ACETYLENE GAS GENERATOR.

(Application filed Mar. 6, 1901.)

(No Model.) 4 Sheets—Sheet 2.

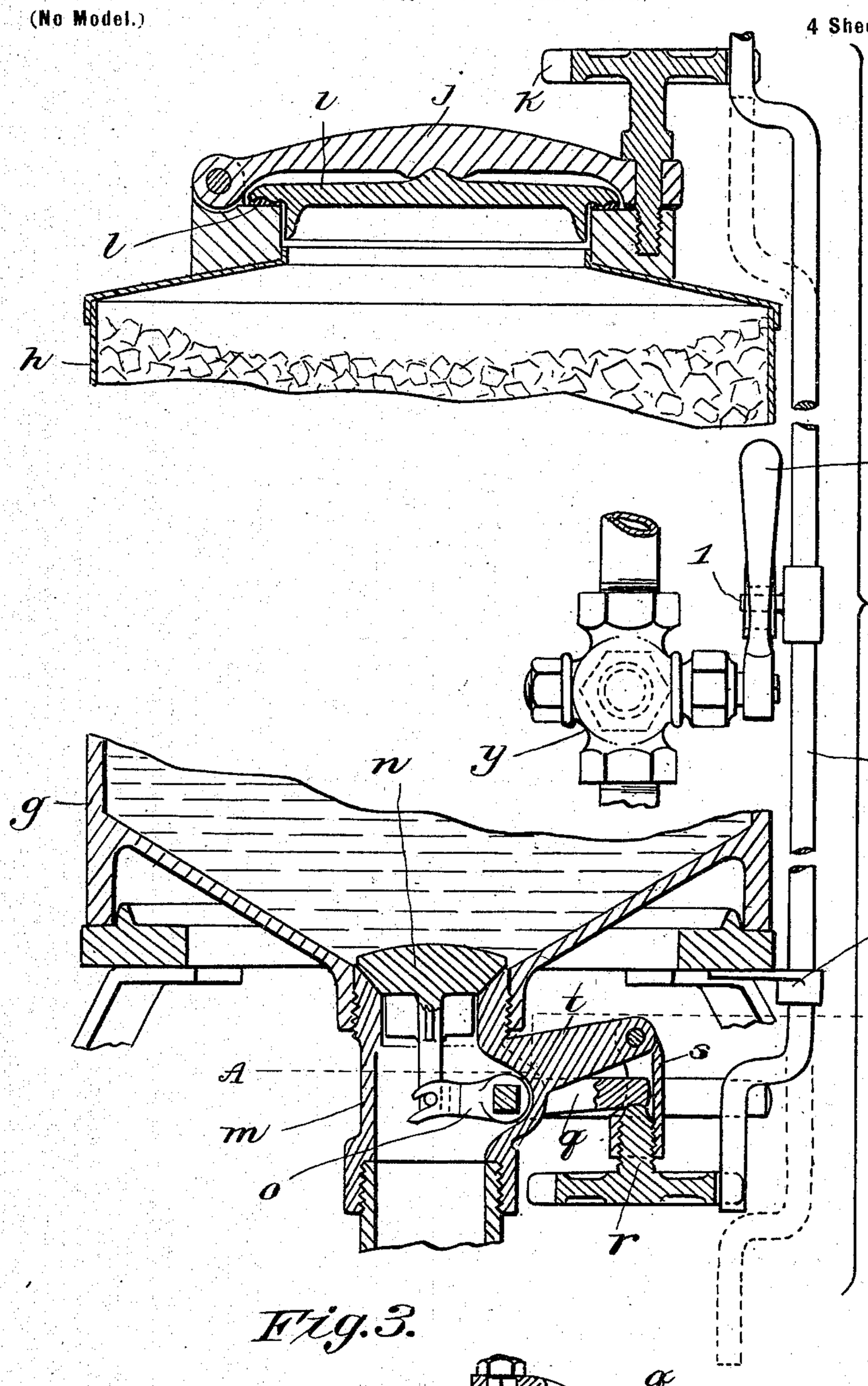
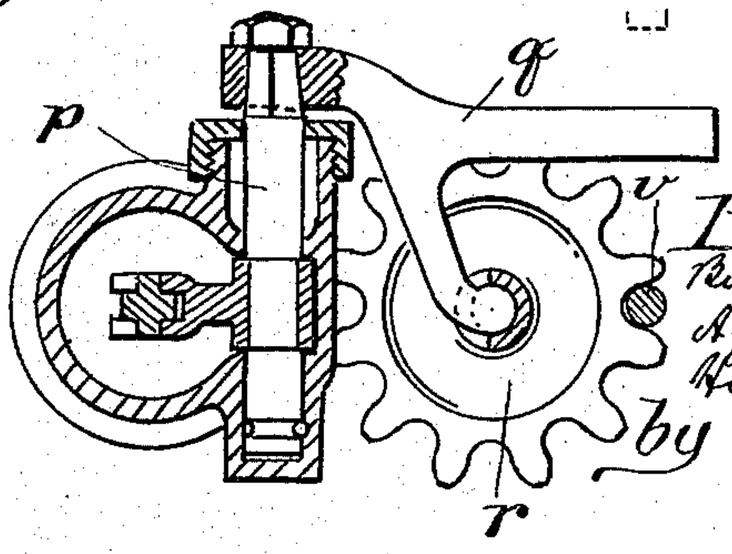


