No. 661,333. Patented Nov. 6, 1900.

G. L. WILSON.

ACETYLENE GAS GENERATOR.

(Application filed Dec. 2, 1897.)

(No Model.) 2 Sheets—Sheet I.

FIG. 1.

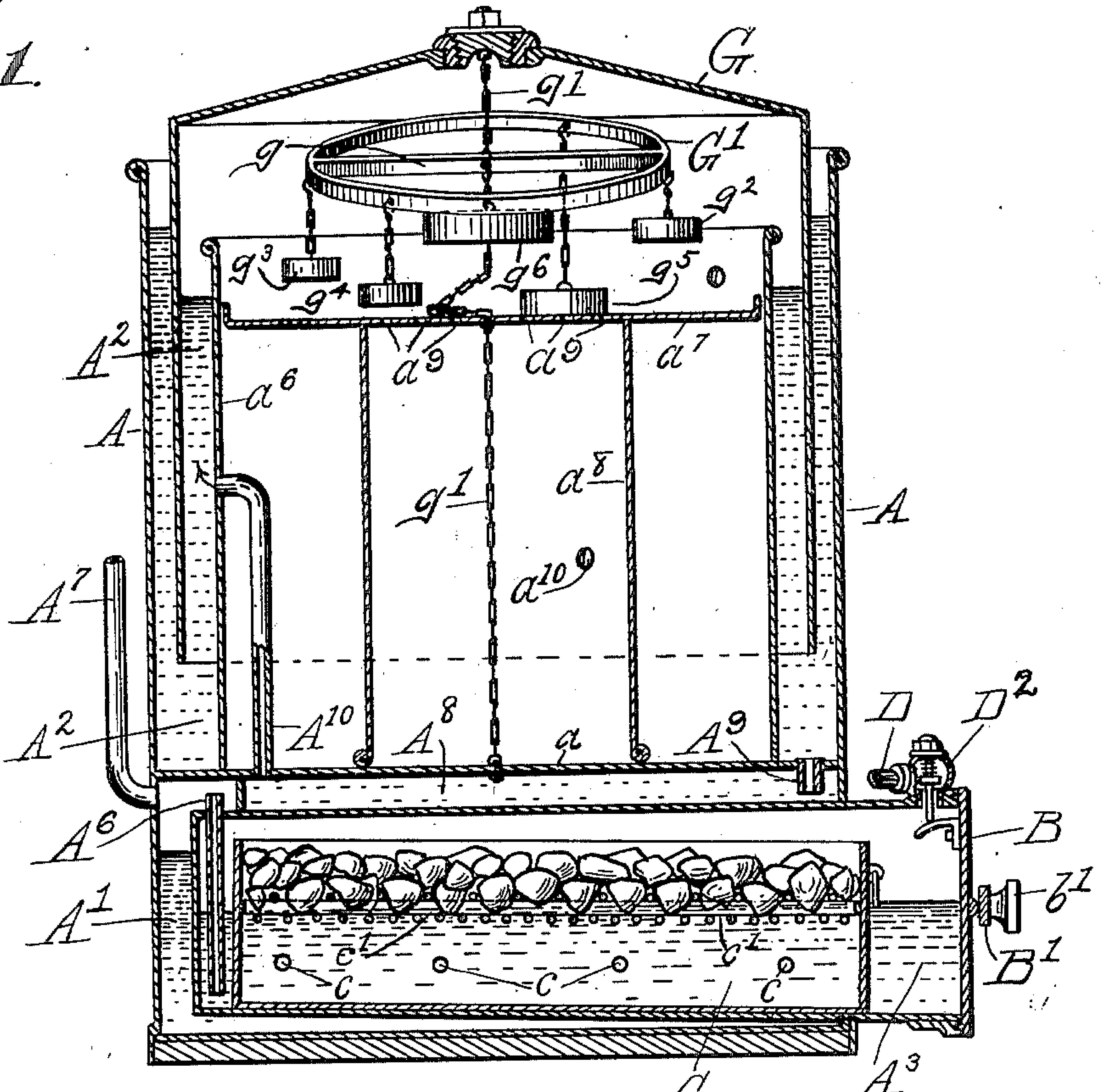
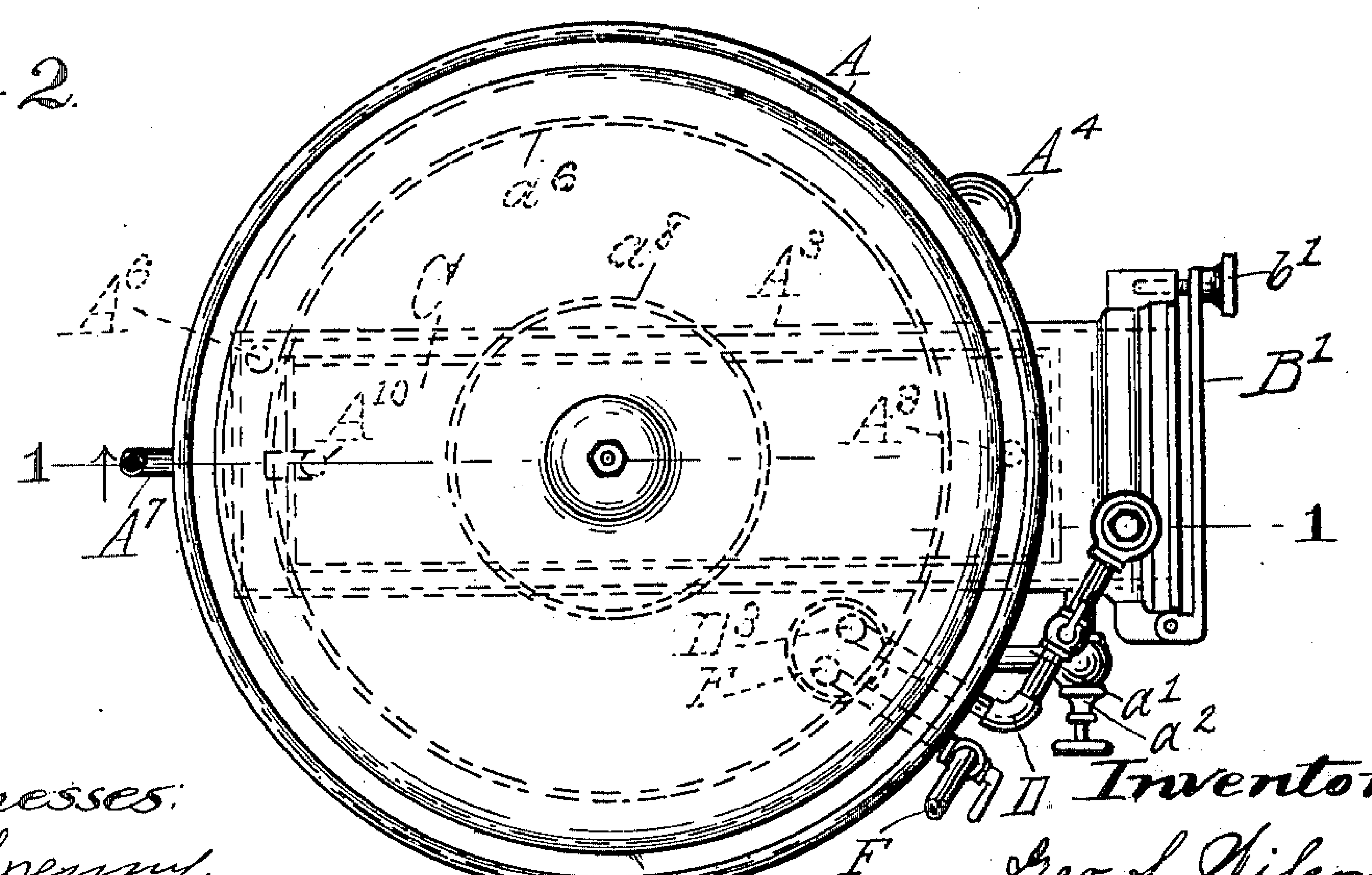


