No. 614,593. Patented Nov. 22, 1898.

D. S. WILLIAMS.

ACETYLENE GAS GENERATOR

(Application filed Aug. 13, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

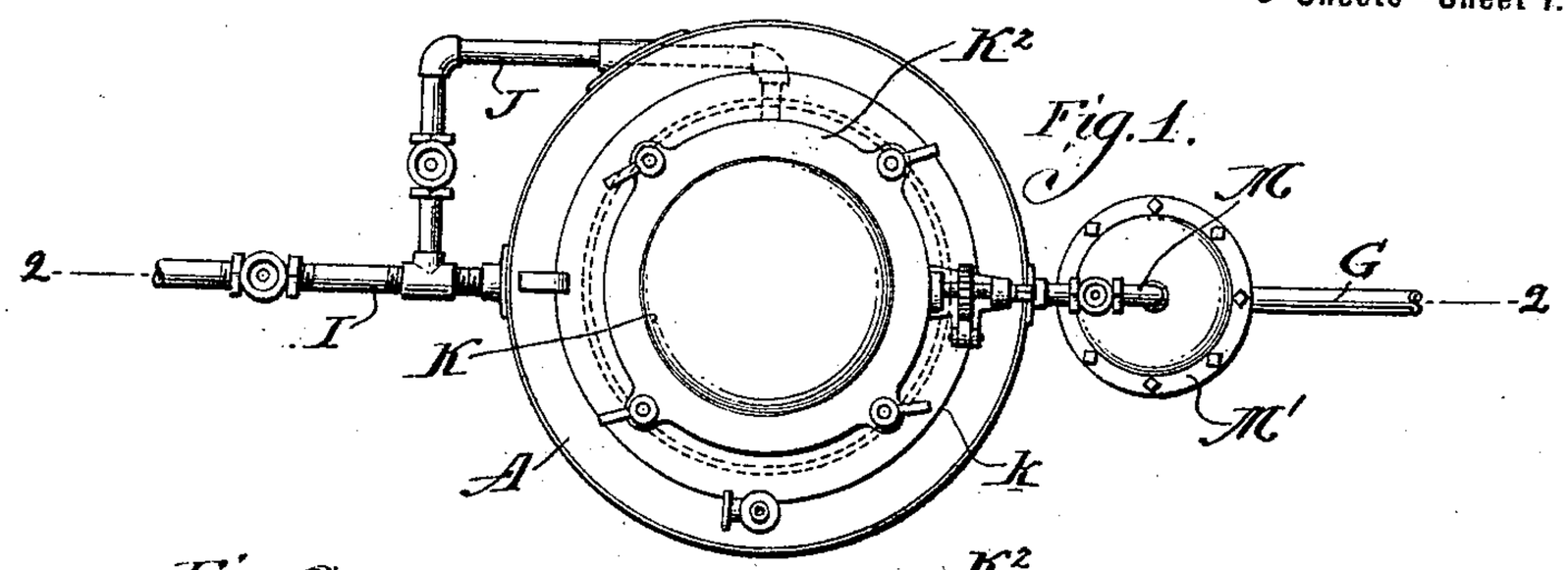

Fig. 3.

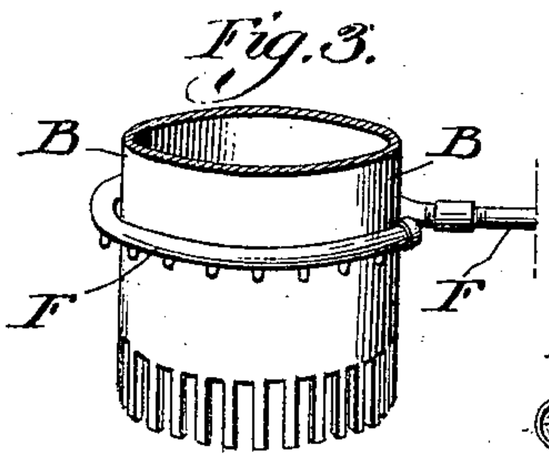

Fig. 2.

Fig. 4.

Fig. 5.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 6.