Fig. 2.

Fig. 3.



Witnesses:
J. H. Garfield
H. S. Clemons

Inventors
Benjamin J. Graham,
Abel C. Buell and
Herbert L. Salisbury.
by Chapin & Co
Attorneys.

No. 681,168. Patented Aug. 20, 1901.

B. J. GRAHAM, A. C. BUELL & H. L. SALISBURY.

ACETYLENE GAS GENERATOR.

(Application filed Mar. 6, 1901.)

(No Model.) 4 Sheets—Sheet 3.

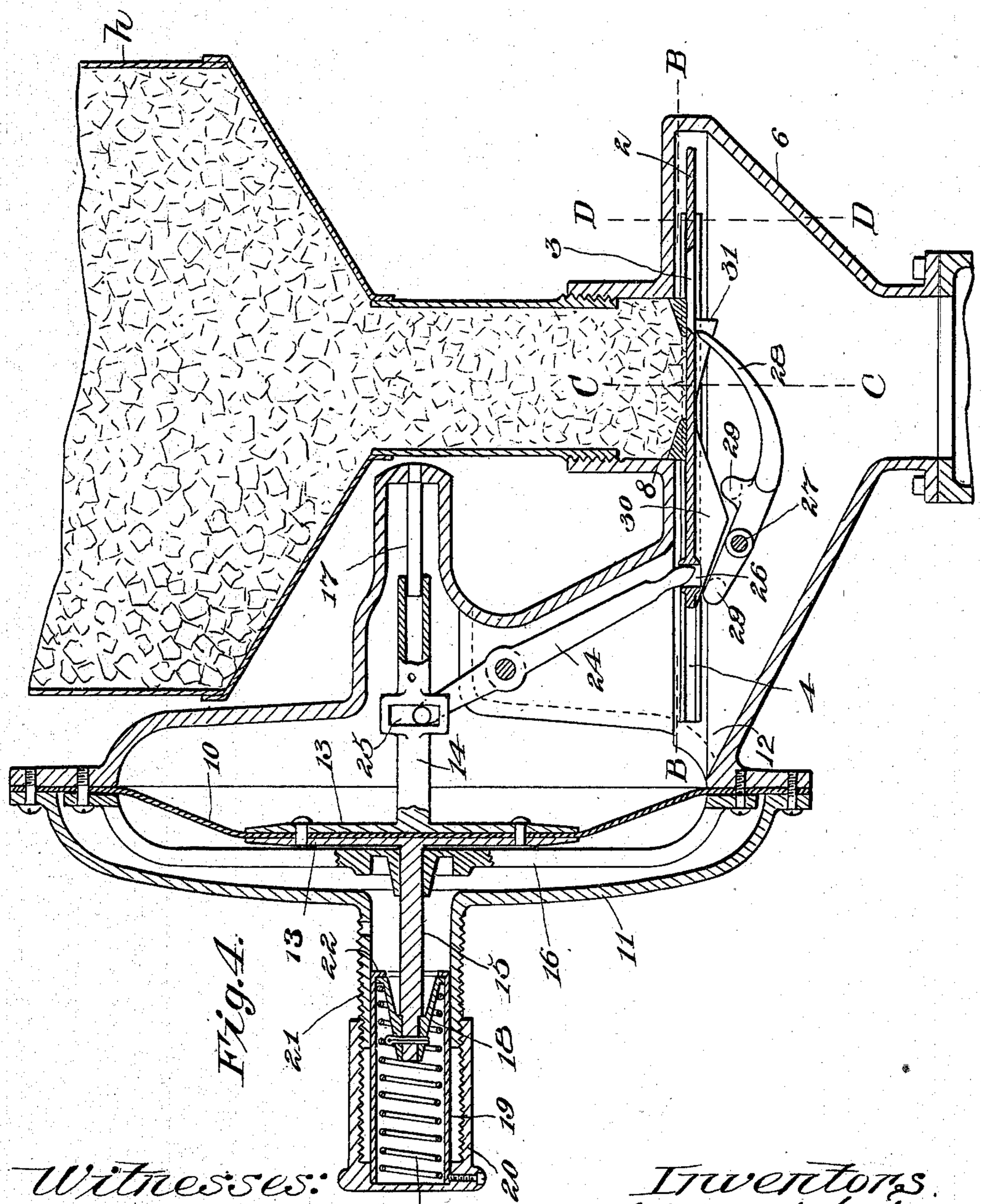


Fig. 4.

