No. 626,586. Patented June 6, 1899.

G. BALDWIN & C. CRASTIN.

ACETYLENE GAS GENERATOR.

(Application filed Dec. 4, 1897.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

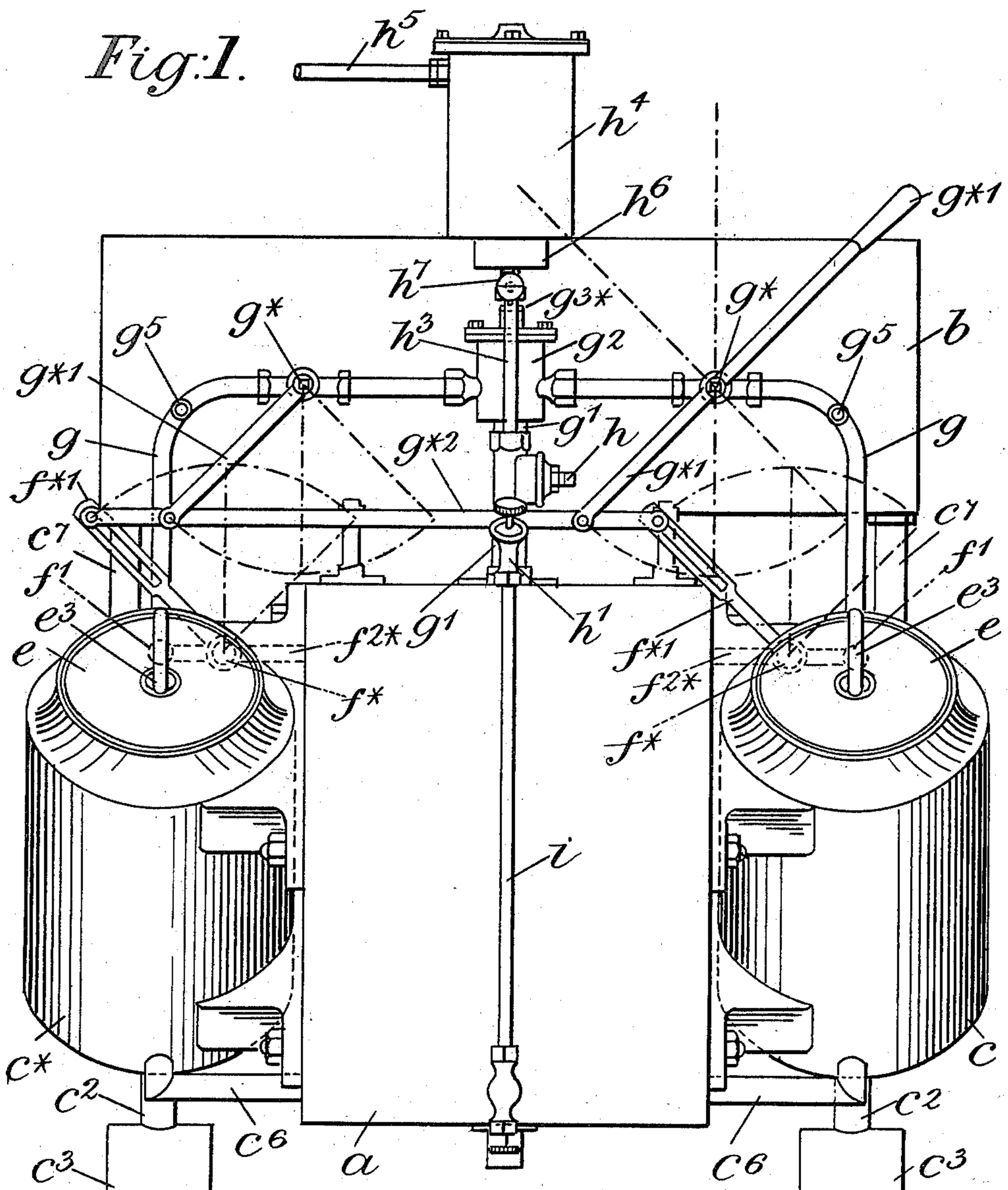
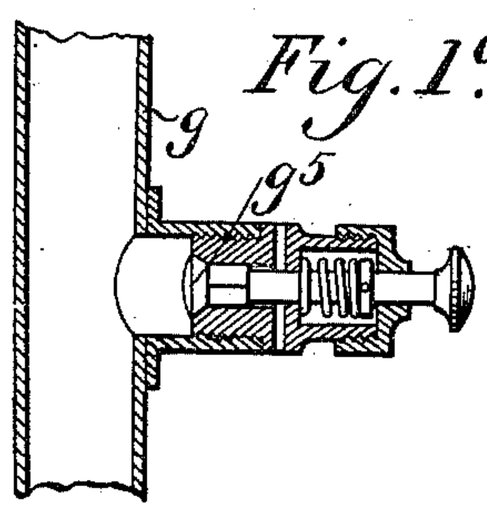


Fig. 1a.



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(No Model.) 5 Sheets—Sheet 2.

Fig: 2.

