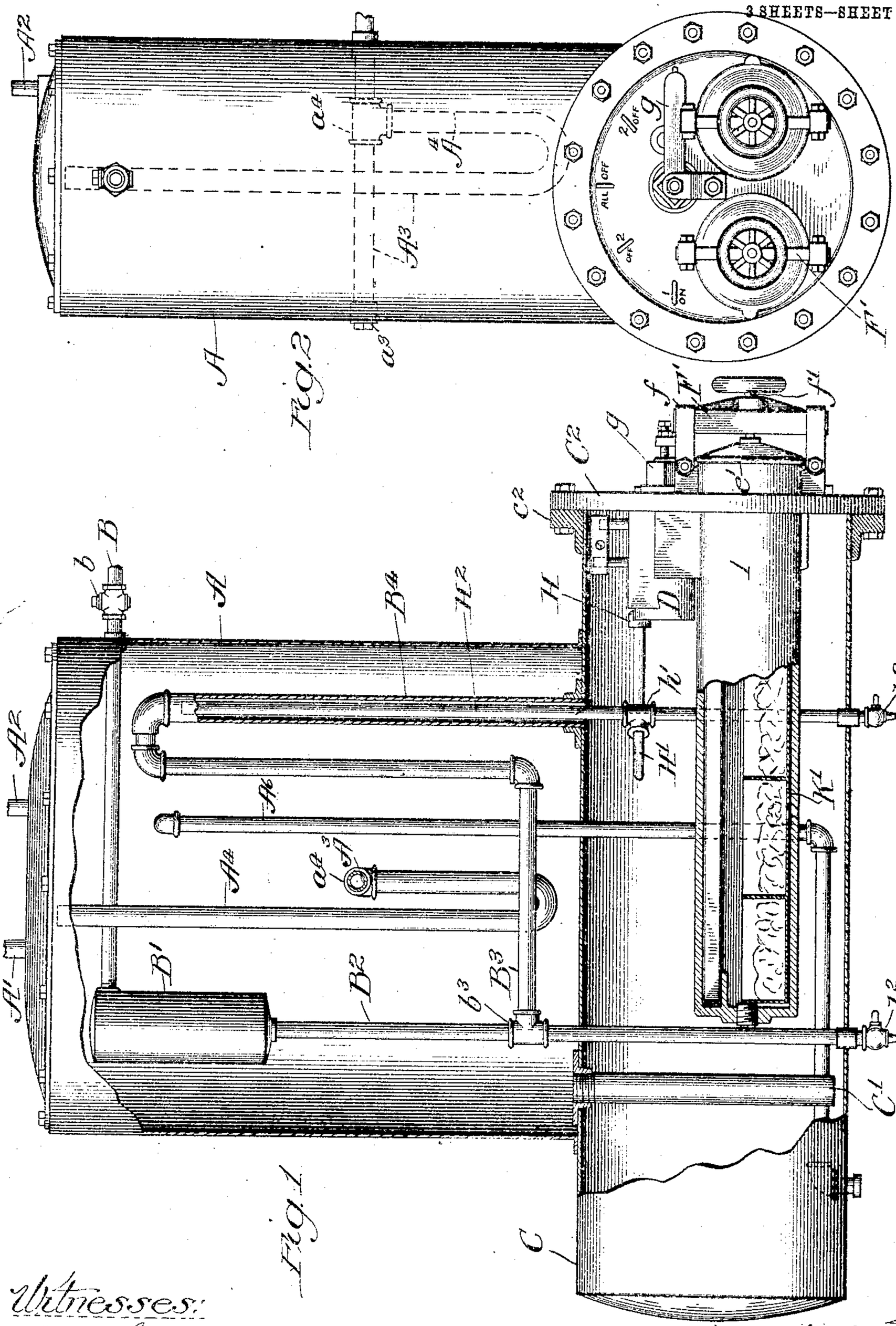
No. 779,531. PATENTED JAN. 10, 1905.

E. R. COOK.

ACETYLENE GAS GENERATING APPARATUS.