Witnesses:
J. H. Gaylord
H. L. Clemons

Inventors.
Benjamin J. Graham.
Axel C. Buell and
Herbert L. Salisbury
by Chapin & Co
Attorneys.

No. 681,168. Patented Aug. 20, 1901.

B. J. GRAHAM, A. C. BUELL & H. L. SALISBURY.

ACETYLENE GAS GENERATOR.

(Application filed Mar. 6, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

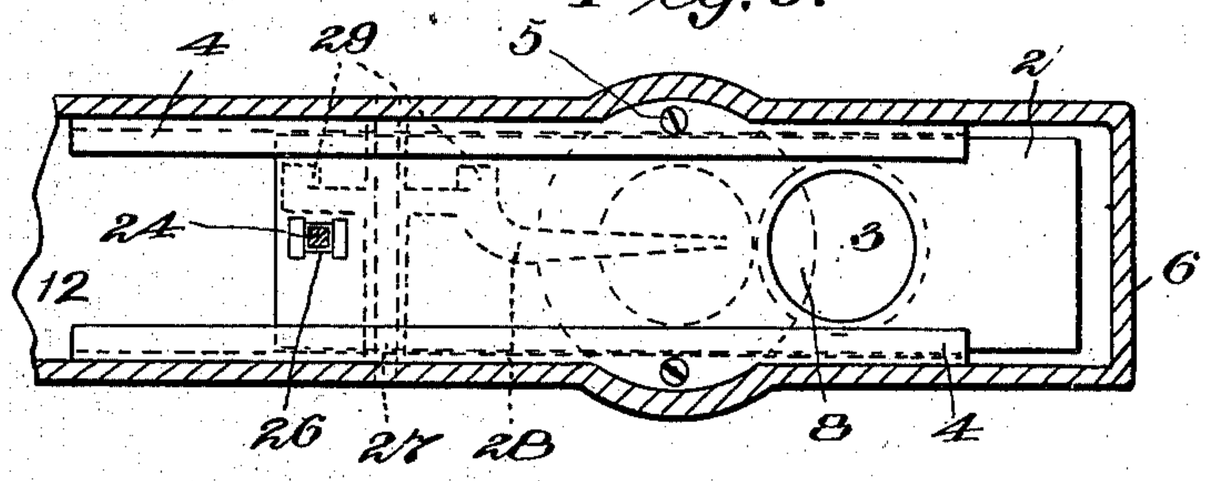


Fig. 6.