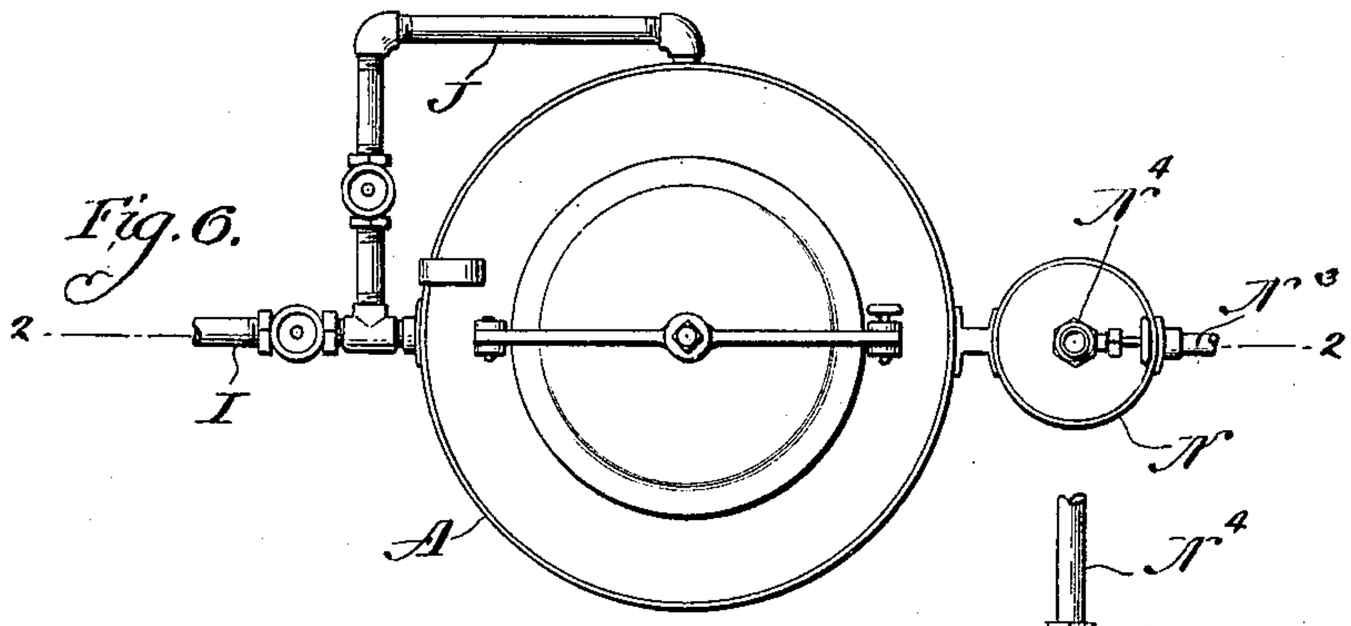
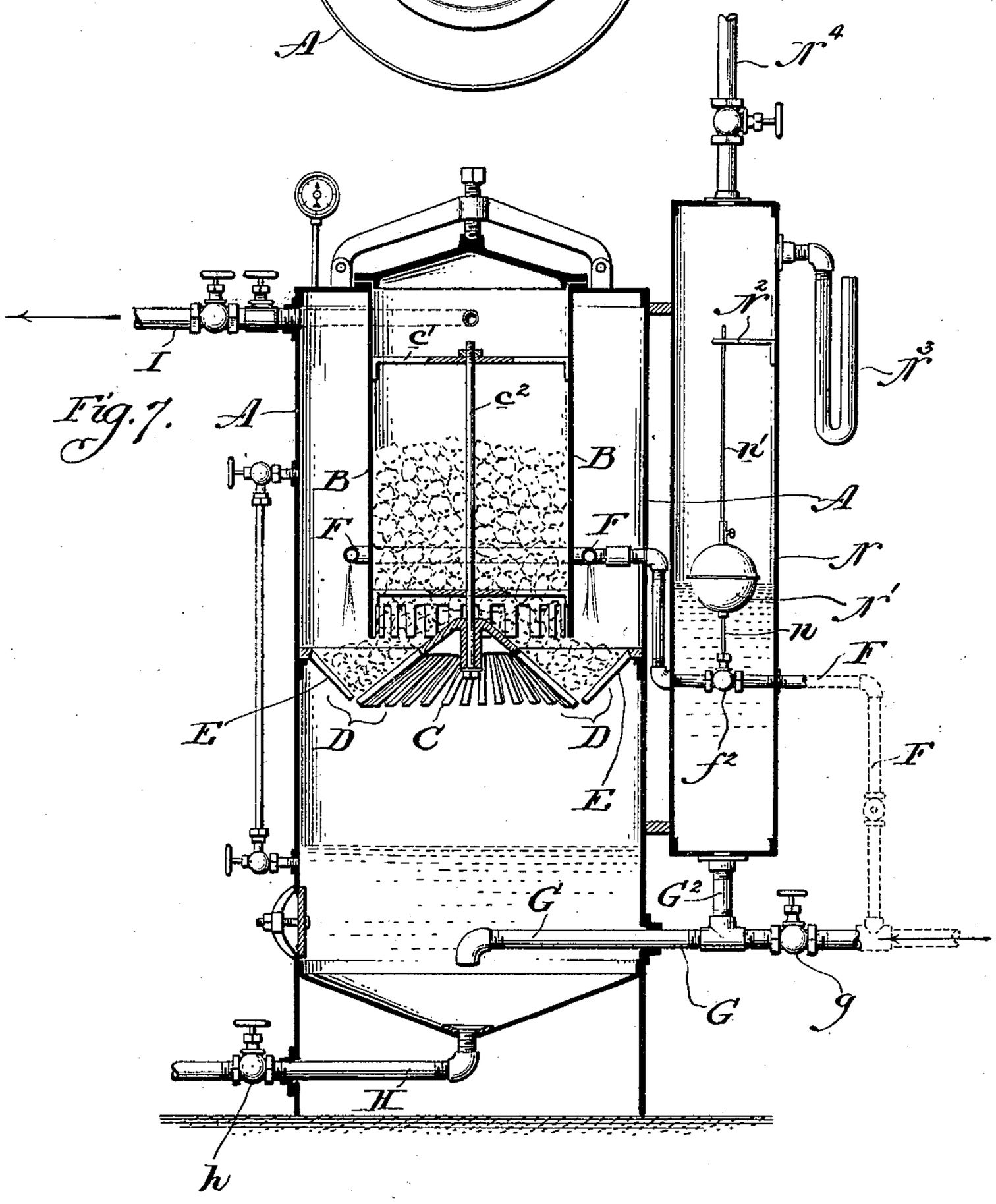