FIG. 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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## ACETYLENE GAS GENERATOR.

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(No Model.) 2 Sheets—Sheet 2.

FIG. 3.

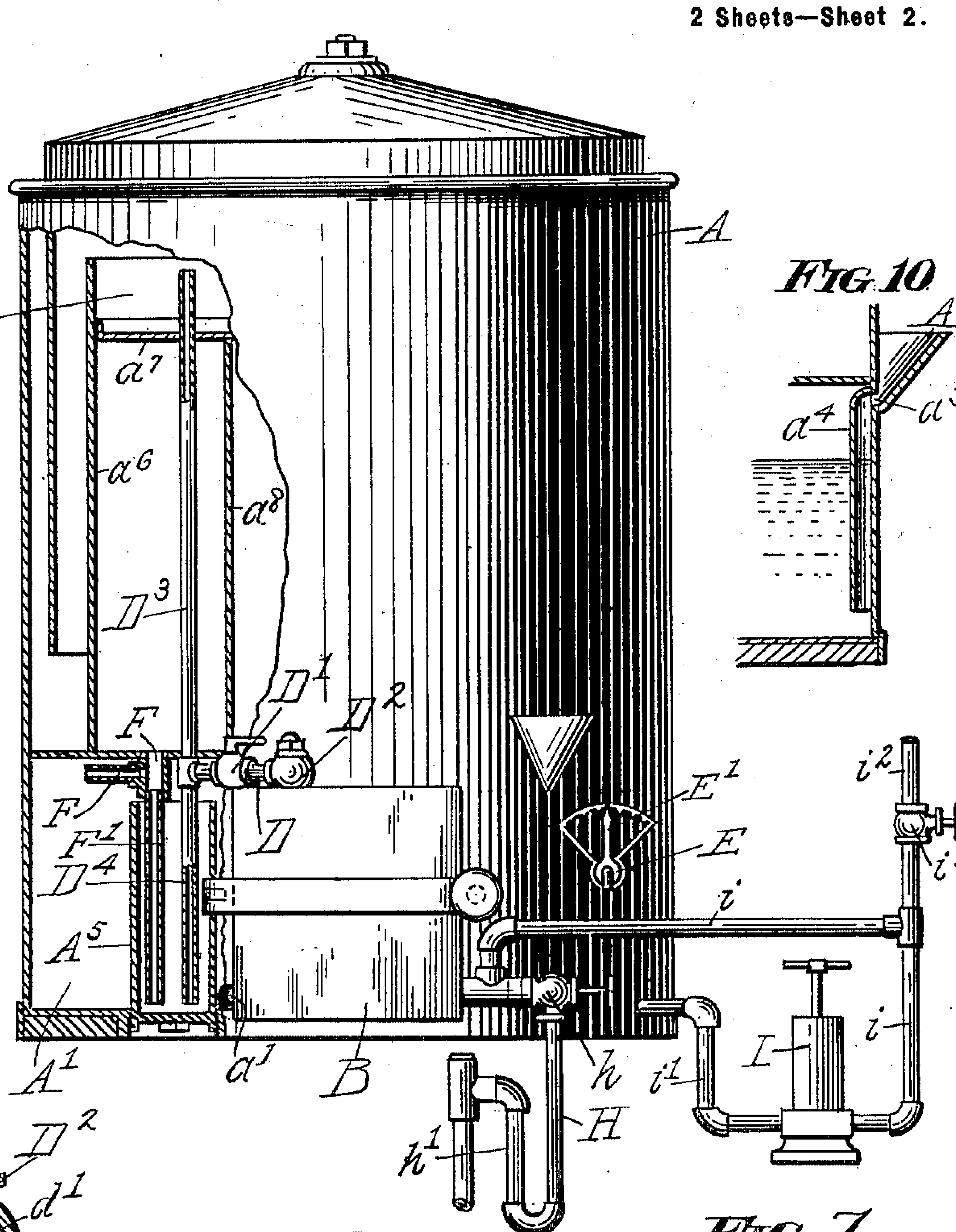



FIG. 10.

FIG. 6.

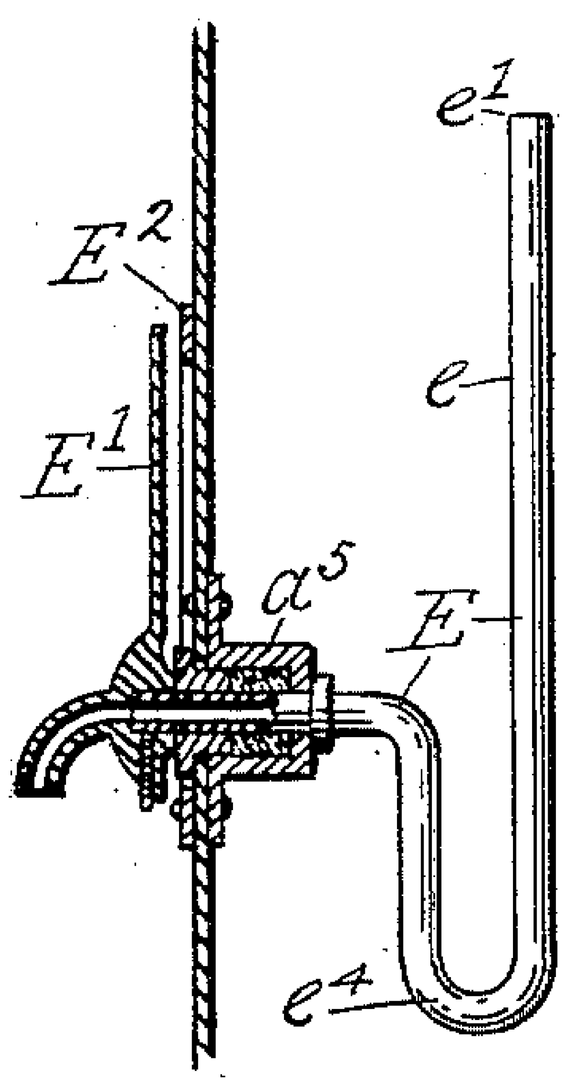



FIG. 4.

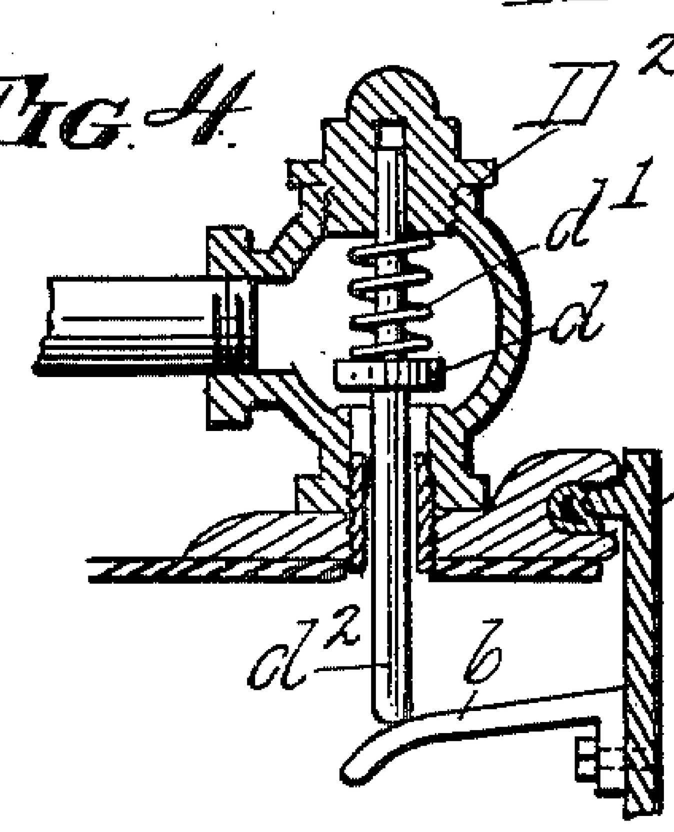



FIG. 5.