APPLICATION FILED SEPT. 19, 1902.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 3

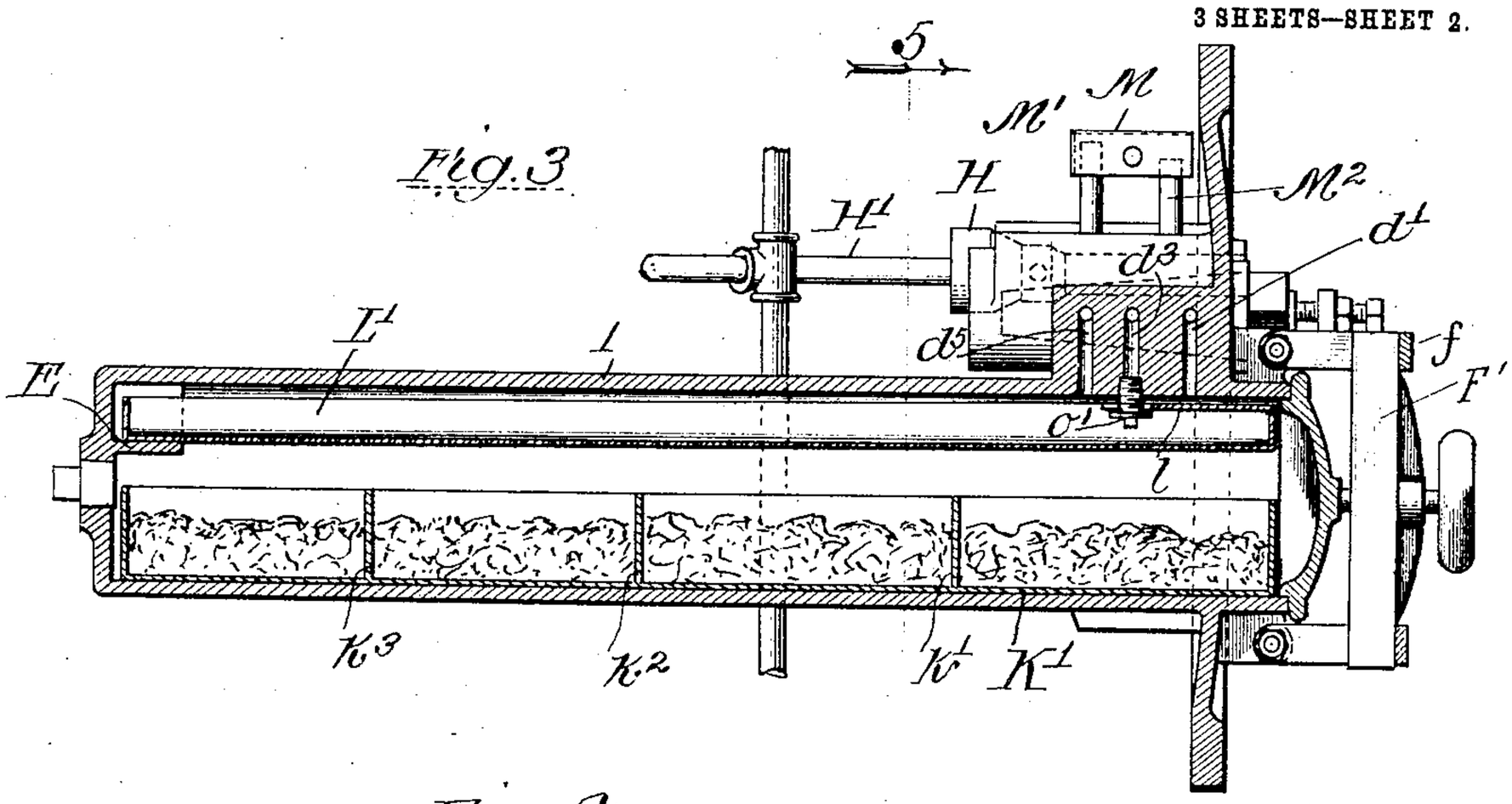