Fig. 7.



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(No Model.) 3 Sheets—Sheet 3.

FIG. 8.

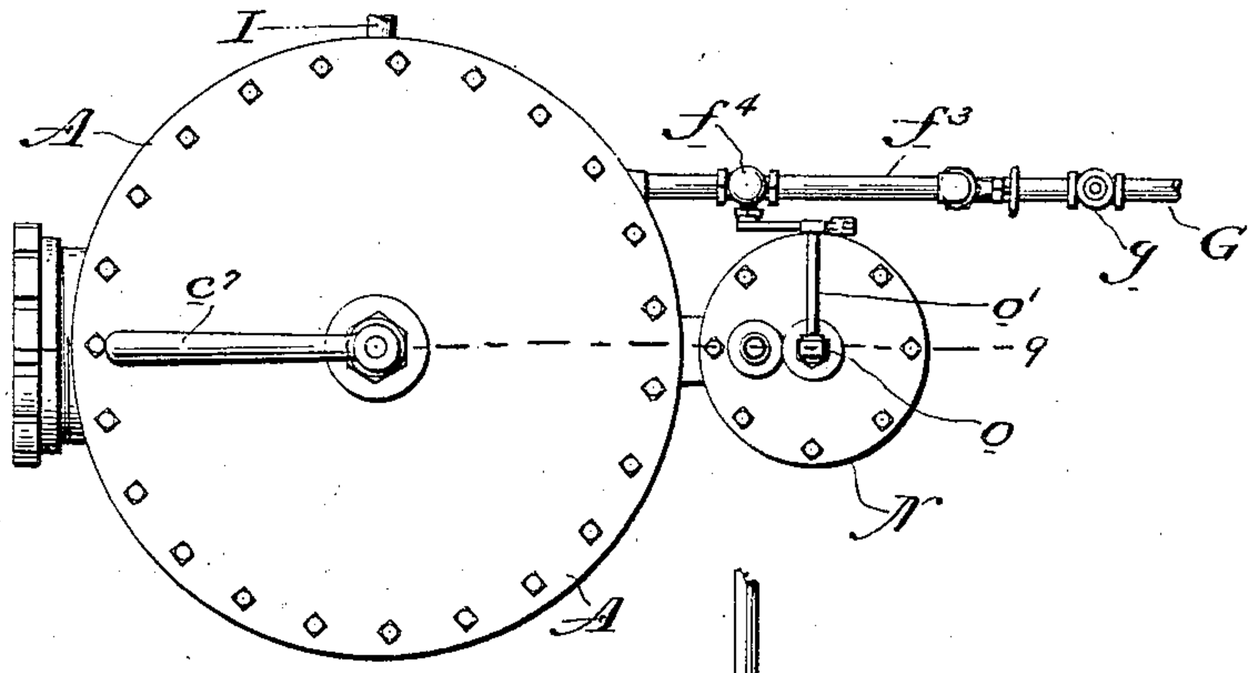