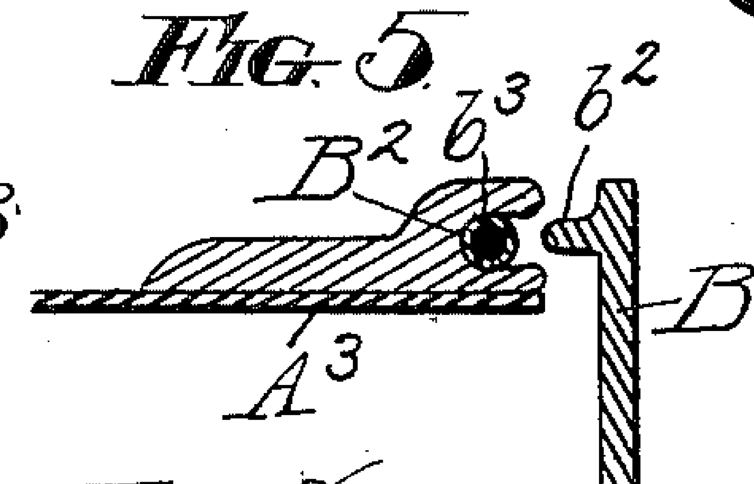



FIG. 7.

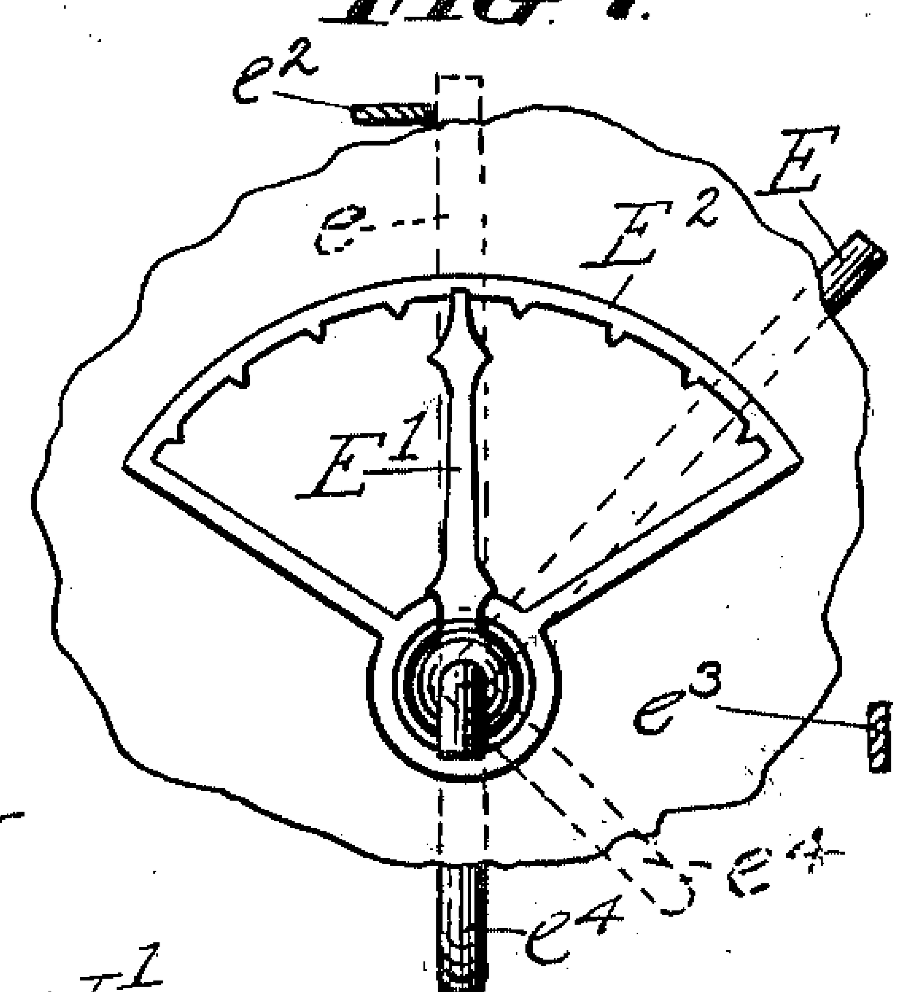
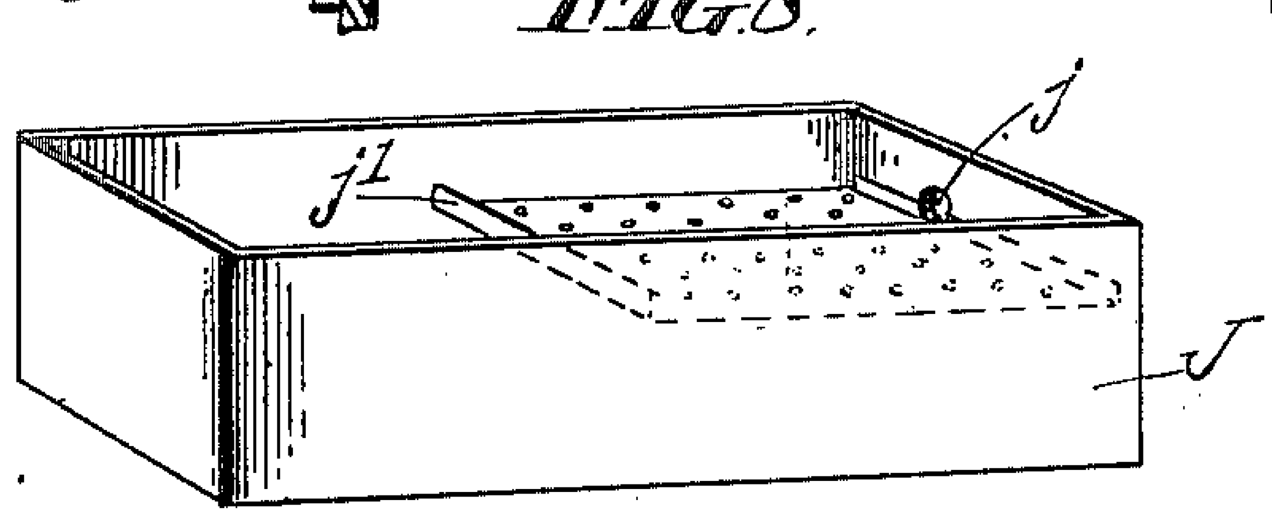



FIG. 8.