Fig. 4

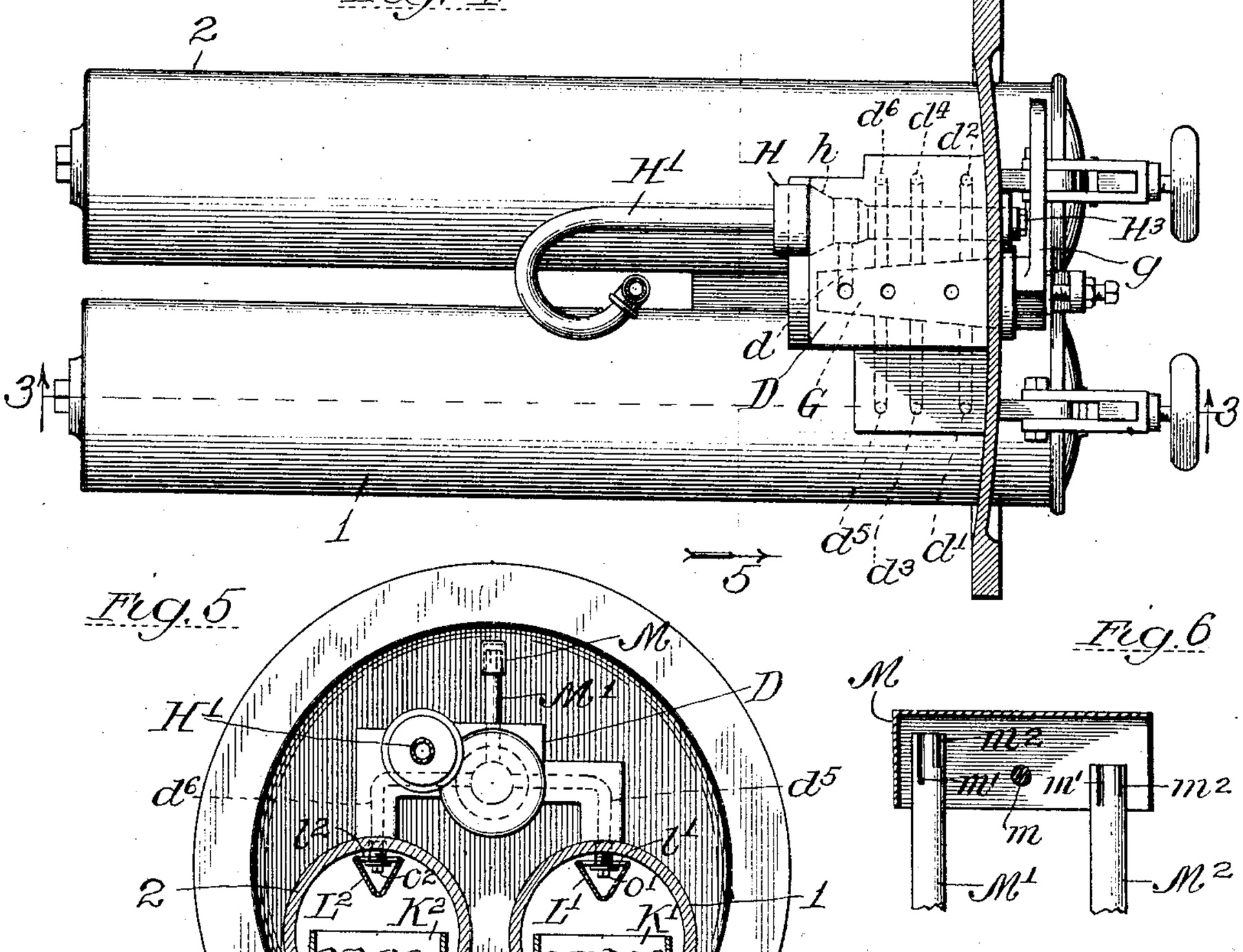

Fig. 5

Fig. 6

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3 SHEETS—SHEET 3.