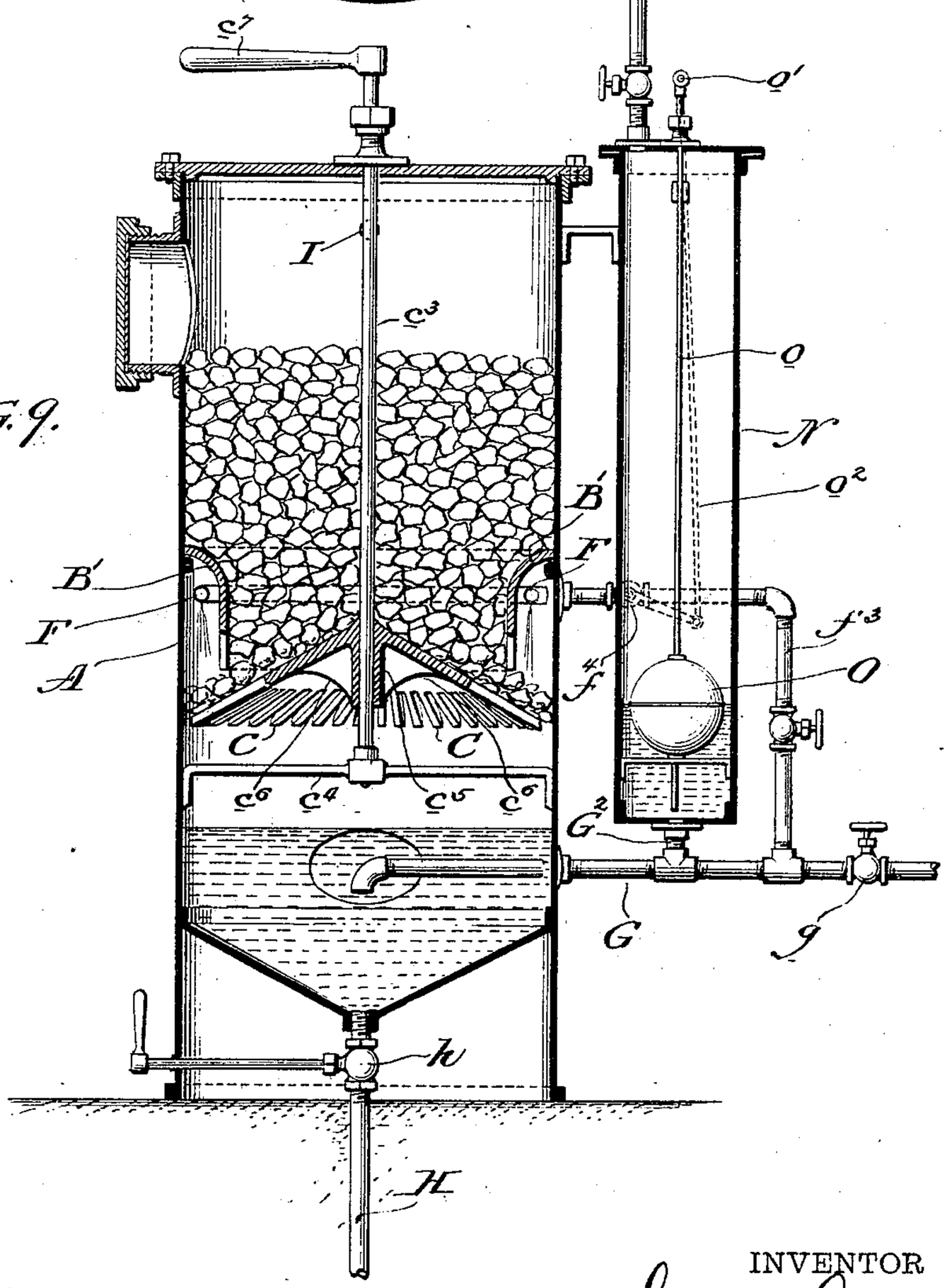


FIG. 9.



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UNITED STATES PATENT OFFICE.