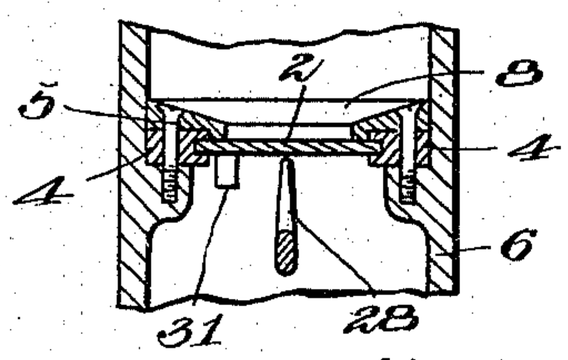
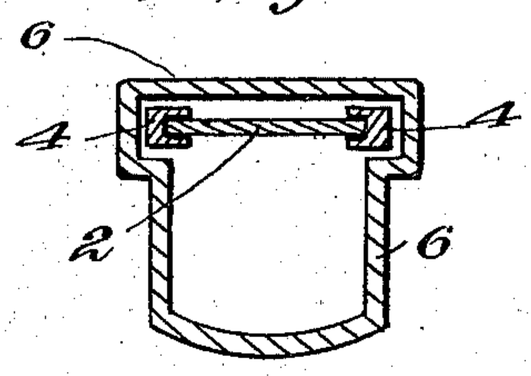


Fig. 7.

Fig. 8.



Witnesses:
J. W. Garfield
K. I. Clemons

Inventors
Benjamin J. Graham
Abel C. Buell and
Herbert L. Salisbury.
By Chapin & Co
Attorneys.

UNITED STATES PATENT OFFICE.

BENJAMIN J. GRAHAM, AZEL CASE BUELL, AND HERBERT L. SALISBURY,
OF SPRINGFIELD, MASSACHUSETTS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 681,168, dated August 20, 1901.

Application filed March 6, 1901. Serial No. 50,052. (No model.)

To all whom it may concern:

Be it known that we, BENJAMIN JOSEPH GRAHAM, AZEL CASE BUELL, and HERBERT L. SALISBURY, citizens of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Acetylene-Gas Generators, of which the following is a specification.

This invention relates to acetylene-generators; and the object thereof is to produce a machine of this class in which the feeding of the carbid into the generator may be effected accurately and efficiently by automatic means governed by the pressure in the generator and to provide suitable relief-chambers connected with the generator, which chambers are so constructed as to area, capacity, and location relative to and connection with said generating-chamber as to provide easy and rapid evacuation of the latter and constant agitation of the sediment at the bottom of the chamber.

A further object of the invention is to provide an improved cut-off mechanism for the carbid and means for operating it, all of which shall be inclosed in a casing in the walls of which there are no openings, whereby through defective packing gas might escape, and in the construction of an agitator operated by the movements of the cut-off slide for preventing the clogging of the cut-off slide.

A still further object of the invention is to provide means whereby neither the carbid-holder nor the cleaning-outlet in the generating-chamber can be opened without first manipulating a valve in the generating-chamber, whereby pressure in the latter is first reduced.

The invention consists in the construction set forth in the following specification and claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of an acetylene-gas generator embodying our invention. Fig. 2 shows a part of the carbid-holder, a part of the gas-generator, a valve in the service-pipe connected with the generator, a valve in the bottom of the generator, and a locking device for the cover of the carbid-holder, the outlet-valve in the bottom of the generator, and the valve in the service-pipe. Fig. 3 is a sectional view on line A A, Fig. 2. Fig. 4 is a vertical section through the cut-off mechanism in the lower part of the carbid-holder and showing the agitator operating in the feed-passage. Fig. 5 is a horizontal section on line B B, Fig. 4. Fig. 6 is a vertical section on line C C, Fig. 4. Fig. 7 is a perspective view of a retaining-ring for the cut-off slide, and Fig. 8 is a vertical section on line D D, Fig. 4.