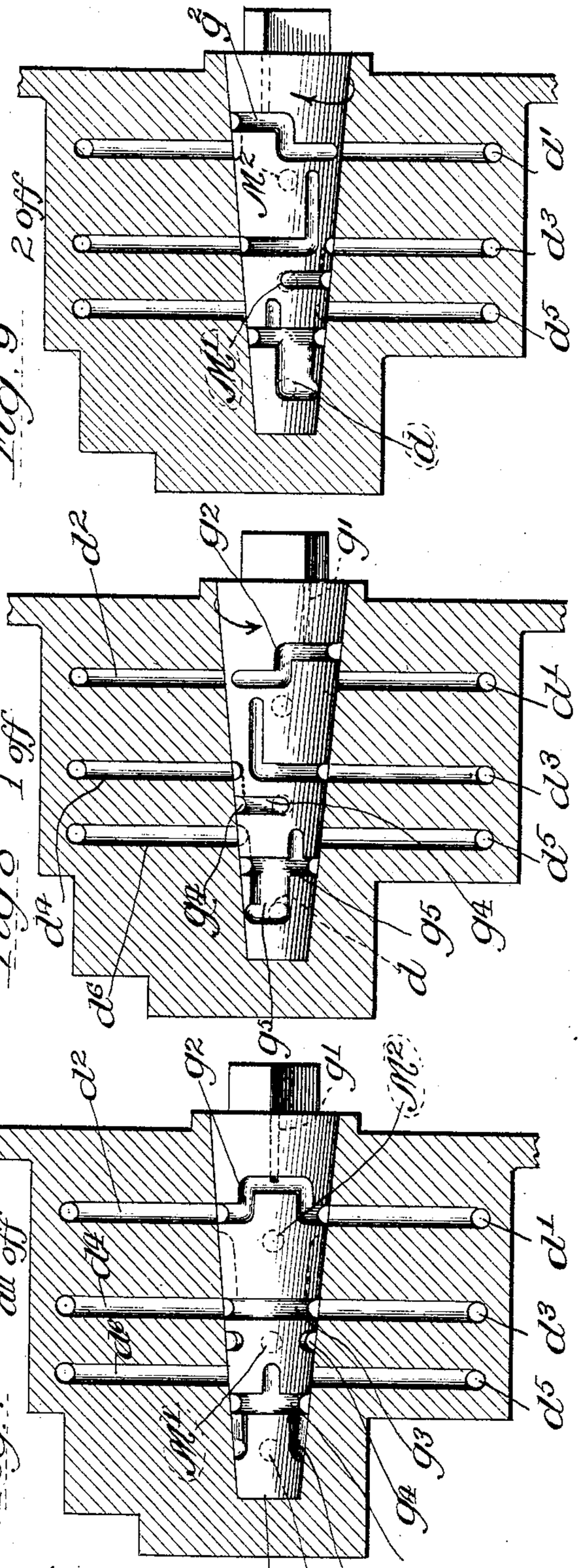

Fig. 9

Fig. 8

Fig. 7

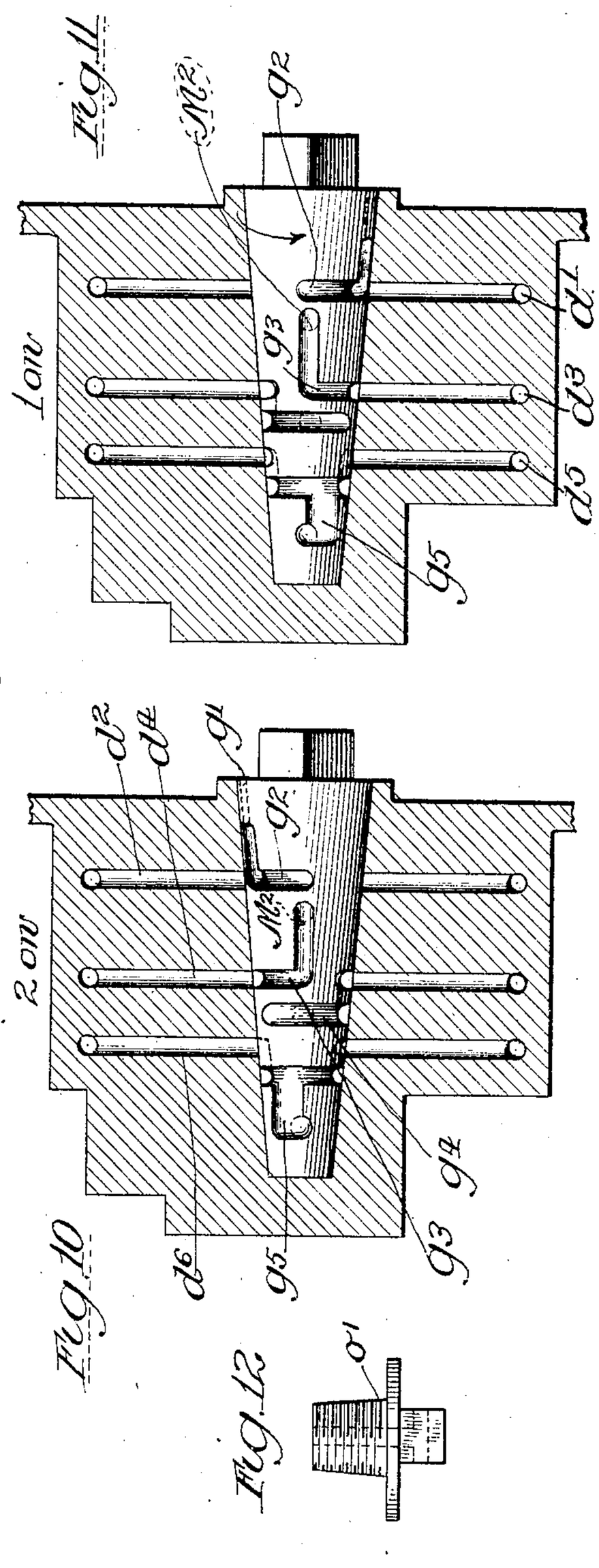

Fig. 10

Fig. 12

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No. 779,531. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

EDMOND R. COOK, OF CHICAGO, ILLINOIS.

ACETYLENE-GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 779,531, dated January 10, 1905.

Application filed September 19, 1902. Serial No. 124,092.

To all whom it may concern:

Be it known that I, EDMOND R. COOK, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Apparatus for Generating Acetylene Gas; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates generally to apparatus for generating gas, and more particularly to acetylene-gas generators especially designed for supplying gas to locomotive-headlights.

My present invention comprises certain improvements in the acetylene-gas-generating apparatus covered by my prior patents No. 670,196, granted March 19, 1901, and No. 708,956, granted September 9, 1902.