DAVID S. WILLIAMS, OF PHILADELPHIA, PENNSYLVANIA.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 614,593, dated November 22, 1898.

Application filed August 13, 1897. Serial No. 648,116. (No model.)

To all whom it may concern:

Be it known that I, DAVID S. WILLIAMS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Generating Acetylene Gas; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of acetylene gas; and it consists of a new and improved machine for automatically bringing the gas-making material in contact with a stream of water, in means for regulating the supply of water to said material according to the amount of gas generated, and in means for replenishing the supply of gas-making material while the machine is in operation.

My invention further consists in details of construction, as more fully set out hereinafter.

Heretofore in the manufacture of acetylene gas it has been customary to place the calcium carbid in a containing vessel and different means were provided for supplying water to the calcium carbid for the purpose of generating the hydrocarbon gas, all of which involved the saturation or moisture of the entire mass or a large part thereof. As a consequence the gas is generated with great rapidity, and although arrangements have been devised either for shutting off the water-supply or for withdrawing the calcium carbid from the water automatically as the pressure of gas approaches the danger-point it has been found that the generation of gas continues, owing to the calcium carbid being in a more or less wet condition, for a considerable time after the supply of water is discontinued. The result has been that in spite of the perfect working of said automatic devices and notwithstanding the exercise of every reasonable precaution the pressure occasionally increases to such an extent that disastrous explosions result.

The embodiments of the invention herein described comprise as their main features a tank in which the gas is generated, the tank containing a vessel for holding the calcium carbid, the vessel having a floor, preferably a deflecting one, as a grate, upon which the contained material is adapted to be fed toward the circumference of the floor, which constitutes an annular receptacle for containing the limited quantity of the calcium carbid that is to be subjected at any one time to the action of the water. Water is supplied to the material in the receptacle preferably by means of a supply-pipe, which extends around the tank over the material in the annular receptacle, the supply-pipe being provided with orifices through which the water is sprayed upon the material.

The invention also consists in automatic means for shutting off the water-supply when the pressure increases up to a certain point, in means for charging the vessel for containing the calcium carbid during the generating process and without interference therewith, and in means for removing the residuum from the tank.

I will now proceed to describe the several embodiments of my invention.

It must be understood that my invention so far as the machine is concerned is not restricted to the types shown and described, as the construction may be altered in many details without departing from the principle of the invention.

In the drawings, Figure 1 is a plan view of a machine constructed in accordance with my invention. Fig. 2 is a sectional elevation on the line 2 2 of Fig. 1. Fig. 3 is a detached perspective view of a portion of the vessel for containing the material. Fig. 4 is a perspective view of the grating comprising the outer part of the floor sustaining the material. Fig. 5 is a perspective view of the grating forming the central part of the floor. Fig. 6 is a plan view of a slightly-modified form of my invention. Fig. 7 is a sectional elevation on the line 2 2 of Fig. 6. Fig. 8 is a plan view of a second modification of my invention, and Fig. 9 is a sectional elevation on the line 9 9 of Fig. 8.

A is the tank or outer casing; B, the vessel containing the calcium carbid. This vessel may be circular in shape, of substantially uniform diameter, and extend upwardly to the top of the tank, leaving an annular space between it and the wall of the tank, as in Figs. 2, 3, and 7, or it may consist of the walls of the tank itself, plus the circular inwardly

and downwardly projecting piece B′, secured to the wall of the tank, as in Fig. 9. The floor of this vessel consists of a cone-shaped grate C, the sloping top thereof acting to deflect the material from the vessel into the annular receptacle D, which may be joined, as in Figs. 2 and 7, partly by the grate itself and partly by an annular sloping grate E, secured to the wall of the tank and shown in detail in Fig. 4, or the annular receptacle may be formed, as in Fig. 9, simply by the prolongation of the floor-grate C. In Fig. 2 the floor-grate C is suspended from the vessel B by means of the depending bars *c*. This floor-grate is shown in detail in Fig. 5. In Fig. 7 the floor-grate is shown suspended by means of stay-rods *c′*, extending across the vessel B, and a rod c^2, depending therefrom and secured to the floor-grate C at its apex. In Fig. 9 the deflecting-grate is supported by means of a shaft c^3, projecting above the cover of the tank and extending through the apex of the grate to stay-bars c^4, extending across the tank beneath the floor-grate. The floor-grate in Fig. 9 is shown provided at its apex with a depending collar c^5, surrounding the shaft, and reinforcing-ribs c^6 between the collar and the grate.