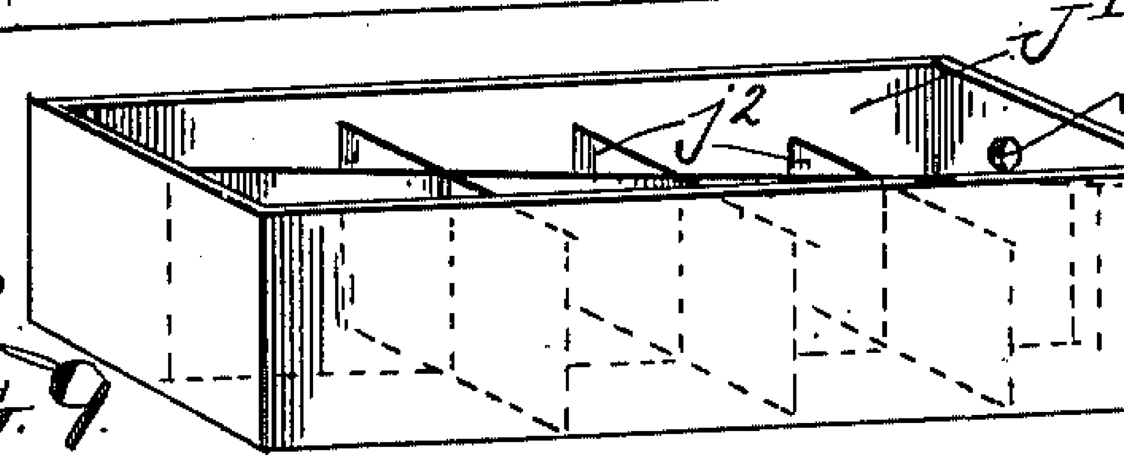




FIG. 9.

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# UNITED STATES PATENT OFFICE.

GEORGE LANDIS WILSON, OF OAK PARK, ILLINOIS.

## ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 661,333, dated November 6, 1900.

Application filed December 2, 1897. Serial No. 660,469. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE LANDIS WILSON, of Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas-Generators, of which the following is a specification.

This invention relates to improvements in gas-generators of a type more particularly intended for the production of acetylene gas from a calcic or other metallic carbid and water, but which may also prove useful in the generation of any gas which can be evolved by the reaction of a liquid upon a solid substance.

In its general design and operation the generator hereinafter set forth is patterned after that heretofore described in a certain patent for improvements in acetylene-generators granted June 6, 1899, to Augustine Davis and numbered 626,272, and the novelty of the present invention resides principally in the construction and arrangement of various structural details, hereinafter more particularly described, which assist toward the perfect action necessary to a commercially-successful apparatus.

In the accompanying drawings, Figure 1 is a sectional side elevation of a generator provided with my improvements. Fig. 2 is a top plan view thereof. Fig. 3 is a front elevation, partially in sections. Figs. 4 and 5 are sectional details showing the coöperation of the check-valve and cover. Figs. 6 and 7 are details of the overflow for adjustably limiting and indicating the hydraulic head and gas-pressure. Figs. 8 and 9 show modified forms of carbid-receptacle. Fig. 10 is a sectional detail of the filling-nozzle and trap.

In said drawings, A designates an outer casing or tank, which is divided by a horizontal partition $a$ into a lower water-supply chamber $A'$ and an upper gas-holding compartment $A^2$. The water-chamber $A'$ surrounds and contains an elongate generating-chamber $A^3$, to which access may be had from the exterior of the tank through a removable door B. A pan or drawer C, forming a receptacle for the charge of carbid, is inserted within the generating-chamber and may be readily removed and replaced in cleaning and recharging the apparatus. Water is admitted to the generating-chamber from the water-chamber through a pipe $a'$, controlled by a valve $a^2$, and enters the pan C through apertures $c$, located above its bottom, but below the supporting-grating $c'$, upon which the carbid rests. Under the head of the supply in the chamber $A'$ the water rises into contact with the carbid, and the gas produced by the resulting reaction passes off through an outlet-pipe D into the gas-holder $A^2$. The pressure of the generated gas reacts against the surface of the water, and if such pressure becomes excessive by reason of a too-rapid generation of gas the water is forced down and out of contact with the carbid, and the evolution of gas is thereby checked until the pressure is reduced and the water rises again.