The improvements herein disclosed consist, first, in providing the controlling-valve with ports to connect either one or both of the carbid-cylinders with the atmosphere when they are disconnected from the water-supply and gas-delivery passages, thereby rendering unnecessary vent check-valves which are liable to be held off their seats by particles of foreign matter and permit water to flow into the cylinders from the interior of the equalizing-chamber; second, in supporting the drip-troughs at their front ends upon the spray-nozzles; third, in dividing the carbid-trays into compartments, thereby separating the carbid into several portions which are successively consumed; fourth, in providing a restricted or graduated flow of water into the carbid-cylinders; fifth, in rendering the flow of water to the carbid-cylinders constant by preventing the waves produced in the generating-chamber by the motion of the locomotive flowing directly into the carbid-cylinders, and, sixth, in providing an escape for the gas from the water-chamber separate from the water overflow, so that the escaping gas may be conducted to the locomotive-cab or other point out of danger of ignition by the trainmen's torches.

My invention has for its object the production of a generator for supplying acetylene gas to the headlight of a locomotive which will be simple in construction, inexpensive in manufacture, and reliable and efficient in operation.

My invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is an elevational view of my invention, parts of the surrounding walls of the chambers being broken away; Fig. 2, an elevational view looking from the right in Fig. 1; Fig. 3, a central longitudinal section through one of the carbid-cylinders, taken on line 3 3, Fig. 4; Fig. 4, a plan view of the two carbid-cylinders, showing the ports and passages leading to and from the same; Fig. 5, a cross-sectional view on line 5 5, Figs. 3 and 4; Fig. 6, a detailed view of the tubes through which water passes to the carbid-cylinders; Figs. 7, 8, 9, 10, and 11, detailed views showing the controlling-valve in its five different positions, and Fig. 12 a detailed view of the spray-nozzle.

Similar reference characters are used in the several figures of the drawings to indicate similar parts.

Reference character A indicates the water-chamber, which supplies water to the equalizing-chamber C. The water-chamber may conveniently consist in an upright cylinder supported at its lower end upon the equalizing-chamber, which may conveniently consist in a horizontally-disposed cylinder.

A′ indicates a supply-pipe through which water is delivered to the water-chamber.

A^2 indicates a discharge-pipe leading from the top of the water-chamber and extending to the locomotive-cab or any other point where there will be no danger of the ignition of the escaping gas from the trainmen's torches or otherwise.

A^3 designates a horizontal pipe supported at its opposite ends in collars secured in the walls of the water-chamber. One end of the pipe A^3 is closed by any suitable means—as,

for instance, a screw-plug a^3—while its opposite end is open. A pipe A^4 is connected to the transverse pipe A^3 by means of a T-coupling a^4. The pipe A^4 extends downwardly below the transverse pipe and terminates at a point adjacent to the top of the water-chamber.

A^6 indicates a steam-coil for maintaining the water at a temperature above freezing.

A pipe C′ extends downwardly into the chamber C, and terminates at a point adjacent to the bottom thereof. A cylinder-head C^2 closes the end of the cylinder C and is detachably secured thereto by any suitable means—such, for instance, as bolts extending through registering holes in the cylinder-head and in a collar c^2, rigidly secured around the end of the chamber C.

A plurality of carbid-cylinders 1 and 2 are secured to the cylinder-head C and are preferably formed integrally therewith. The ends of the carbid-cylinders extend through the cylinder-head and are closed by means of hand-hole covers e', removably held in position over the ends of the cylinders by any suitable means—such, for instance, as screw-threaded shafts f', which engage screw-threaded holes through bars F′. The bars F′ are removably supported in bales f, pivotally mounted upon the exterior of the cylinder-head C^2. The valve-casing D is also supported by the cylinder-head C^2 and preferably formed integrally therewith.

Passages d', d^3, and d^5 extend through the valve-casing D from the valve-seat therein to the carbid-cylinder 1, while corresponding passages d^2, d^4, and d^6 extend through the valve-casing from the other side of the valve-seat to the interior of the carbid-chamber 2. The passage d is formed in the valve-casing and extends from a point in communication with the top of the valve-seat to a conical recess h, formed in a portion of the casting adjacent to the valve-casing. The carbid-cylinders are provided with carbid-trays K′ and K^2, respectively. Such trays are provided with a series of transverse partitions k', k^2, and k^3, which form compartments for containing separate quantities of carbid.