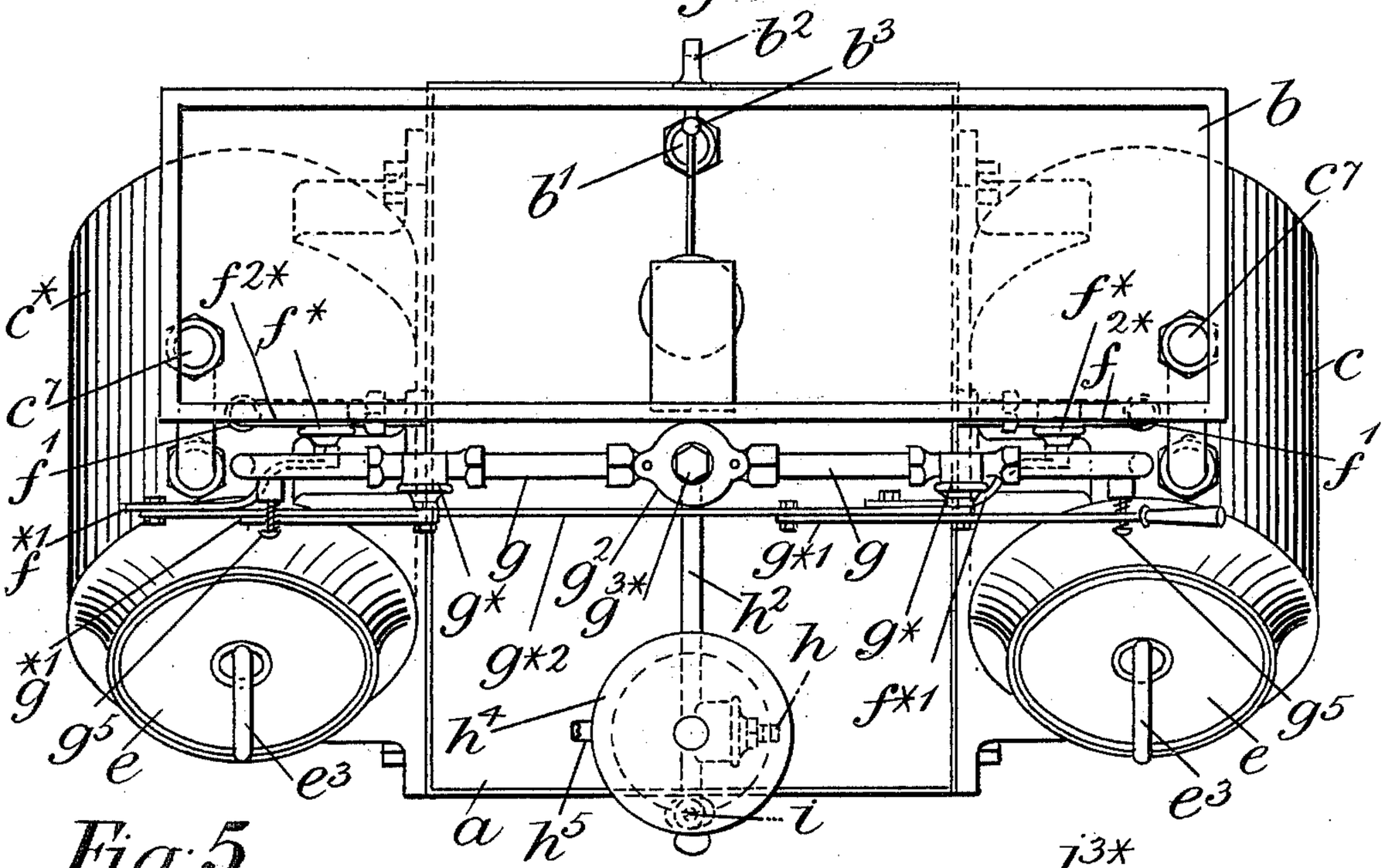
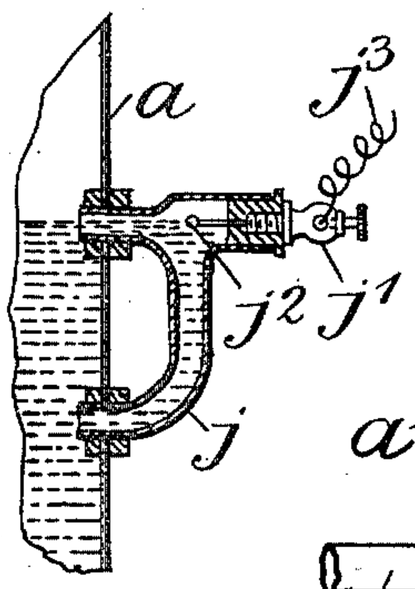


Fig: 5.

Fig: 7.