Referring to the drawings, *a* represents a cylindrical generating-chamber of metal provided with a suitable quantity of water, into which carbid in quantities regulated by the pressure of gas in the generating-chamber may be delivered. The production of gas brought about in the usual manner by the contact of the carbid with the water is governed and its pressure is regulated by means which will be described farther on. The normal water-line in the generating-chamber is indicated by the dotted line *b b*, Fig. 1—that is to say, the level at which water would stand in both relief and generating chambers when there is no gas-pressure in the latter. The space above this line to the top of the generator indicates the normal capacity of the gas-generating chamber.

Connected with the generating-chamber *a*, near the bottom of the latter, are the relief-chambers *c*, preferably two in number, though not necessarily, and preferably arranged as shown in the drawings, one on each side of the generating-chamber *a*. These relief-chambers are cylindrical in form and have a smaller diameter than the generating-chamber and a greater height, their capacity and proportion being such that when all of the water above the point of connection of said relief-chambers within the generating-chamber is driven out of the latter by the pressure of gas therein said relief-chambers will be nearly filled. When the evacuation of the generating-chamber *a* takes place to this extent, the gas may escape up through the relief-chambers *c* and by means of the pipe connections *d*, uniting the tops of said chambers, escape to the open air.

The relief-chambers *c* are each provided

with screw-threaded plugs *e*, located at the normal water-line of the apparatus, through one or both of which water may be introduced into the generating-chamber *a*, and by reason of their location an excess of water cannot be introduced into the machine.

The generating-chamber *a* and the relief-chambers *c* may be united in any suitable manner, whereby a free passage from one to the other may be maintained and whereby the currents of water passing from the generating-chamber *a* into the relief-chambers *c* and back may be entirely unobstructed and of such volume as will prevent the settling of the sediment where it might obstruct the flow of water to and from the relief-chambers *c*. The height of the relief-chambers relative to the generating-chamber will determine the maximum pressure which may be carried in the latter.

In constructing this machine we prefer to mount the relief-chambers *c* one at each end of a hollow base *f*, with the gas-generating chamber between them, connection between the latter and the relief-chambers being had through the hollow base *f*. The latter is provided with a cylindrical pocket *g*, toward which the sides of the base converge and into which when the water in the machine is not agitated by the repeated generation of a small volume of gas the sediment will settle. This construction of the relief-chambers and the generating-chamber is illustrated and described as the preferred mode of construction; but, if desired, the generating-chamber *a* could be continued down to the point occupied by the pocket *g*, and the two relief-chambers provided with curved ends could be connected directly with the body of the generator.

It is preferred to make the relief-chambers *c* entirely separate from the generating-chamber *a*, for the reason that this construction largely increases the area of water-containing portions of the gas-generating chamber and the relief-chambers *c*, whereby any heat generated by the rapid generation of gas may be more readily dissipated than if the ordinary gas-tank were used in which the relief-chamber surrounds the generating-chamber.

Above the generating-chamber *a* is located the carbid-holder *h*, which is of metal and provided with a conical lower end, (shown in Fig. 4,) which leads directly into a passage connecting the carbid-holder with the gas-generating chamber, which passage is closed by a cut-off slide, to be described. The upper end of the carbid-holder has an opening therein closed by a circular cap *i*, which is spanned by a swinging arm *j*, in contact with said plate at the center thereof, which arm by a suitable hand-screw *k*, passing through its free end and entering a solid portion of the upper end of the carbid-holder *h*, serves to hold the cap *i* to a bearing against the top of the carbid-holder, closing the same. A suitable packing-ring *l* is provided for said cap *i*. This construction is clearly shown in Fig. 2, and in the same figure, together with Fig. 3, the valve construction for closing the bottom of the pocket *g* is also shown. The bottom of this pocket is downwardly inclined toward its center, into which is screwed a valve-body *m*, whose valve *n* is seated in the upper end thereof and is held to its seat by means of a swinging arm *o*, having a forked end which engages with a down-hanging portion of the valve. This arm *o* swings on a short shaft *p*, which extends through the wall of the valve-body *m* and has connected to the outer extremity thereof a lever *q*, one arm of which is fashioned into a handle and the other arm terminates over the point of a hand-screw *r*, which is threaded into a nut *s*, which in turn is pivotally hung from an arm *t*, cast on the valve-body *m*. From the lower end of the latter a waste-pipe may carry the contents of the machine to any desired point. It will be readily understood that if the screw *r* is loosened sufficiently to permit it to be swung clear of that arm of the lever *q* against which it bears said lever may be swung downward and the valve *n* opened by being raised from its seat and the contents of the machine drawn off.