Located in the carbid-cylinders are spray-troughs L′ and L^2, respectively, which are supported at their inner ends upon flanges E, formed integrally with the cylinders. The front ends of the spray-troughs are partially covered by inwardly-extending flanges l' and l^2, respectively, which are adapted to engage around annular collars formed on the spray-nozzles o' and o^2. The spray-nozzles are secured into the lower ends of passages d^3 and d^4 and are provided with openings, preferably as shown in Fig. 12, through which the water passes to the spray-troughs, the latter being provided with a series of perforations for the water to pass through and flow upon the carbid in the trays K′ and K^2. It is evident, therefore, that the spray-nozzles o' and o^2 perform the double function of spraying the water into the troughs and also of supporting the front ends of the water-troughs.

A plurality of short tubes M′ and M^2 extend above the valve-casing and communicate with the valve-seat at points in alinement with the end of the passage d, which communicates with the valve-seat. The tubes M′ and M^2 are of different heights, and each is provided with passages through its wall extending different distances below the top thereof. Such passages may conveniently consist in saw-cut slots m' and m^2, the former of which is cut deeper than the latter. Consequently when the water-level rises in the cylinder C the water will first pass through the slots m' and subsequently through the slots m^2. In order to insure the water passing through the slots in the upper ends of the tubes when the water-level is not above the tops of the tubes, a hood M, having a closed top, sides, and end, is secured around the upper ends of the tubes by any suitable means—such, for instance, as a screw or rod m passing through the side walls and clamping the same against the tubes. The bottom of the hood, as well as the front end, is open to permit the water-level to rise within the same, while the closed top and rear end prevent water from flowing directly into the open tops of the tubes when the motion of the locomotive produces waves in the equalizing-chamber.

A conical coupling H fits within the conical opening h, formed in the casting adjacent to the valve-seat. Such coupling is extended in the form of a rod H^3 through the opening in the casting and chamber-head C^2 and is engaged by a nut located on the outside of the chamber-head and is thereby removably retained in engagement with its conical seat h. A pipe H′ forms a continuation of the coupling H and is secured at its other end by means of a T-coupling h' to an upright pipe H^2. The pipe H′ is preferably curved, as shown in Fig. 4, to give it sufficient resiliency to permit a close contact between the conical coupling and its seat. The pipe H^2 extends upwardly into the water-chamber A and is surrounded by the pipe B^4, secured to the upper surface of the chamber C. The pipe B^4 communicates with the upper end of a pipe B^3 and extends downwardly and also horizontally within the water-chamber, and communicates, by means of a T-coupling b^3, with a vertical pipe B^2. The pipe B^2 is connected to a gas-purifier B′, which in turn communicates with a delivery-pipe B, extending through the water-chamber A. The cut-off cock b is located in the portion of the delivery-pipe B which extends beyond the water-chamber. A regulator of any suitable construction may be provided for maintaining a constant pressure of gas in the delivery-pipe. The regulator forms no part of my present invention, and hence illustration and detail description thereof is unnecessary. The

pipe H^2 is extended below the T-coupling h' and projects through the lower wall of the equalizing-chamber and is there provided with a drain-nozzle h^2. The pipe B^2 is similarly extended downwardly through the lower wall of the equalizing-chamber and is also provided with a drain-nozzle b^2.

The valve G is located within the valve-casing D and controls the several passages d, d', d^2, d^3, d^4, d^5, and d^6 leading to and from the carbid-cylinders 1 and 2. The valve G preferably consists in a conical plug provided with superficial irregular passages g^2, g^3, g^4, and g^5 and a passage g' extending from the superficial passage g^2 through the valve to the exterior of the chamber-head C^2. The function of the passage g^2 on the valve is to connect either one or both of the carbid-cylinders with the atmosphere through the medium of the passages d' and d^2 in the valve-casing and the passage g' in the valve. The function of the passage g^3 is to connect either one or both of the carbid-cylinders with the short tube M^2 through the medium of the passages d^3 and d^4. The function of the passage g^4 is to connect either one or both of the carbid-cylinders with the longer tube M', also through the medium of passages d^3 and d^4. The function of passage g^5 is to connect either one or both of the carbid-cylinders with the gas-delivery pipe d through the medium of the passages d^5 and d^6.

When the handle g of the valve is in the position "All off," (indicated in Fig. 2,) the valve is in the position shown in Fig. 7, in which both carbid-cylinders are disconnected from the water-supply tubes M' and M^2 and also from the gas-delivery passage d, but are both connected to the atmosphere through the passages d' and d^2 in the valve-casing and the passages g^2 and g' in the valve.

When the valve-handle g is turned to the position "One off," (indicated in Fig. 2,) the valve is in the position indicated in Fig. 8, in which carbid-cylinder l is disconnected from the water-supply tubes and the gas-delivery passage, but is connected to the atmosphere through the passages d', g^2, and g'. In such position of the valve the cylinder 2 is connected with the water-supply tube M' through the passages d^4 and g^3 and is also connected to the gas-delivery pipe by the passages d^6, g^5, and d.