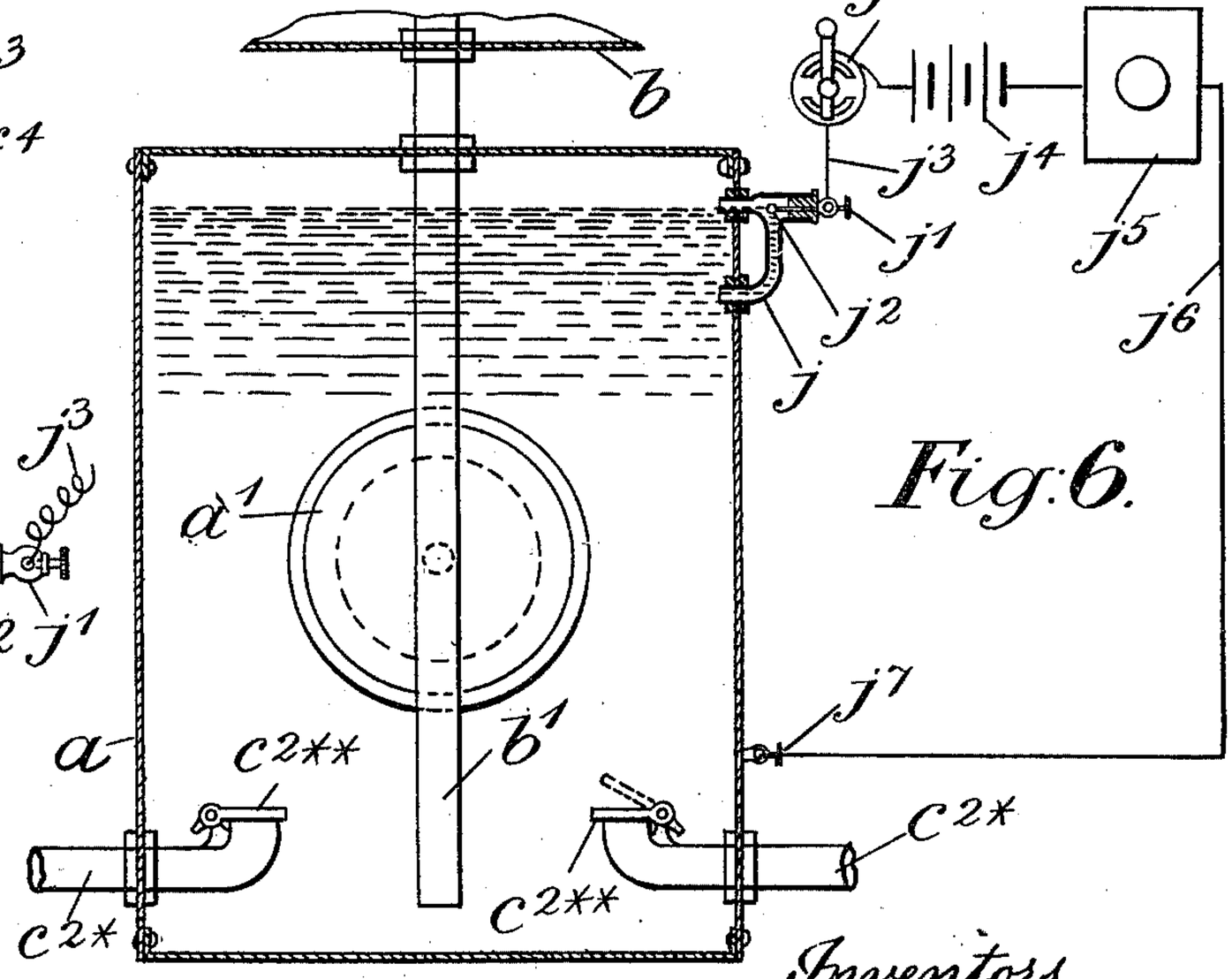


Fig: 6.

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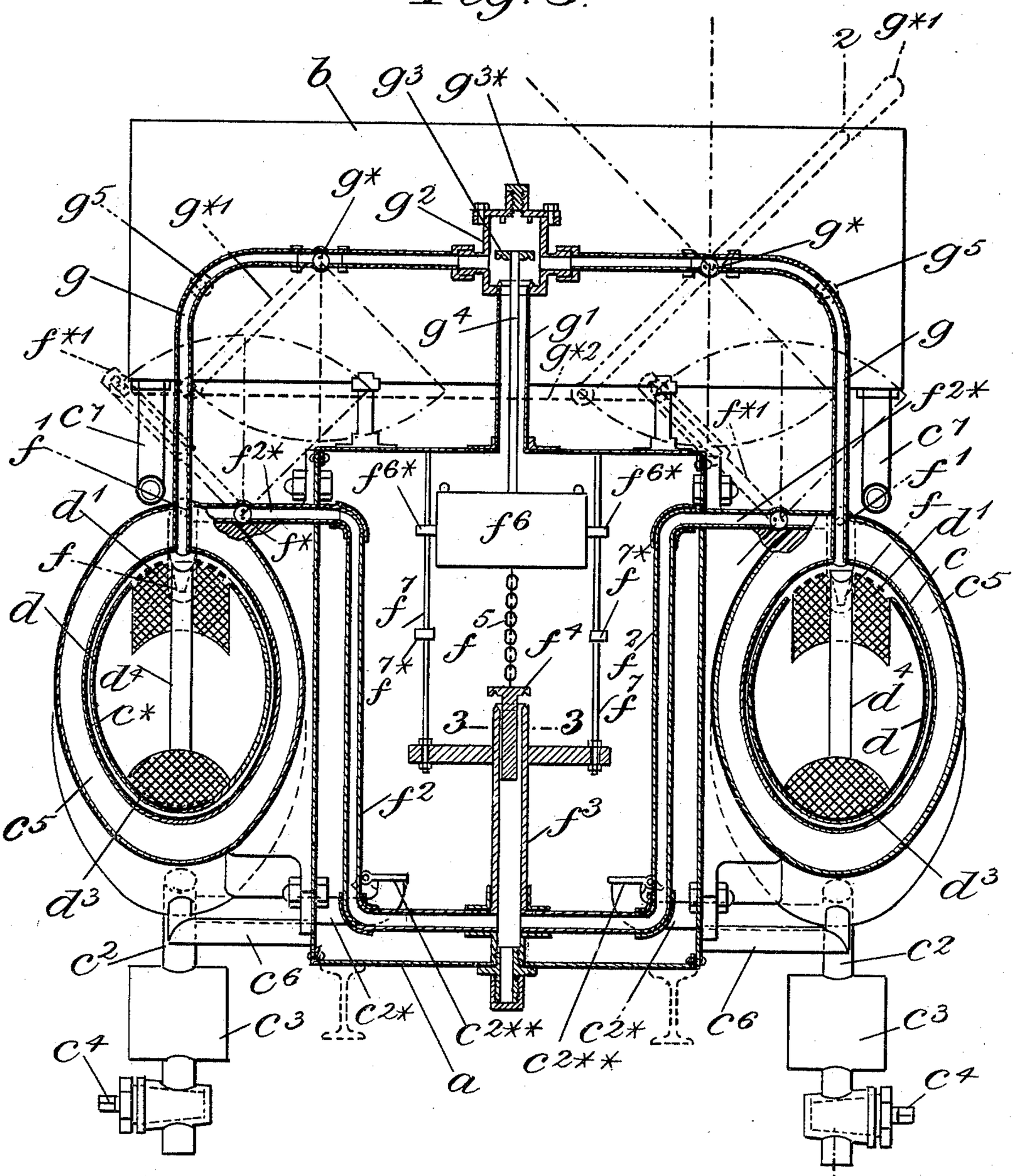
(No Model.) 5 Sheets—Sheet 3.

Fig. 3.