The specific controlling means associated with the valve *n* have necessarily been described in the present case in view of the direct coöperation between the said controlling means for the valve *n* and the common rod *v*, which is also associated with the cover for the carbid-holder and the handle of the valve *y*; but the said specific controlling means for the valve *n* and the novel mounting of this valve are not made the subject-matter of specific claims in the present case.

It will be observed now by a glance at Figs. 2 and 3 that the hand-screw *k* on top of the carbid-holder *h* and the hand-screw *r* under the pocket *g* are provided with recesses in the periphery of their hand-wheels. At suitable points on the carbid-holder and generating-chamber supports, as at *u*, Fig. 2, are provided for a rod *v*, whose extremities are adapted to engage the recesses in the hand-wheels of the screws *k* and *r*. In the top of the generating-chamber *a* is an outlet-pipe *w*, through which the gas is distributed to the mains. In this outlet-pipe is a waste-pipe *x*, and at the junction of these two pipes is a three-way valve *y*, which when it is in the position shown in Fig. 1 closes the waste-pipe *x* and leaves the outlet-pipe *w* open; but when said valve is operated, as it would be by moving the handle *z* thereof downward, then the delivery end of the outlet-pipe *w* would be closed and the opposite end of said pipe placed in communication with the waste-pipe *x*, whereby pressure on the generating-chamber will be released. Said verti-

cal rod *v* is so applied to the hand-wheel of the screws *k* and *r* when it is in engagement therewith that the downward movement of said rod will cause the disengagement thereof with said hand-wheels, and this rod *v* has an engagement with the handle *z* of the valve *y* by means of the pin 1, which enters a slot in said handle, all as clearly shown in Fig. 2. It is thus apparent that the carbid-holder *h* cannot be opened, nor can the valve *n* at the bottom of the pocket *g* be opened, until the handle *z* of the valve *y* has been turned to such a position as will cause the gas to be cut off from the outlet-pipe *w* and a passage to be opened from the generating-chamber directly into the waste-pipe *x*. Thus it is impossible ever to open the carbid-holder or the outlet in the bottom of the generating-chamber without first blowing off the gas-pressure within the generating-chamber, whereby all accidents may be avoided.

Referring now to the valve whereby the carbid is fed to the generating-chamber *a* and the controlling mechanism of said valve, these devices are illustrated in detail in Figs. 4, 5, 6, 7, and 8 particularly, and in order to provide a machine from which the escape of gas is impossible we construct the valve and its actuating mechanism in such a manner that all these parts are entirely inclosed in a tightly-sealed casing, to the end that from the top to the bottom of this machine there is not an opening through which gas might escape, either in the carbid-holder, the connections between the latter and the generator, nor in the generator, nor in the casing inclosing the cut-off slide.