When the valve-handle g is turned to the position "Two off," the valve occupies the position shown in Fig. 9, in which the carbid-cylinder 2 is disconnected from the water-supply tubes and the gas-delivery passage, owing to the passages g^3, g^4, and g^5 on the valve being out of register with the passages d^4 and d^6, but is in communication with the atmosphere through the passages d^2, g^2, and g'.

When the valve-handle g is turned to the position "Two on," the valve assumes the position indicated in Fig. 10, in which the passage g^2 is out of register with both of the passages d' and d^2, and hence the two cylinders are both disconnected from the atmospheric vent. In this position of the valve the cylinder 2 is connected with the short tube M^2 by means of the passages d^4 and g^3, while the cylinder 1 is connected with the longer supply-tube M' through the passages d^3 and g^4. In this position of the valve both of the cylinders are connected with the gas-delivery pipe, owing to the passage g^5 being in register with both of the passages d^5 and d^6 and the passage d.

When the valve-handle g is turned to the position of "One on," the valve is rotated so that its passages are located as shown in Fig. 11, in which neither of the passages d' or d^2 is in communication with the passage g^2, and hence both cylinders are disconnected from the atmospheric vent. In this position of the valve the cylinder 1 is connected with the shorter water-supply tube M^2 through the passages d^3 and g^3, while the cylinder 2 is connected with the longer water-supply tube M' through the passages d^4 and g^4. In this position of the valve the passage g^5 connects both of the passages d^5 and d^6 with the delivery-passage d, and consequently places both of the cylinders in communication with the gas-delivery pipe.

The valve G is an eleven (11) way valve, in the sense that it performs the following eleven functions: First, it conducts gas from carbid-cylinder 1; second, it conducts gas from carbid-cylinder 2; third, it conducts water to carbid-cylinder 1; fourth, it conducts water to carbid-cylinder 2; fifth, it connects the short water-pipe M^2 with one carbid-cylinder only; sixth, it connects the longer water-tube M' with the other carbid-cylinder only; seventh, it conducts gas from both carbid-cylinders to the delivery-pipe; eighth, it connects only carbid-cylinder 1 with the atmosphere; ninth, it connects only carbid-cylinder 2 with the atmosphere; tenth, it simultaneously connects both carbid-cylinders with the atmosphere, and, eleventh, it simultaneously disconnects both carbid-cylinders from the atmosphere.

The general operation of my improved acetylene-gas generator is the same as the operation of the apparatus covered by my patent granted September 9, 1902, and may be briefly described as follows: Water is supplied through the pipe A' to the water-chamber A and thence flows through the pipe C' into the chamber C and rises in the pipe B^4, around the pipe H^2, to the level of the water in the chamber A. When it is desired to generate gas in both of the carbid-cylinders, the valve-handle is turned to either of the positions "One on" or "Two on," when the valve assumes either the position shown in Fig. 10 or Fig. 11. Water then flows through the lowest passage in the top of the shorter tube into one of the carbid-cylinders and is distributed, by means of

the spray-nozzle and drip-trough, upon the carbid. The gas flows through the valve and coupling H into the delivery-pipe H′, thence through the pipe H^2, then through the pipes B^3 and B^2, through the purifier B′ into the pipe B, and thence to the point of use, which in the present instance is the headlight of the locomotive. The excess of gas generated over the amount consumed forces the water downwardly in the chamber C and up into the water-chamber A. Should the water in the chamber A rise above the upper end of the pipe A^4, it would pass into the same and through the transverse pipe A^3 to the exterior of the water-chamber. If the excess of generated gas is so great that all of the water is forced out of the generating-chamber into the water-chamber and gas also flows into the water-chamber, it will be discharged through the pipe A^2, which may be extended to any point where there is little danger of ignition. By providing a separate overflow-pipe the water may be discharged at a point adjacent to the exterior of the generator, while the discharge-pipe for the gas may be extended to the least dangerous point of discharge. When the excess of generated gas diminishes, the water-level in the chamber C rises, so that water will pass through all of the passages through the tops of the water-tubes, and hence be supplied to the carbid-cylinders in greater quantity, resulting in increased generation of gas. The location of the hood over the upper end of the water-supply tubes prevents an abnormal generation of gas, which would otherwise occur whenever a wave produced by the motion of the locomotive carried the water above the open ends of the water-supply tubes.

The water is delivered to the carbid-cylinders at points near the front thereof, and consequently the carbid in the front end of the trays first receives the water and is consequently first consumed. By providing partitions in the carbid-trays the carbid in the front compartment is first consumed, and when it has become saturated the water flows over the adjacent partition *k* into the next compartment and saturates the carbid therein. In such manner the carbid in the several compartments is successively consumed. By providing the partitions in the carbid-trays a more thorough consumption of the carbid is effected than occurs where no partitions are employed, as in the latter case the expansion of the carbid which first receives the water causes it to extend over the adjacent carbid and communicate moisture thereto.

