No. 627,705. Patented June 27, 1899.

E. A. PAULI.

ACETYLENE GAS GENERATING LAMP.

(Application filed Jan. 19, 1899.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

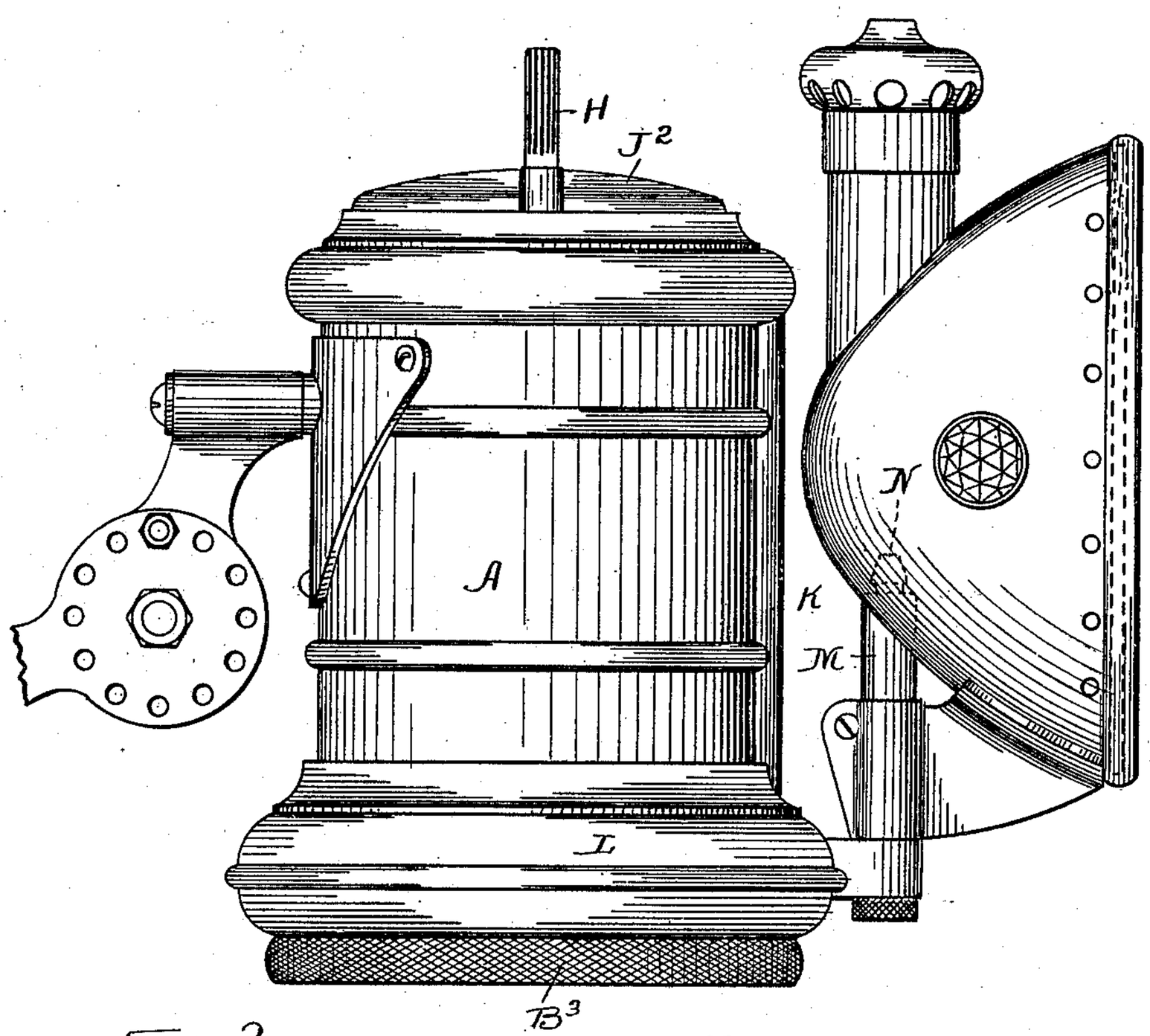


FIG. 2.