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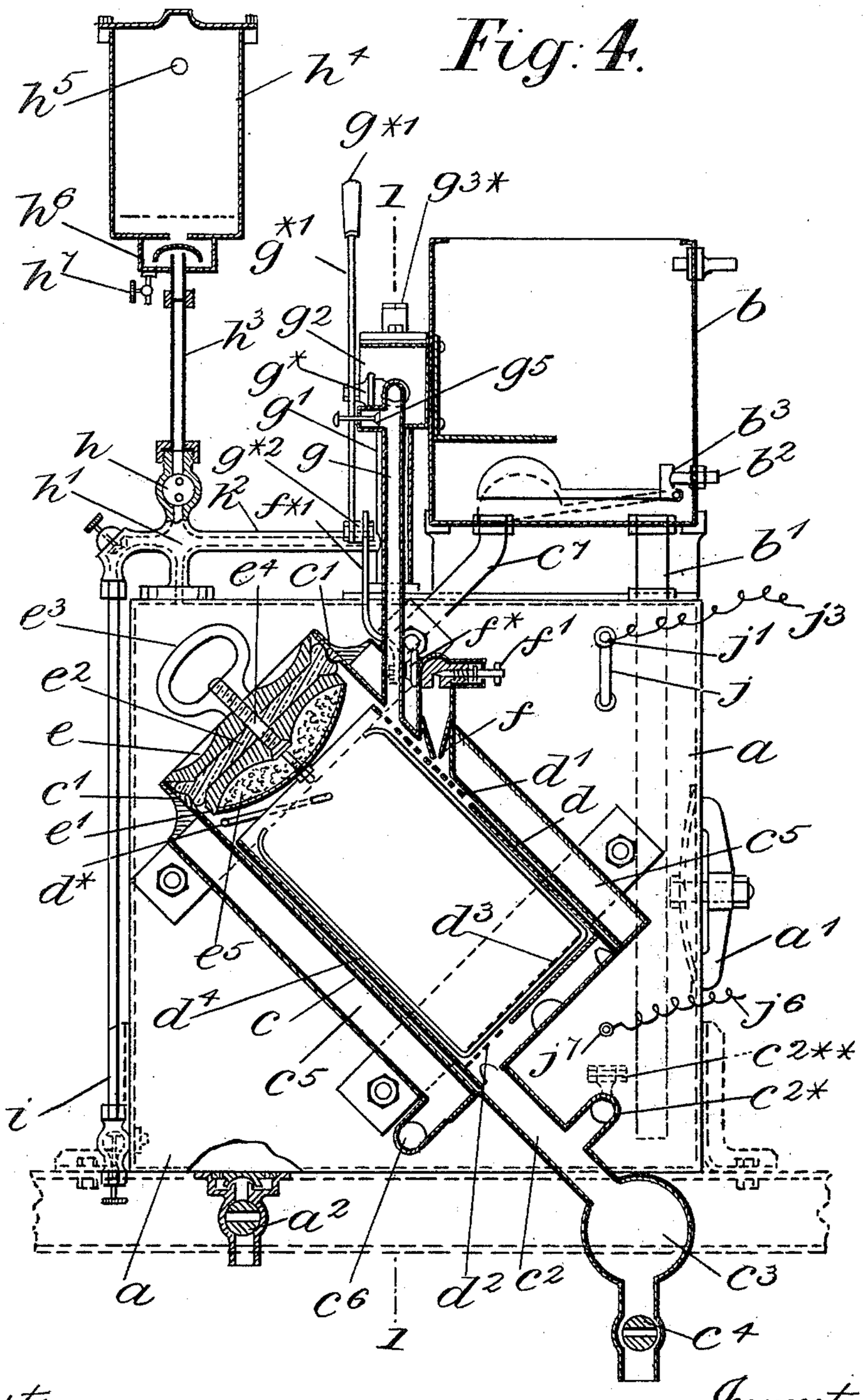
(Application filed Dec. 4, 1897.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 4.



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(Application filed Dec. 4, 1897.)

(No Model.)

5 Sheets—Sheet 5.

Fig: 8.

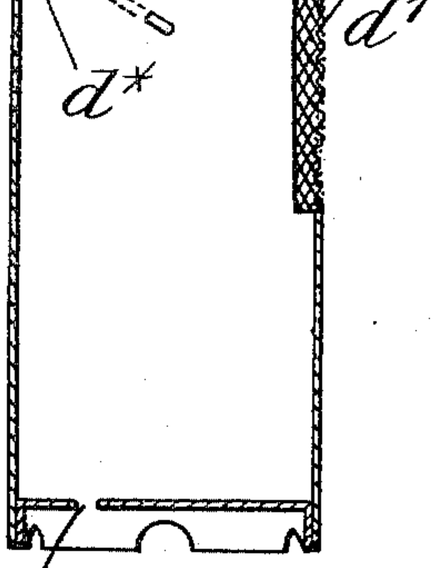


Fig: 9.

Fig: 10.

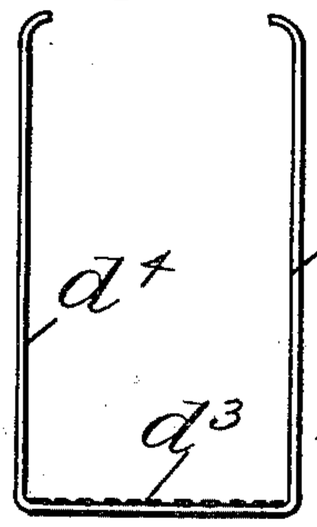


Fig: 11.

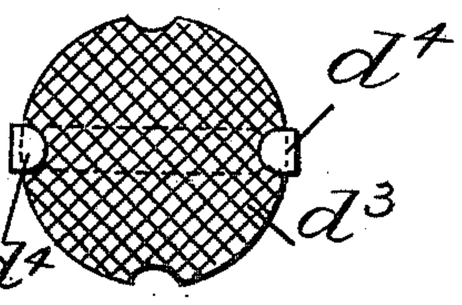


Fig: 12.