In each of the several embodiments of my invention shown the water is introduced into the tank by means of a pipe F, which is arranged within the tank to extend entirely around the same and between the wall thereof and the wall of the containing vessel B and directly over the receptacle D. This pipe is provided with orifices through which the water sprays over the material in the receptacle.

The tank in each of the embodiments shown is adapted to contain water, and a pipe G, from a source of water-supply controlled by a suitable valve *g*, leads to the lower part of the tank for the purpose of supplying water thereto, while a discharge-pipe H, controlled by a valve *h*, extends from the conical bottom of the tank.

The operation of the machine so far as I have described it is as follows: The vessel B is filled with the calcium carbid, and a limited quantity thereof is fed by means of the deflecting-grate C to the annular receptacle D. Water is then admitted into pipe F and is sprayed upon the material in the receptacle, the hydrogen of which, as is well known, enters into chemical combination with the constituent carbon of the calcium carbid, thus generating hydrocarbon or acetylene gas, which fills the tank and is drawn off for consumption through the pipe I. The residual oxid of calcium and water drops down to the bottom of the tank and accumulates there, whence it is expelled by flushing—that is, opening the valve *h* and withdrawing the water. The flushing operation may be continued by opening the valve *g* and admitting such additional quantities of water as may be necessary to thoroughly clean out the tank, after which the valve *h* is closed and the valve *g* opened until the tank is again supplied with the desired quantity of water. As the receptacle C is depleted by the operation just described, it is continuously supplied with fresh material from the vessel B, the quantity of calcium carbid under the action of the water remaining, therefore, practically stationary. When the water-supply is turned off, either by manipulating the controlling-valve by hand or by the closing of an automatic valve by the means hereinafter to be described, only a small proportion of the material—namely, the material in the receptacle C—will be in a wet or moist condition, and the subsequent generation of gas will be limited. So far this described operation applies to each of the several embodiments which I have illustrated; but it is obvious that machines used as a part of a large supply plant and those intended for individual use for domestic purposes should differ somewhat, not in principle, but in details of construction. The construction shown in Figs. 1 to 5 is one which I consider suitable for use in the manufacture of gas on a large scale and I will proceed to describe some of its peculiarities of construction.

It is manifestly sometimes desirable in machines of this class when the stock of material in the tank becomes depleted to introduce a new supply without discontinuing the generation of gas. To this end I have placed a reservoir-tank K above the tank, the said tank having the annular flange *k* at its bottom, which is bolted to the top of the tank, the bolts also extending through the annular flange *b* on the top of the vessel B, by which means the vessel B is suspended within and the tank K sustained above the tank A. This tank K has a trap-door bottom K′, which is shaped, preferably, like the floor-grate C. On the rim of this trap-door bottom is a gasket *k′*, so that a gas-tight joint will be normally maintained between the reservoir and the interior of the tank. To sustain the bottom in this position, I have shown a windlass L and chain L′, the chain being secured to a depending bar L^2, having the stay-rods *l′* and l^2, and secured to the bottom K′ by any desirable means. The reservoir K has the cover K^2, through which the material is introduced to fill the reservoir. To fill the vessel B from the reservoir, the chain is unwound, thus dropping the bottom of the reservoir and permitting the desired quantity of material to drop into the vessel B.

In order to automatically shut off the water-supply when the gas accumulates in the tank faster than it is withdrawn for consumption, I have provided the following means: The pipe G from the source of water-supply has the branch pipes G′ and F, both hereinbefore described. The pipe G has the hand-valve *f* and the globe-valve *f′*, adapted to be operated automatically. A gas-pipe M leads from the top of the tank to a diaphragm-case M′, sustained on bracket *m* and having the diaphragm *m′*, which has a spring-pressed

rod m^2, secured to the valve f'. By this means the diaphragm is set to yield at a definite pressure, and when the gas in the tank reaches that pressure the valve will close.

Instead of introducing the water-supply pipe into the annular space between the tank A and vessel B above the receptacle D it may be arranged as shown in dotted lines, Fig. 2—namely, by extending the pipe F into the tank beneath the floor-grate and spraying the water horizontally and radially upon the material in the bottom of the receptacle D.

The gas may be expelled from the tank at any time that the vessel B is empty by opening the valve g and allowing the water from the pipe G to fill the same. The gas in the interior of vessel B will be expelled by means of the pipe J, leading therefrom and connecting outside of the tank with the pipe I.