The water-supply of the chamber $A'$ is introduced through a suitable filling-aperture $a^3$, around which an exterior funnel $A^4$ is provided and over which a trough $a^4$ is secured on the inside of the chamber, leading downwardly along the walls of the tank to a point near the bottom of the chamber (see Fig. 10) and constituting a normally water-sealed passage, which prevents any possible escape of gas from the water-chamber through said filling-aperture. The extent to which the water-chamber can be filled, and consequently the head of water within the chamber, is adjustably limited by means of an overflow-pipe E, (see Figs. 6 and 7,) which passes revolubly through a stuffing-box $a^5$ in the wall of the chamber and which has its inner portion $e$ bent upwardly and out of line with its axis of rotation, so that its inner end or mouth $e'$ will be raised or lowered by rotating the pipe in its stuffing-box. A pointer $E'$ is rigidly secured to the outer end of the pipe and indicates the height of the inner end $e'$ of the pipe upon an exterior gage $E^2$. Suitably-located stops $e^2$ and $e^3$ limit the rotation of the pipe and determine the maximum and minimum water-levels which can be secured by the adjustment of the overflow, said stops being herein shown as so located as to permit the inner end of the pipe to swing through an angle of ninety degrees or from a vertical to a horizontal position. To seal the overflow also against any possible escape of gas from the water-chamber, the pipe E is formed with U-shaped bend $e^4$, extending downwardly from the stuffing-box intermediate between the latter and the upwardly-projecting inner portion $e$ of the pipe and located on the opposite side of the axis of rotation of the pipe relatively to the inner end $e'$ thereof. The pipe is furthermore bent laterally on its axis of rotation, as shown, to bring the **U**-shaped bend into a plane which lies at an angle with the plane of its end portions, said angle being desirably about one-half of the size of the angle of rotation permitted by the stops $e^2$ and $e^3$ and being in this instance about forty-five degrees. With this construction the rotation of the pipe E through the permitted angle of ninety degrees or from a horizontal to a vertical position of its inner end portion will not move the **U**-shaped bend beyond a depending angle of forty-five degrees from the vertical, and consequently will not spill the water contained in said bend and which constitutes the gas-seal. The length of the bend will be made great enough to contain a sufficient depth of water to accomplish the necessary seal even at the extreme limits of its angular movement.

For the purpose of preventing the escape of gas from the holder to the generating-chamber when the latter is open for recharging, the pipe D is herein shown as provided with a shut-off valve D', and for safety is further provided with a check-valve $D^2$, having a valve-plate $d$, which is normally pressed toward its seat by a spring $d'$. Means are also provided for holding the valve open whenever the door B is fastened in place and for automatically releasing the valve to permit its closure when said door is removed. To this end the stem $d^2$ of the valve is extended downwardly into the generating-chamber and the door B is provided with an inwardly-projecting finger or lug $b$, which comes in contact with the extremity of said stem and lifts the valve when the door B is closed. The opening of the door under these circumstances will obviously withdraw the finger $b$ from beneath the valve-stem and permit the valve to close. For convenience and accessibility said valves D' and $D^2$ are herein shown located upon the projecting end of the generating-chamber outside of the casing A, and the pipe D leads thence inwardly through the wall of the casing and is turned upwardly into the gas-holder, as shown at $D^3$. As a further improvement and for the purpose of preventing the accumulation of any moisture in the pipe D, which might interfere with the passage of the gas, and consequently with the regulation, a drip-pipe $D^4$ is carried downwardly from the pipe $D^3$ and trapped in the water-chamber A'. In this instance and to insure a sufficient depth of water seal about the pipe under all circumstances a distinct trap $A^5$ is provided, said trap consisting merely of a cylinder or cup open at its upper end, into which the drain-pipe $D^4$ discharges at a point near the bottom thereof. With this construction any moisture condensing in the pipe D and uptake $D^3$ will at once be drained off through the pipe $D^4$, while the escape of gas through the latter will be prevented by the water with which the trap $A^5$ will be filled. The trap is made deep enough to afford the necessary seal without extending to the top of the water-chamber, so that any surplus of water entering it will flow over its top into the water-chamber and can never rise high enough to enter and clog the pipe D. With this construction also the open cup or trap $A^5$ is submerged when the water-chamber A' is filled, and the maintenance of the proper seal within the trap is thus insured. This trap is also utilized for draining the gas-holder $A^2$ by leading off the gas-outlet or service pipe F from the holder at a point directly above the trap and providing a drainage-pipe F', leading directly downwardly into the trap in the same manner as the pipe $D^4$.

Any suitable means may be provided for clamping the door B in place against the open end of the generating-chamber, that herein shown consisting of a bar B', hinged at one end and detachably secured at the other end by a clamping bolt and nut $b'$. The margins of the door are provided with inwardly-turned flanges $b^2$, which project into a groove in the casing surrounding the end of the chamber, said groove being filled with a suitable packing $B^2$ to secure a gas-tight joint. The particular packing consists of rubber tubing the interior of which contains a separate filling $b^3$, that prevents the adhesion of the inner walls of the tube and permits it to resume its original shape when released. Ordinary lamp-wicking drawn through the tubing is found satisfactory for this purpose; but other substances may obviously be employed with similar results.