The cut-off slide controlling the feed of carbid consists of a flat metal slide 2, having an aperture 3 therein. (Shown in Figs. 4 and 5.) This slide is supported in ways 4, which by means of screws 5 are held in position in the cut-off-slide casing 6. As shown in Figs. 4 and 5 particularly, that part of the casing containing the slide 2 is rectangular in horizontal section and has a lower and an upper cylindrical neck thereon in axial alinement, the upper one of which is screwed onto the neck of the carbid-holder and the lower one of which is bolted to the top of a small drum 7 on the top of the gas-generating chamber. As stated, the ways 4 are screwed to ribs cast on the inside of the casing 6, near the upper flat top thereof; but before the screws 5 are passed through the ways a ring 8 is inserted through the upper cylindrical neck of said casing, the sides of said ring being cut away at 9, as shown in said Fig. 7, a sufficient distance to allow the lower surface of the ring to lie in the plane of the top of the slide 2, the screws 5 passing through said ring and the ways 4 into said ribs. A section on which Fig. 5 is taken does not show the ring 8, though the screws 5 have been shown in their place for the sake of clearness, and the ring 8 has been indicated in dotted lines. The upper surface of the slide 2 is thus brought closely in contact with the under surface of the ring 8, and the movement of the slide will bring the hole 3 therein into registration with the opening in the ring 8, which will allow carbid to pass through into the generating-chamber, whereupon the pressure of said gas resulting from the introduction of carbid will again close the valve by means of the following devices: One end of the casing 6 is fashioned into a vertically-disposed circular cup-shaped form, which is adapted to serve as an inclosure for one side of a circular diaphragm 10, clamped between the annular flange on this part of the casing referred to, and a similar flange on an outer casing 11 corresponding in shape to the opposite half thereof referred to, is screwed to the latter.

It will be observed that the above-described construction provides a passage 12 between the lower part of the casing 6 and that part thereof within which the diaphragm 10 is inclosed, whereby gas from the generating-chamber *a* may act against the inside of the diaphragm. As usual in constructions of this kind, the center of the diaphragm is clasped between two plates 13, on which there are stems 14 and 15, which extend in opposite directions concentrically with the circular casing in which the diaphragm is inclosed. The stem 15 has a bearing in a rigid member 16, secured by its opposite ends to the diaphragm-casing and inside thereof and extending diametrically across the latter. The stem 14 has a bearing on a short post 17, which is supported in proper position in the casing and which enters a hole in the end of the stem. The stem 15 is provided with a conical head 18 on its outer end, which enters a tubular member 19, which is fixedly secured in a screw-cap 20, adapted to screw down over a screw-threaded neck 21, which is integral with the part 11 of the diaphragm-casing. The head 18, while it moves freely toward the outer end of the tubular member 19, is limited in its motion in the opposite direction by its engagement with the inwardly-turned flange 22 on the inner end of the tubular member 19. Bearing in mind that the tubular member 19 is secured by its outer end in the head of the screw-cap 20, it will be apparent that with the screw-cap in the position shown in Fig. 4 the diaphragm has been drawn outward by it and the slide 2, actuated by the movement of the diaphragm in the manner to be described, is locked in a closed position. To release the diaphragm and allow the slide to return, the cap 20 is screwed inward, and the spring 23, located between the inner end of the cap and the head 18 on the stem 15 within the tubular member 19, will be forced against said head, which will carry the diaphragm in the opposite direction and move the slide to such position as will allow carbid to drop through

the aperture 3 therein. This movement is imparted to the slide by an arm 24, pivotally supported within the casing and whose upper end engages with a vertical slot 25 in the stem 14 and whose lower end passes through a hole 26 in the slide 2, near one end thereof. Assuming now that the screw-cap 20 has been screwed inward on the neck 21 sufficiently to open the passage for carbid into the generating-chamber, a quantity of carbid will drop into the generating-chamber *a*, and as soon as the pressure of gas behind the diaphragm 10 is sufficient to overcome the resistance of the spring 23 then by means of the arm 24 the slide will be closed. When the compression of the spring 23 takes place, the head 18 will have a sliding movement within the tubular member 19 toward the outer end of the cap 20. When the gas-pressure decreases, the spring will force the diaphragm back again toward the center, thus operating the slide 2 to allow more carbid to fall into the generating-chamber. In this manner the supply of carbid will be governed by the pressure of gas against the diaphragm 10. By screwing the cap more or less toward the casing the tension of the spring 23 may be varied.