The construction shown in Figs. 6 and 7 is intended for the manufacture of gas on a small scale. I have shown the following means for automatically shutting off the water-supply as the gas-pressure increases to a fixed amount: Adjoining the tank A is a receiver N, connected by means of a branch pipe G^2 with pipe G. Pipe F extends in this construction through the receiver and has a globe-valve f^2 within the same. To this valve is connected the float N' by means of rod n. A guide-rod n' projects upwardly from the float, passing through a circular orifice in bracket N^2, secured to the inner wall of the receiver. A column of water is sustained in the receiver by the pressure of gas in the tank. The receiver communicates with the room in which the same is placed by means of the gooseneck N^3, extending from the receiver a short distance from the top thereof, while it communicates with the exterior atmosphere by means of a flue N^4, extending from the top thereof to the chimney. As the pressure of gas increases beyond the desired amount the volume of water in the receiver is lifted, raising the float and shutting the valve f^2. If for any reason, whether due to the derangement of valve f^2 or otherwise, the gas continues to generate after the float is lifted to an abnormal extent, the level of the water in the receiver will rise until it reaches the gooseneck, into and through which the water will flow until the level of the water in the tank A sinks beneath the mouth of the pipe G. The pressure in the tank then forces the gas through the water-pipe G and receiver N, the gas escaping through the flue N^4, the water in the gooseneck acting as a seal to prevent the escape of the gas into the room. This automatic valve and safety device constitutes no part of my present invention, except so far as it is efficient for use in combination with the novel features of my invention and is described and claimed in Letters Patent granted to me October 19, 1897, Serial No. 592,035.

In the construction shown in Figs. 8 and 9 the shaft c^3 for supporting the floor-grate C and hereinbefore described extends up through the top of the tank and has secured to it the crank c^7. Should the material clog in vessel B, so as to interfere with the feed of the same to the receptacle, the grate C may be turned by operating the crank c^7. I have also shown in these figures a modified device for automatically shutting off the water-supply to the tank. The valve-controlling pipe F is in this construction located outside of the tank and is lettered f^4. A float O is sustained within the receiver, and a rod o, secured to it, projects up through the top of the receiver and is secured to the rock-shaft o', to which is attached the connecting-rod O^2, secured to an arm attached to valve f^4. As the float rises the connecting-rod is drawn up, thus operating the valve.

By having the automatically-controlled valve without the tank the danger of water in the receiver leaking into the valve, as might occur in the construction shown in Figs. 6 and 7, is obviated.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A machine for generating acetylene gas consisting of a receptacle adapted to contain the gas-making material, a conical grate arranged below said receptacle, so as to convey the gas-making material away from the receptacle into an annular space surrounding the same, a water-supply pipe located in said annular space above the gas-making material, and means as shown for regulating the supply of water to the gas-making material by the pressure of gas contained within the reservoir.

2. A machine for generating acetylene gas consisting of an inner receptacle adapted to contain the gas-making material, a conical grate arranged below said receptacle so as to guide the material into an annular space formed between the inner and outer receptacles of the generator, a water-supply pipe located in said annular space provided with a regulating device governed by the pressure of gas in the outer receptacle for regulating the flow of water to the gas-making material, and a gas-discharge pipe for conveying the gas from said outer receptacle.

3. A machine for generating acetylene gas, consisting of an inner receptacle adapted to contain the gas-making material, and an outer receptacle adapted to hold gas and contain the residuum from the gas-making material, a conical grate arranged below the inner receptacle so as to convey the gas-making material from the inner receptacle to the annular space formed between the same and the outer receptacle, a gas-discharge pipe connected to the outer receptacle, a water-supply pipe located in said annular space over the gas-making material, provided with a series of openings, a reservoir supported from the outside of the generator provided with a pipe

communicating with the outer casing of the generator, said reservoir being adapted to hold a quantity of water, a float arranged within said reservoir and being connected by a lever with a valve in the water-supply pipe so that the pressure of gas acting upon said body of water will regulate the supply of water to the gas-making material.

4. In a machine for manufacturing acetylene gas, the combination with a tank or casing having a conical floor or grate therein adapted to support a quantity of calcium carbid, of a partition above said floor adapted to separate a part of said material from the remainder thereof, and means as shown located in the annular space between said partition and the tank for supplying water to a part only of said material, the tank being adapted to receive the gas, a valve as shown, for controlling said water-supply, and means as shown for closing said valve adapted to be actuated by a given pressure of gas.