The gas-holder provided in the upper portion $A^2$ of the tank contains an inverted bell G, the annular side wall of which depends into a water seal formed in the space between the outer casing and an adjacent interior cylindric wall $a^6$, which rises from the bottom $a$ of the holder. The space beneath the bell G and within the wall $a^6$ constitutes the storage-space for the gas, and this space is herein shown as divided by a horizontal partition $a^7$, located near the top of the cylindric wall $a$ and by the inner cylinder $a^8$, which extends from the partition $a$ to the bottom of the holder. The uptake $D^3$ of the gas-inlet pipe discharges into the holder at a point above the partition $a^7$, and the gas passes beneath the partition through apertures $a^9$ near its center, into the inner cylinder $a^8$, and then through an aperture $a^{10}$ in said cylinder into the surrounding annular space within the wall $a^6$. In this manner the gas is thoroughly mixed and cooled and pretty much rid of aqueous vapor before reaching the outlet-pipe F. The bell G is weighted in accordance with the practice set forth in said patent of Augustine Davis, so that as it rises it offers an increasing resistance acting to increase the gas-pressure and to thereby effect regulation by forcing the water in the generating-chamber away from the charge of carbid. Improved means are, however, herein shown for suspending the weights centrally of the bell. Such means comprise an annular hoop G′, which has an inner cross-bar $g$ and is suspended from the center of the top of the bell by a chain $g'$, that is fastened to the middle of said cross-bar. A number of weights $g^2$, $g^3$, $g^4$, and $g^5$ are suspended from the hoop G at intervals by chains of different lengths, and in this instance still another weight $g^6$ is suspended by the chain $g'$, which depends from its engagement with the cross-bar and is finally carried down and secured to the bottom $a$ of the holder, said chain being made of the right length to check the upward movement of the bell just before it rises far enough to permit the escape of gas beneath its edges. The several weights $g^2$, $g^3$, $g^4$, and $g^5$ are so proportioned and distributed around the hoop that when they are all lifted clear of the partition $a^7$ by the rising of the bell the hoop will be evenly balanced about its center of suspension. As the bell rises the several weights will then be picked up one by one, the hoop tipping to various angles in lifting the weight until they are all freely suspended and serving always as an equalizer by which their total pull is concentrated at the center of the bell. In this manner the tendency of the weights to tip the bell in different directions as it rises which exists when the weights are separately suspended from eccentric points on the bell is done away with, and the resulting binding and irregularity of movement liable to interfere with the uniformity of the gas-pressure is obviated. At the same time the weights can be distributed so as to be taken up in succession at the proper intervals without requiring any considerable vertical space for their distribution.

In order to obviate any possibility of excessive and dangerous pressure in the generating-chamber, the latter is provided with a relief-pipe $A^6$, that in the present improvement opens into the water-chamber A′, which in turn is ventilated by an open pipe $A^7$, leading off to the open air. The relief-pipe $A^6$ terminates at its lower end sufficiently below the normal water-level in the generating-chamber to be ordinarily sealed thereby, and will obviously not be uncovered until the pressure of gas in the generator has become great enough to force the water-level down to a point below the lower end of the relief-pipe. The ventilating-pipe $A^7$ leads off from the water-chamber at a point near the top thereof, so that its inlet is always free from water when the apparatus is in operation, and the shape of the pipe is such that any moisture accumulating within it will drain off into the water-chamber without danger of being retained in the pipe and interfering with the escape of gas through the same.

As is well understood by those skilled in this art, the generating of acetylene gas from carbid and water is always accompanied by the release of an amount of heat which may become a source of danger and which tends to deteriorate the gas produced unless arrangements are provided for absorbing it. A valuable feature of this form of generator consists in the fact that the water-chamber so surrounds the generating-chamber as to act as a water-jacket by which the latter is cooled. Inasmuch, however, as the water-level in the water-chamber will ordinarily be below the top of the generating-chamber, it has been found advantageous in the present improvement to provide a separate water-space $A^8$ over the top of the chamber to also act as a cooling-jacket, and to prevent the water in this space from itself becoming heated connection is made between this space $A^8$ and the annular water seal of the gas-holder. This connection consists, as herein shown, of a short open pipe $A^9$, leading from the bottom of the water seal to a point near the bottom of the water-space $A^8$ and a second open pipe $A^{10}$, leading from the top of the water-space to a point considerably above the bottom of the water seal, so that a constant circulation of a relatively-large quantity of water through the space $A^8$ is insured.

A drain-pipe H, controlled by valve $h$, leads out of the lower part of the generating-chamber and is herein shown as trapped, as at $h'$, to prevent the escape of gas through this channel. As a further improvement a pipe $i$ leads from the generating-chamber to the discharge-port of a force-pump I, so that by operating said pump the generating-chamber may be completely filled with water, and thus rid of all gas before being drained off preparatory to being opened for recharging. In the approved construction shown the suction-pipe $i'$ of the pump I leads out of the water-chamber A′, and in this case the water-supply in said water-chamber will be utilized in thus flushing the generating-chamber to expel the gas therefrom. A pipe $i^2$, controlled by a valve $i^3$, may also be provided to connect with the municipal water system or other independent source of available supply, if desired. No danger can result from this connection in the construction of apparatus shown even if the independent supply is under high pressure, since as soon as the generating-chamber is filled the excess of water will flow through the relief-pipe $A^6$ into the water-chamber and thence out through the filling-funnel $A^4$.

While in the apparatus as thus far described the carbid is exposed to the action of the water rising from beneath, it will be understood that the generator will still be operative if so modified as to some of its features as to constitute, in effect, a "sprinkler-machine" or one in which the water is poured upon the carbid from above. For example, in Fig. 8 I have shown a modified form of carbid-receptacle J, to which water is designed to be admitted as it rises in the generating-chamber through an aperture $j$ near the top of the receptacle. If the water thus admitted enters in too-great quantities, its contact with the carbid placed in the receptacle will generate such an excess of gas as to increase the normal pressure and force down the level of water in the surrounding generating-chamber until it stands below the aperture $j$, so that no more water will enter the receptacle until the generation resulting from the previous supply is checked. A perforated pan or diaphragm $j'$, extending across the receptacle just below the aperture $h$, may in this case be used to spread the water over a considerable mass of carbid. In Fig. 9 a receptacle $j$, of generally similar construction to that shown in Fig. 8, is divided into a number of compartments by partitions $j^2$, which increase in height with their distance from the aperture $j$, through which the water is admitted. With this construction the carbid in the shallower compartment near the inlet-aperture would be first exhausted before the water-level would rise high enough to flow over into the succeeding compartments, and in this manner the several distinct charges of carbid would remain dry until saturated in succession, as required.