From the foregoing description it will be observed that I have invented an improved acetylene-gas-generating apparatus in which a single valve controls the supply of water to, the delivery of gas from, and the connection with the atmosphere of either one or both of a plurality of carbid-cylinders. It will be also observed that I have invented an improved means for supporting the drip-troughs in the carbid-cylinders, improved trays for holding the carbid and effecting a more uniform consumption thereof, and improved water-supply tubes for automatically controlling the supply of water according to the excesses of generated gas, an improved device for preventing the waves of water in the generating chamber or tank from producing abnormal gas generation, and by separating the water-overflow and gas-discharge from the water-chamber the water may be discharged at the generator, while the gas may be conveyed to a distant point.

While I have described more or less precisely the details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of my invention.

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

1. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles, of a single valve having ports for controlling the supply of water to, the delivery of gas from, and the venting of said plurality of receptacles.

2. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles, of a single plug-valve, having superficial passages and ports for controlling the supply of water to, the delivery of gas from, and the venting of said plurality of receptacles.

3. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles, of a single valve having ports for controlling the supply of water to and the delivery of gas from any one of said receptacles, and for simultaneously venting another receptacle.

4. In a gas-generator, the combination with an equalizing-chamber, a removable head for said chamber, and a plurality of carbid-receptacles formed rigid with said head, a single valve interposed between the receptacles, and provided with gas, water and vent passages, gas water and vent passages connecting the passages of the valve with said receptacles, and means whereby the valve may be turned to open communication with one receptacle, and shut off communication with and at the same time vent another receptacle.

5. In a gas-generator, the combination with an equalizing-chamber, a removable head therefor, a plurality of carbid-receptacles connected with said head, a turning plug provided with independent gas and water inlet and outlet ports and a vent-port, gas and water inlet and water inlet and outlet passages and a vent-passage leading from the plug to each receptacle, and means whereby the plug may be

turned to open communication with one carbid-receptacle, and shut off commuication with and simultaneously vent another receptacle.

6. In an acetylene-gas generator, the combination with a carbid-receptacle, of a drip-trough therein, a spray-nozzle through which water passes to said trough, and means for supporting said trough at one end upon said nozzle.

7. In an acetylene-gas generator, the combination with a carbid-receptacle, of a drip-trough therein having inwardly-projecting flanges at one end, a spray-nozzle through which water passes to said trough, and an annular collar on said nozzle adapted to be engaged by said flanges and thereby support said trough.

8. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles, of an equalizing-chamber adapted to contain water, a plurality of tubes of different height extending into said equalizing-chamber and each adapted to communicate with any one of said carbid-receptacles, any one of said tubes having a plurality of passages through its wall the lower edges of which extend different distances below the top thereof.

9. In an acetylene-gas generator the combination with an equalizing-chamber adapted to contain water, of a carbid-receptacle, a tube extending into said chamber and adapted to communicate with said carbid-receptacle, and a hood closed at its top and open at its side supported around the open end of and fixed relatively to said tube.

10. In an acetylene-gas generator, the combination with an equalizing-chamber, of a carbid-receptacle, a tube extending into said chamber and adapted to communicate with said carbid-receptacle, said tube having a plurality of passages through its walls the lower edges of which extend different distances below the top thereof, and a hood supported around the open top of said tube.

11. In an acetylene-gas generator, the combination with a plurality of carbid-receptacles, and an equalizing-chamber adapted to contain water, a plurality of tubes of different heights extending into said equalizing-chamber, and adapted to communicate with said receptacles successively, said tubes having passages through their walls adapted to carry the flow of water through the same into the receptacles, and a hood supported around the open ends of said tubes.

12. In an acetylene-gas generator, the combination with a water-chamber, of an equalizing-chamber in communication therewith, an overflow-pipe leading to the exterior of said water-chamber, and a separate gas-discharge pipe leading from said water-chamber.

13. In an acetylene-gas generator, the combination with a water-chamber, of an equalizing-chamber, a transverse pipe supported at its ends by the walls of said water-chamber and communicating with the exterior of the latter, an overflow-pipe located in said water-chamber communicating with said transverse pipe and terminating near the top of said water-chamber, a water seal located in said overflow-pipe, and a separate gas-discharge pipe leading from said water-chamber.

In testimony whereof I sign this specification in the presence of two witnesses.

E. R. COOK.

Witnesses:
GEO. L. WILKINSON,
E. H. BELL.