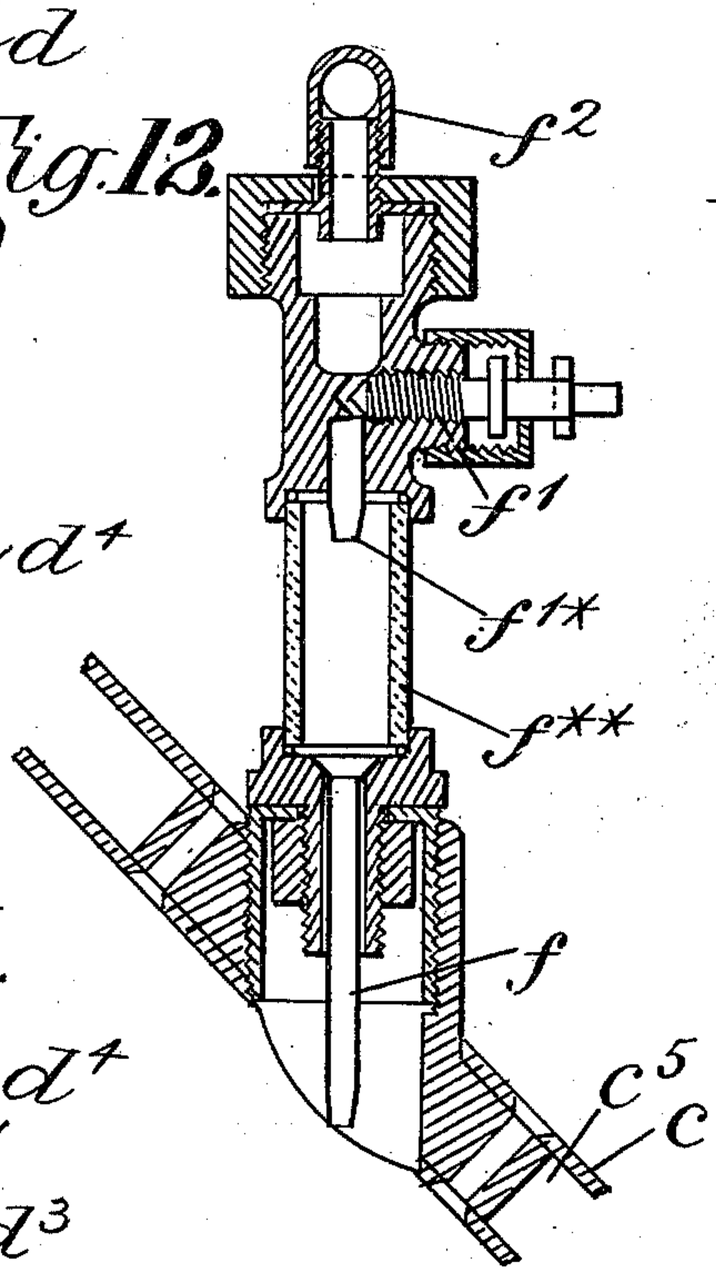
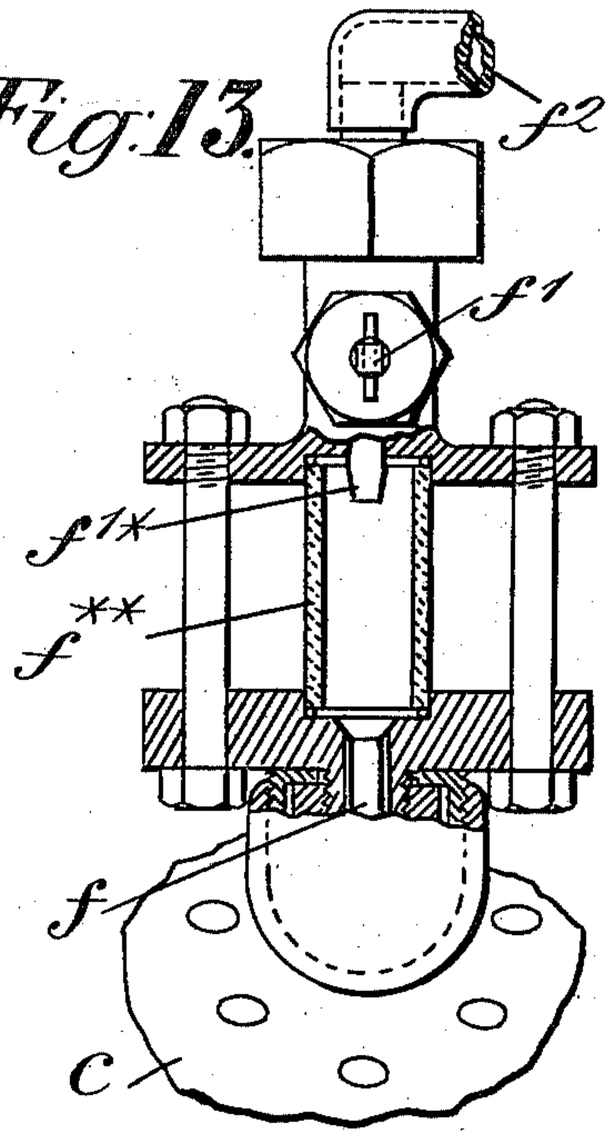


Fig: 13.



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UNITED STATES PATENT OFFICE.

GEORGE BALDWIN AND CORNELIUS CRASTIN, OF LONDON, ENGLAND.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 626,586, dated June 6, 1899.

Application filed December 4, 1897. Serial No. 660,799. (No model.)

To all whom it may concern:

Be it known that we, GEORGE BALDWIN, herbalist, formerly of 9 Electric Parade, Seven Sisters road, Holloway, but now residing at 5 Clive road, West Dulwich, and CORNELIUS CRASTIN, engineer, residing at 16 Tollington road, Holloway, London, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Apparatus for the Manufacture of Acetylene Gas, of which the following is a specification, reference being had to the drawings hereunto annexed and to the letters marked thereon.

The invention relates to improvements in apparatus for the manufacture of acetylene gas, and has for its chief object to automatically supply water to the calcium carbid when the pressure of the gas within the storage-tank or holder falls below a given point, to cut off such supply when the gas-pressure rises above a given point, and upon a further rise of the gas-pressure, caused by a reduction or cessation of the consumption of gas, to at once discharge all free water from contact with the carbid, permitting the latter to dry, and thereby causing the generation of gas to cease.

In the accompanying drawings, Figure 1 is a front elevation of an apparatus for the manufacture of acetylene gas constructed according to the present invention. Fig. 1^a is a detail view of the relief-valve. Fig. 2 is a plan thereof. Fig. 3 is a vertical longitudinal section thereof, taken on the line 1 1 of Fig. 4. Fig. 4 is a vertical transverse section taken on the line 2 2 of Fig. 3. Fig. 5 is a horizontal section taken on the line 3 3 of Fig. 3, showing more particularly the shape of the spindle of the automatic water-valve. Fig. 6 is a sectional view of the water-tank and some adjacent parts, separately illustrating more particularly the alarm for indicating when a charge of calcium carbid is exhausted. Fig. 7 is a detail view of part thereof. Fig. 8 is a vertical section of one of the pots or baskets for containing the calcium carbid, but with the tray removed. Fig. 9 is a plan thereof. Fig. 10 is a similar view of the tray. Fig. 11 is a plan thereof. Fig. 12 is a vertical section of the sight-feed regulator that it is preferred to employ for controlling the flow of water to the calcium carbid, and Fig. 13 is a similar view taken at right angles to Fig. 12.

In the several figures, in which like parts are indicated by similar letters of reference, Figs. 5, 7, 12, and 13 are drawn to an increased scale with respect to the other figures of the drawings.