It will be understood that while the several features of improvement thus described may be found useful separately and in connection, they are deemed particularly advantageous in the peculiar arrangement and combination shown. For example, the feature of providing for automatically maintaining the check-valve D open when the door of the generating-chamber is closed, while permitting said valve to close whenever the door is open, is peculiarly valuable in a generator in which the regulation is effected by means of an expansible gas-receiver, affording an increase of pressure with increase of capacity and operating in opposition to a predetermined hydraulic head to regulate the exposure of the carbid to the water, it having been found in practice that in an apparatus of this type even the resistance of a light check-valve in the passage between the generator and receiver will interfere with the delicacy and success of the regulation. Said several features of improvement are consequently hereinafter claimed in various combinations as well as separately.

I claim as my invention—

1. The combination with a water-chamber and connected generating-chamber, of a superposed gas-holder, a connecting-passage between the generating-chamber and gas-holder, and a drain for said passage consisting of an open depending pipe extending downward into an open cup forming a trap and located within the water-chamber, so that it will fill from and overflow into said water-chamber.

2. The combination with a water-chamber and connected generating-chamber, of a superposed gas-holder, a passage connecting the generating-chamber and gas-holder, a drain for said passage consisting of an open depending pipe, an open cup located within the water-chamber so that it will fill from and overflow into said water-chamber and forming a trap to receive said depending pipe, and a drain-pipe from the gas-holder also depending into said cup.

3. The combination with a generating-chamber having a gas-outlet of a closed water-chamber connected with the generating-chamber, a relief-pipe opening into the water-chamber at a point above the normal level of the water therein from a point in the generating-chamber below the normal level of the water therein, and an open ventilating-pipe leading from the water-chamber.

4. The combination with a generating-chamber having a door of a closed water-chamber connected with the generating-chamber, a relief-pipe opening into the water-chamber from a point in the generating-chamber below the normal level of the water therein, and an open ventilating-pipe leading from the water-chamber, a filling-orifice leading into the water-chamber at a point below the normal water-level therein, means for draining the generating-chamber, and means for flushing the generating-chamber to expel the gas therefrom before opening the door.

5. The combination with a water-chamber of a generating-chamber having a door and connected with the water-chamber by a valved passage, said chambers being so proportioned and arranged that the inflow from the water-chamber when filled will partially fill the generating-chamber, a force-pump having its suction and discharge connected respectively with the water and generating chambers for flooding the latter, and a drain for the generating-chamber.

6. The combination with a generating-chamber and connected water-chamber having a water-inlet of means for adjustably limiting the maximum water-level in said chamber, consisting of an overflow-pipe revolubly mounted in the wall of the chamber with its inner end deflected from its axis of rotation and carrying a trap for containing a water seal against the escape of gas.

7. The combination with a generating-chamber and connected water-chamber having an inlet-passage, of means for adjustably limiting the maximum water-level in the water-chamber, comprising an overflow-pipe revolubly mounted in the wall of the chamber with its inner end deflected from its axis of rotation and bent to contain a water seal against the escape of gas.

8. The combination with a generating-chamber and connected water-chamber having an inlet-passage, of means for adjustably limiting the maximum water-level in the water-chamber, comprising an overflow-pipe revolubly mounted in the wall of the chamber and having its inner end deflected from its axis of rotation and bent to contain a water

seal, stops limiting the rotary movement of the pipe, and an angular bend in the pipe whereby the plane of the water-containing portion is at such an angle with the plane of the extremities that the water seal is maintained throughout the extreme movement of the pipe between the stops.

9. The combination with the water-chamber and inclosed generating-chamber projecting above the normal water-level in said chamber and with a superposed gas-holder provided with a floating bell depending into a water seal, of a separate water-space covering the upper portion of the generating-chamber for cooling the latter, and connections at different levels between said water-space and the sealing-chamber of the gas-holder for securing a circulation of water therethrough.

10. The combination with a generating-chamber in which the water-supply is controlled by the gas-pressure, of a gas-holder provided with a floating bell, a number of weights adapted to be lifted in succession by said bell to increase the pressure as the latter rises, and means for concentrating the pull of said weights upon the bell, consisting of an equalizer loosely suspended centrally from the center of the bell, and separately supporting the several weights.

11. The combination with a generating-chamber in which the water-supply is controlled by the gas-pressure, of a gas-holder provided with a floating bell and a number of weights arranged to be lifted in succession by said bell to increase the gas-pressure as the bell rises, and means for concentrating the pull of said weights upon said bell, consisting of a hoop having a cross-bar and suspended centrally from the bell by the middle of its cross-bar, and links or chains of different lengths connecting the several weights with different points on the hoop.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two subscribing witnesses, this 23d day of November, A. D. 1897.

GEO. LANDIS WILSON.

Witnesses:
H. WARREN WILSON,
N. A. COSTELLO.