Pivotally supported at 27 under the slide 2 is a lever 28, (shown in side elevation in Fig. 4 and in plan view in Fig. 5,) the forward end of which curves upward and normally lies close under the slide 2 at the edge of the aperture 3 therein, as shown in Fig. 4. On said lever 28 are two bosses 29, lying a little to one side of the lever, which are engaged by cams 30 and 31 when the slide 2 is operated by the diaphragm to force said curved end of the lever up through the aperture 3 in the slide and through the aperture in the ring 8 for the purpose of lifting the carbid at the point of its passage through these apertures, whereby it will be impossible for these apertures to become clogged. As the slide 2 moves to the left the cam 30 will strike the boss 29 on the end of the said lever, forcing the curved opposite end thereof upward. Then the cam 31 will strike the boss 29 on the right-hand side of the bearing 27 and force the curved end of the lever down again away from the aperture in the slide. As the diaphragm again returns to normal position by decrease of pressure these movements of the lever 28 will be repeated.

From the above description it is seen that means for operating the cut-off slide and the agitator are entirely inclosed and that the slide-operating devices, the agitator 28, the carbid-holder *h*, and the generating-chamber *a* constitute a structure having continuous inclosing walls, through which no operative member passes whereby the gas might escape save only the stem of the valve *y*, and as this is hand-operated the packing for the stem of this valve may be made exceedingly tight, which is not possible in the case of stems of valves or other members operated by the pressure of the gas.

By making the valve *n* to open inward by a lifting movement, as described, a passage is cleared through any sediment which may have settled in the pocket *g*. It has been found in practice that this sediment if the apparatus stands idle for some time will settle in the lower part of the generator in a mass so solid that the opening of an ordinary valve, as a plug or globe valve, in the cleaning-outlet will not enable one to draw the water out of the generating-chamber, for the sediment in the bottom of the latter is almost impermeable. However, by means of a lifting-valve, as described herein, the center of the mass of sediment may be lifted against the pressure of the water above it, thus permitting the water to start at once through the mass, after which the water will scour out the whole of it in a few moments.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. In an acetylene-gas generator, the combination of a generating-chamber, a carbid-holder, a closure for said carbid-holder, a fastening for said closure, a gas-outlet valve for the generating-chamber, said valve having a handle, a cleaning-outlet for the generating-chamber, a valve for said cleaning-outlet, a fastening device associated with the said latter valve, and a vertically-reciprocating common locking-rod having locking engagement respectively with the fastening for said closure and the fastening device for the cleaning-outlet valve, said rod also having an operative engagement with the handle of the outlet-valve whereby the rod will be actuated from said handle.

2. In an acetylene-gas generator, a carbid-holder, a generating-chamber, a passage for the carbid from said holder to said chamber, a diaphragm-chamber in communication with said passage, a flexible diaphragm located in the chamber therefor, a cut-off slide in said carbid-passage and having an operative connection with the diaphragm, an agitator-lever hung below the slide, and means on the latter for forcing the end of the lever upward in said passage, when the slide is withdrawn, substantially as described.

3. In an acetylene-gas generator, a carbid-holder, a generating-chamber, a carbid-passage between the holder and said chamber, a diaphragm-chamber in communication with said passage, a flexible diaphragm located in said chamber, a cut-off slide in the carbid-passage and having an operative connection with said diaphragm, an adjustable spring-pressure device associated with said diaphragm, an agitator supported beneath said slide, and means, carried by the slide, for moving the agitator into and out of the passage-way above the slide.

4. In an acetylene-gas generator, the combination with the generating-chamber, of a relief-chamber located outside of the generating-chamber, a connection from the bottom of the relief-chamber to the generating-chamber, at or near the bottom of the latter; the carbid-holder, a passage from the latter leading down into the generating-chamber, a cut-off slide in said passage, a pressure-actuated diaphragm connected with said cut-off slide for moving the latter in one direction, a spring bearing on said diaphragm for moving said slide in the opposite direction, and a passage between the generating-chamber and the chamber containing said diaphragm whereby the pressure of gas in said generating-chamber will operate to close said valve, substantially as described.

BENJ. J. GRAHAM.
AZEL CASE BUELL.
HERBERT L. SALISBURY.

Witnesses:
WM. H. CHAPIN,
K. I. CLEMONS,
JOHN F. MUNGER.