Referring to Figs. 1 to 11, a represents a closed water-tank and gas-holder which is provided with a manhole and cover a' for cleaning and repairing purposes and fitted with a drainage-cock a^2, and b represents an open-topped displacement-cistern, which is located at a suitable elevation above the tank a and communicates with such tank by means of a vertical pipe b', extending nearly to the bottom of the tank a, and c c^* represent two gas-generators, one of which is arranged upon each side of the tank or gas-holder a.

Inasmuch as the generator c^* is a duplicate of that c, reference will, as far as is practicable, only be made to the generator c.

Within the generator c is provided a loose pot or basket d, which is perforated at d' d^2 for the purposes hereinafter described, and the basket d, which is provided with a handle d^*, is adapted to be withdrawn at the times desired to receive the charge of calcium carbid and then replaced in position in the generator, and in order that the residue from the carbid may be readily removed from the pot or basket d the latter is provided with a perforated tray d^3, furnished with handles d^4, by the aid of which it may be readily lifted out of the pot d at the times desired.

In practice two pots or baskets d would be employed in connection with each generator, so that a clean dry pot would always be at hand in readiness to receive a fresh charge of carbid.

The generator c is preferably arranged in an inclined position, as shown, in order that the contents may drain down to a point from which a pipe c^2 leads through a mud box or trap c^3, adapted to collect any residual carbid which may escape from the pot d, and the outlet from which is controlled by a cock c^4, while the inclined arrangement of the generator also gives a better lead for the water

fed to the carbid, as hereinafter described, causing it to attack a large surface of said carbid.

The upper end of the generator *c* is adapted to be hermetically closed against the pressure of the gas by means of a stopper or cover consisting of two disks *e e'*, formed with beveled edges, between which is placed a disk of rubber e^2, provided with an enlarged thickened rim or edge, and the disks *e e'* are adapted to be forced together by means of a hand-nut e^3, which screws upon the threaded upper end of a spindle e^4, the lower end of which is fixed with the disk *e'*, so that the thickened edge or rim of the rubber disk e^2 will be forced against and caused to embrace or surround an annular rib or projection *c'*, provided around the inside of the generator at the mouth thereof, and in order to protect or insulate the stopper from the heat generated by the carbid the under side of the stopper is covered or packed with a suitable thickness e^5, of asbestos or other non-conducting material.

In order to prevent the generator *c* becoming unduly heated, it is surrounded by a water-jacket c^5, the lower part of which is by a pipe c^6 placed in communication with the water in the tank *a*, while the upper part of the water-jacket is similarly by a pipe c^7 placed in communication with the displacement-cistern *b*, and thus the water in the jacket c^5 is more or less circulated or changed by the varying level of the water hereinafter referred to.

The lower part of the generator *c* is placed in communication with the water in the tank *a* by means of a pipe c^{2*}, which at one end connects with the pipe c^2 and at the other end opens into the tank *a*, where it is filled with a non-return valve c^{2**}, so that while water may be forced from the generator into the tank it cannot pass by that way from the tank *a* into the generator.

The water necessary to moisten the charge of carbid within the pot or basket *d* issues from the nozzle *f* of a feed-regulator, which enters the upper part of the generator *c* in a convenient position for the water issuing therefrom to filter through the perforations *d'* of the pot or basket *d*, and thus reach the carbid in a subdivided form, and this feed is controlled by a screw-down valve *f'*, so that the same may be approximately regulated according to the number of lights in use and the volume of gas required to be generated within a given time.

The feed-nozzle *f* is connected by a pipe f^2, descending nearly to the bottom of the water-tank or gas-holder *a*, with a vertical pipe f^3, located within the tank *a*, so that the water within the tank or gas-holder *a*, when above the level of the upper arm f^{2*} of the pipe f^2, connected with the feed-nozzle *f*, and in the absence of any controlling-valve, will flow by way of the pipes f^2 f^3 to the nozzle *f*, and thus to the carbid.

The upper part of the generator *c* is by pipes *g g'* placed in communication with the upper part of the water and gas storage tank *a*, and the gas required for consumption by the burners is taken off through the supply-cock *h*, and thus as gas is generated it passes into the tank *a*, and unless it is taken off by the supply-cock *h* in equal volume a pressure is created within the tank *a*.

In order to automatically regulate the supply of water to the carbid, and consequently the volume of gas generated according to the consumption thereof, the following arrangement of parts is employed: The displacement-cistern *b* is, as hereinbefore described, placed in communication with the lower part of the tank *a* by means of a vertical pipe *b'*, so that as the volume and pressure of gas within the upper part of the tank *a* increase the water within such tank *a* is gradually forced by way of the pipe *b'* into the displacement-cistern *b* and would upon displacing the water in the tank *a* below the level of the upper arm f^{2*} of the water-supply pipe f^2, connected with the feed-nozzle *f*, cause the flow of water through the nozzle *f* to the carbid to cease. In order, however, to render the apparatus more perfect in its action, the pipe f^3 is provided with a valve f^4, the spindle of which is of suitable section, such as that represented at Fig. 5, to allow of the passage of the water, and this valve f^4 is by a chain f^5 or other flexible connection attached to a float f^6, which is provided with eyes or rings f^{6*}, working on vertical guide-rods f^7, furnished with collars or stops at f^{7*} to limit the downward traverse of the float f^6, so that the position of the valve f^4 will vary with the water-level, and when the water in the tank *a* descends below a given point the valve f^4 will seat itself upon the upper end of and close the pipe f^3, thus imprisoning the water already in the pipe f^2, and if the valve f^4 be arranged to act before the water falls below the upper arm f^{2*} of the pipe f^2 cutting off the supply of water to the generator *c*. The carbid is, however, more or less saturated with moisture and will therefore continue for a short time to generate gas, and in order to deprive the carbid of free moisture the following device is employed:

The pipes *g g'* are connected by a valve-box g^2, in which works a valve g^3, which seats upon the upper part of the tube *g'*, and this valve g^3 is furnished with a rod g^4, which normally rests upon the top of the float f^6, so that when the pressure of the gas within the tank *a* is insufficient to displace the water below a given level the valve g^3 will be held open and gas will be freely admitted to the tank *a*, and thus the greater part of the gas generated after the water-supply to the carbid ceases will pass to the tank *a* by the pipes *g g'*. When, however, owing to the displacement of water from the tank *a* the float f^6 descends farther than is actually necessary to close the valve f^4, such further descent will permit the gas-valve g^3 to close upon its seat, thereby cutting

off the supply of gas to the tank a, and any further gas generated within the generator c, being unable to escape by any other channel, will force its way into the tank a through the pipes c^2 c^{2*} and non-return valve c^{2**}, which in practice should be lighter than the valve f^4, carrying before it any free water which may be within the generator, and thus substantially arresting the generation of the gas, while should a small volume of gas be further generated by the moisture contained in the carbid it will simply find its way in the same manner into the tank a and serve to supplement the store of gas and possibly further slightly displace the water therein. The gas, which it is assumed continues to be taken off at the supply-cock h, is gradually consumed, thus reducing the pressure within the tank a and permitting the water to return from the displacement-tank b until in the rise of the float f^6 the gas-valve g^3 and the water-valve f^4 are opened, when the water rising above the upper arm f^{2*} of the water-supply pipe f^2 will again flow through the pipes f^2 f^3 to the feed-nozzle f, and the above operation will be repeated.

From the foregoing description it will be understood that the flow of water to the carbid will cease when the water in the tank a falls to or below the level of the upper arm f^{2*} of the pipe f^2 and that the water-valve f^4 may be arranged to close the pipe f^3 either before, after, or at the same time that the water falls to such level or thereabout.

In starting the apparatus the tank a is completely filled with water through the service-pipe b^2 and ball-valve b^3, which empties into the cistern b, from which the water passes by the pipe b' to the tank a, and the water is by such valve afterward maintained at that minimum level in the displacement-cistern b, and consequently in the absence of gas-pressure rises to a corresponding level in the fitting h' of the gas-valve h, and there might therefore be a tendency for a small quantity of water to lodge in the way through the valve-fitting h', which connects with the upper part of the tank a; but in order to obviate this difficulty such way is by a pipe h^2 placed in communication with the pipe g', and thus the pressure being equalized there is no tendency for water to remain lodged in these ways.

The air displaced by the water upon the first filling of the tank a is when the valve g^3 is lifted by the air or by hand allowed to escape by an outlet from the valve-box g^2, normally closed by a screw-plug g^{3*}, and the air displaced by the gas in the generator c is similarly allowed to escape by a spring inwardly-opening relief-valve g^5 in the pipe g.

The spring relief or snifting valve g^5 also has for its object to prevent by the cooling of the generator c the formation within the same of a vacuum of any intensity should the regulating gas and water valves f^* and g^* be closed before the charge of carbid is exhausted and which vacuum would prevent the water being drained from the generator or would hinder or prevent the removal of the stopper or cover e and would be otherwise objectionable.

The gas drawn off at the supply-cock h is conducted by a pipe h^3 into a purifier or drying-chamber h^4, filled with lime or other suitable material, whence it passes away by the service-pipe h^5 to the burners, and in order to prevent any free moisture passing by the pipe h^3 into the purifier a trap h^6 is interposed between the pipe h^3 and the purifier h^4 and fitted with a draw-off cock h^7.

The general level of the water, and consequently of the gas, within the tank a is indicated by means of a gage i, which by its lower end is placed in communication with the water in the tank and by its upper end in communication through the fitting h' of the valve h with the gas in the upper part of the tank a.

By the arrangement of parts hereinbefore described if the valve f^4 is timed to close when the water in the tank a is below the upper arm f^{2*} of the supply-pipe f^2 then the water-supply will be cut off simply by the water falling below said arm f^{2*}; but if said valve f^4 is arranged to cut off when the water in the tank is above said arm f^{2*} then the valve f^4 will entirely govern said supply, and it will be understood that the volume of gas stored in the tank a is dependent upon the volume of water supplied to the carbid in the generator c, and these parts may be so adjusted that the volume of stored gas is exceedingly small and the pressure thereof under normal conditions does not exceed that of a six-inch column of water, or thereabout.

It is desirable to give an audible indication when the charge of carbid requires to be renewed, and which condition, by the absence of gas-pressure, permits the water within the tank a to rise above the normal working level, and for this purpose and as indicated more particularly at Figs. 6 and 7 a pipe j is employed, which is at both ends open to the interior of the tank a, and this pipe at a given point is fitted with a terminal j', insulated from the pipe j and provided with a projection or contact-maker j^2, which enters the pipe j, but without contact therewith, and the terminal j' is by a conductor j^3 fitted with a switch j^{3*}, placed in communication with an electric battery j^4 of any suitable construction, which is by a conductor j^6 placed in communication with a terminal j^7, electrically connected with the lower part of the tank a, while a bell j^5 is placed in the electric circuit, and thus upon the reduction of the gas-pressure and the consequent rise of the water in the tank a to a given level—namely, that of the projection or contact j^2 of the terminal j'—the circuit will be completed by the water and the bell will give an audible indication that the supply of carbid is exhausted.

The pipe f^2, supplying water to the carbid, and the pipe g, supplying gas to the tank a,

are respectively provided with cut-off or regulating valves f^* g^*, and these valves are adapted to be operated by means of levers $f^{*'}$ $g^{*'}$, which are coupled by a bar g^{*2}, which also couples them with the corresponding levers of the generator c^*, and these valves f^* g^* are so arranged that in the vertical position of the lever $g^{*'}$ the whole of the valves f^* g^* in both generators will be closed, while in the position of the lever $g^{*'}$ (indicated by the dotted lines in Fig. 3) the valves of the generator c will be opened and those of the generator c^* will be closed, while in the other extreme position of the lever $g^{*'}$ the valves f^* g^* of the generator c will be closed and the corresponding valves of the generator c^* will be opened, and thus upon the carbid-supply in one of the generators becoming exhausted, which would be indicated by the alarm-bell j^5, the position of the lever $g^{*'}$ may be reversed, thus throwing the other generator into action and enabling that thrown out of action to be recharged.

In the example given at Figs. 12 and 13 is shown the feed-regulating device that it is preferred to employ for supplying water to the carbid in the generator, and which consists of a screw-down valve f', from which the water passes through a spout f'^*, projecting into a chamber formed by a cylinder of glass f^{**}, made gas and water tight in a suitable frame or holder and terminating in a spout or nozzle f, which delivers the water into the generator, as hereinbefore described. This device possesses the advantage that the stream of water passing the cock f' can be seen, and therefore more readily regulated than when an ordinary cock or valve admitting water directly to the spout or nozzle f is employed.