5. In a machine for manufacturing acetylene gas, the combination with a tank or casing having a conical floor or grate therein adapted to support a quantity of calcium carbid, of a partition above said floor or grate, adapted to separate a part of said material from the remainder thereof, and means as shown and described for supplying water to a part only of said material, the tank being adapted to receive the gas, a valve extraneous to the tank for controlling said water-supply, a device extraneous to the tank for controlling said valve connected with said tank through the medium of a pipe connection and adapted to be actuated to close said valve by increase of gas-pressure.

6. In a machine for the manufacture of acetylene gas, the combination with a tank in which the gas is generated, of a vessel freely suspended therein, a conical grate arranged below said vessel and suspended thereby a second inclined grate suspended from the tank, a water-supply pipe arranged in the annular space formed between the inner and outer receptacles, means as shown for regulating the supply of water to the generator, a reservoir mounted above the generator having an opening communicating therewith, a conical door for closing said opening, and means extraneous to said reservoir for opening and closing said door.

7. In a machine for the manufacture of acetylene gas, the combination with a tank or casing in which the gas is to be generated, of a vessel within said tank adapted to the generating material, a deflecting-grate beneath said vessel adapted to deflect the material toward the walls of the tank or casing, a water-supply pipe extending into said tank, but without said vessel, the same being provided with orifices in proximity to said deflecting-grate, a reservoir mounted above the generator and communicating therewith, the same being adapted to hold a supply of gas-making material, and a door arranged at the bottom of said reservoir for regulating the supply of gas-making material to the inner receptacle of the generator.

8. In a machine for the manufacture of acetylene gas, the combination with a tank or casing, such as shown and described, in which the gas is to be generated, of a vessel within said tank adapted to the generating material, the said vessel having a deflecting-grate beneath the same adapted to deflect the material toward the walls of the tank or casing, and a water-supply pipe extending into said tank, but without the vessel, and provided with orifices in proximity to the said deflecting-grate.

9. In a machine for the manufacture of acetylene gas, the combination with a tank or casing, substantially as shown and described, in which the gas is to be generated, of a vessel within said tank adapted to the generating material, the said vessel having a deflecting-grate beneath the same adapted to deflect the material toward the walls of the tank or casing, and a water-supply pipe extending into the space between said vessel and the wall of the tank and above the deflecting-grate, the said supply-pipe being provided with orifices, and means as shown and described for regulating the supply of water by the pressure of gas in the generator.

10. In a machine for the manufacture of acetylene gas, the combination with a tank or casing provided with a water-supply pipe and a gas-discharge pipe in which the gas is to be generated, of a vessel within said tank adapted to the generating material, the said vessel having a deflecting-grate beneath the same adapted to deflect the material toward the walls of the tank or casing into an annular receptacle below the wall of said vessel, and a water-supply pipe extending into said tank and arranged to extend around the same above said annular receptacle, the said supply-pipe being provided with orifices.

11. An acetylene-gas generator, comprising an outer casing, an inner carbid-receptacle supported thereon with an open lower end separated by an annular space therefrom, a conical grate below the carbid-receptacle adapted to convey the carbid to the lower part of said annular space, combined with the water-supply pipe in said annular space, and means for regulating the supply of water by the pressure of the generated gas.

12. A machine for generating acetylene gas consisting of an outer tank or receptacle provided at the top with a gas-discharge pipe and at the bottom with an outlet for discharging the waste products from the generation of the gas, a receptacle suspended within said tank or receptacle adapted to contain the gas-making material, a conical grate arranged below said receptacle so as to convey the gas-making material into the annular space between the tank and the inner receptacle, a water-supply pipe located in the annular space above the gas-making material and

regulating devices such as shown and described for regulating the water-supply by the gas-pressure in the generator.

13. A machine for generating acetylene gas consisting of an outer tank or receptacle provided at the top with a gas-discharge pipe and at the bottom with an outlet for discharging the waste products from the generation of the gas, a receptacle suspended within said tank adapted to contain the gas-making material, a conical grate arranged below said receptacle so as to convey the gas-making material toward and into the annular space formed between the tank and the inner receptacle, a water-supply pipe located in the annular space and above the gas-making material an outer receptacle communicating with the tank by a pipe, said outer receptacle being adapted to hold a body of water, and a float within said receptacle communicating with a valve in the water-supply pipe so as to regulate the supply of water by the pressure of gas in the generator.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID S. WILLIAMS.

Witnesses:
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