The generators c c^* are hereinbefore shown and described as attached to the tank a; but it will be understood that they might be separate therefrom and placed at a distance in any other suitable position and that a number or battery of generators might be coupled with a single water-tank.

Although the action of the various parts of the apparatus is hereinbefore separately described, we will for the sake of clearness now proceed to describe the operation of the apparatus as a whole.

All the regulating cocks or valves f^* and g^* are turned off by placing the lever $g^{*'}$ in a vertical position. The supply-cock h is closed, and water is admitted by the ball-valve b^3 to the displacement-cistern b and flows by the pipe b' into the tank a and continues to flow until the ball-valve b^3, by the rise of the water in the displacement-cistern b, is closed, and during this filling operation the screw-stopper g^{3*} of the valve-box g^2 is removed, and the valve g^3 is lifted by the air or by hand in order to allow the contained air to escape from the tank a, after which the screw-stopper g^{3*} is replaced.

The feed-water regulators f' are approximately adjusted to supply the required volume of water to the carbid, and charges of calcium carbid are placed in the pots or baskets d, which should be perfectly clean and dry. The latter are then introduced into the generators c c^*, and the covers or stoppers e are inserted and screwed up. The lever $g^{*'}$ is then pulled over to the right, thus opening the water and gas cocks or valves f^* and g^* and putting the generator c in action, and at the same time the snifting or relief valve g^5 is opened to allow the contained air to escape from the generator c, after which it is closed and the gas generated passes by the pipes g g' to the tank a and may be taken off through the supply-cock h to the burners.

So long as the gas is consumed in volume equal to that in which it is generated water will flow by the pipes f^3 f^2 and feed-regulator f' into the generator c; but upon the consumption of gas lessening or ceasing the volume of gas within the tank a will increase, thus displacing some of the water and forcing it into the displacement-tank b, when upon the water in the tank a falling below the level of the upper arm f^{2*} of the supply-pipe f^2 it will cease to flow to the carbid, and at about the same time by the descent of the float f^6 the water-valve f^4 will close the end of the water-supply pipe f, or if the float-valve f^4 be timed to close before the water falls below the upper arm f^{2*} of the pipe f^2 it will cut off the supply of water to the carbid. By reason of the wet condition of the carbid the generation of gas continues, and the level of the water in the tank a is still further lowered, so that the gas-valve g^3 cuts off the supply of gas from the generator c to the tank a, whereupon the gas further generated forces out any free water through the pipe c^{2*} and non-return valve c^{2**} into the tank a, while the small quantity of gas still further generated by reason of the damp state of the carbid passes by the same channel into the water-tank a. The generation of gas now practically ceases until by the consumption of that which is stored in the tank a water is permitted to flow from the displacement-cistern b into the water-tank a, when the float f^6 will first open the gas-valve g^3 and then the water-valve f^4, and the above-described operations will be repeated until the charge of carbid is exhausted and the bell j^5 sounds an alarm, when by turning the lever $g^{*'}$ to its opposite extreme position the generator c will be thrown out of action and that c^* will be put in action.

In practice when the supply of water to the carbid and consequent generation of gas is properly adjusted to the consumption thereof the variation of the water-level in the tank a is but trifling.

The water-valve f^4 may, if desired, be dispensed with, while retaining the float f^6 and gas-valve g^3, while where only the simple regulation of the water-supply to the carbid is required both of the float-actuated valves f^4 and g^3 and the water-pipe c^{2*} may be dispensed

with; but such modified arrangements would not be so perfect in their action as the complete apparatus hereinbefore shown and described.

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. An acetylene-gas apparatus comprising a combined water-tank and gas-holder, a gas-generator, a displacement-cistern placed at a suitable elevation and connected with the lower part of the water-tank, a water-pipe rising vertically therein, and by a branch rising from the lower part of said vertical pipe connecting the water-tank with the upper part of the generator to supply water to the carbid, a gas-pipe connecting the upper part of the generator with the upper part of the water-tank to conduct the gas into the latter and suitable valves controlled by a float within the water-tank for closing the pipe supplying water to the carbid and the pipe supplying gas to the water-tank and a water-pipe fitted with a non-return valve connecting the lower part of the generator with the lower part of the water-tank for the passage of free water driven out of the generator by the gas and of any further gas generated after the closing of the said gas and water valves substantially as herein shown and described and for the purpose stated.

2. An acetylene-gas apparatus comprising a combined water-tank and gas-holder, a generator, a displacement-cistern placed at a suitable elevation and connected with the lower part of the water-tank, a water-pipe rising vertically in the water-tank and by a branch rising from the lower part of the vertical pipe connecting the water-tank with the upper part of the generator to supply water to the carbid, a gas-pipe connecting the upper part of the generator with the upper part of the tank to conduct the gas into the latter, a float within the water-tank, a valve actuated by the float for closing the gas-supply pipe from the generator and a water-pipe fitted with a non-return valve connecting the lower part of the generator with the water-tank substantially as herein shown and described and for the purpose stated.

3. An acetylene-gas apparatus comprising a combined water-tank and gas-holder, a displacement-cistern connected at its lower part with the lower part of the water-tank, a gas-generator, a water-pipe connecting the water-tank with the upper part of the generator, a gas-pipe connecting the upper part of the generator with the upper part of the water-tank, a float within the water-tank, a valve attached to the float by a flexible connection for closing the water-supply pipe to the generator, a valve provided with a rod normally resting upon the float for closing the gas-supply pipe from the generator to the water-tank and a water-pipe fitted with a non-return valve connecting the lower part of the generator with the water-tank substantially as herein shown and described and for the purpose stated.

4. An acetylene-gas apparatus comprising a water-tank, a displacement-cistern, two generators, a single set of float-actuated valves for cutting off the water-supply to the generators and the gas-supply from the generators to the water-tank, and suitable cocks controlling the said water and gas supply pipes coupled in such manner that when one generator is in action the other is thrown out of action, while both may be thrown out of action; substantially as herein shown and described and for the purpose stated.

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Witnesses:
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