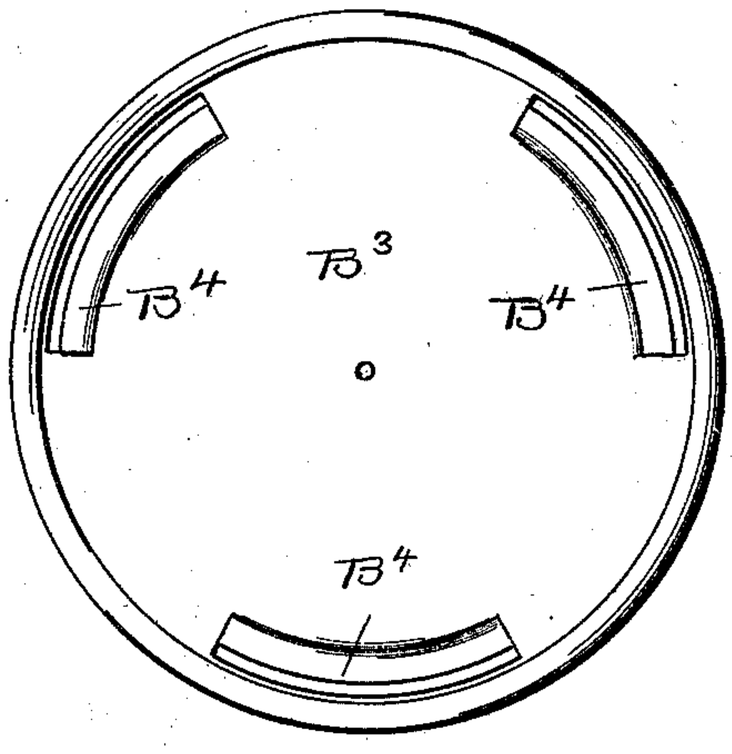
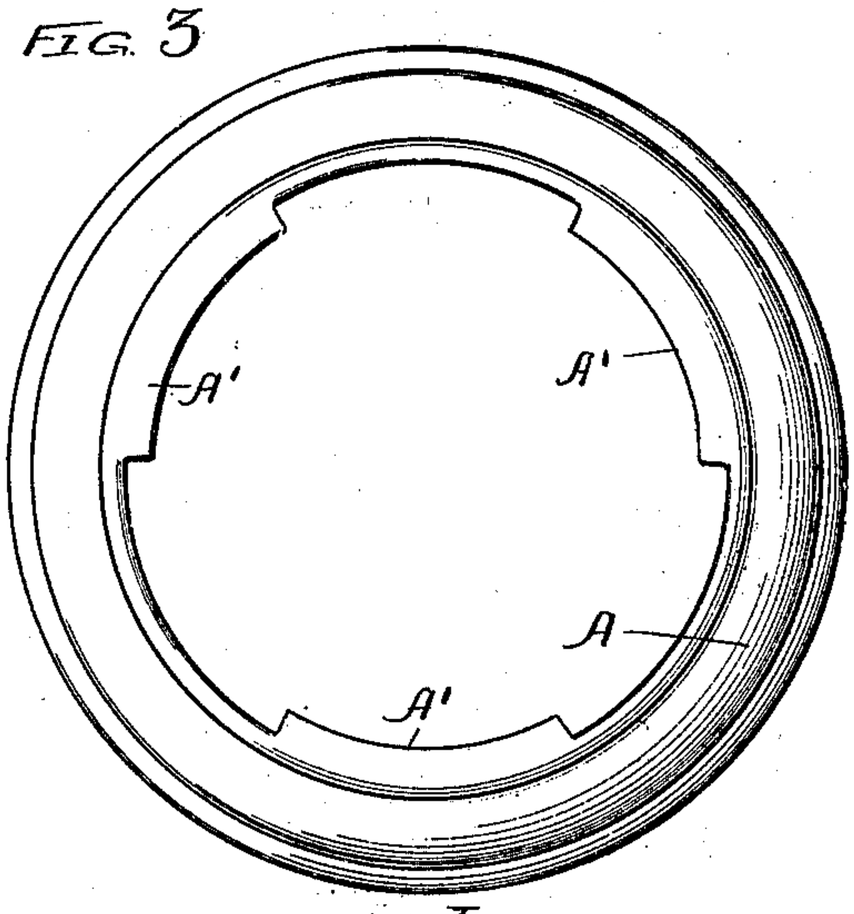


FIG. 3



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(No Model.) 2 Sheets—Sheet 2.

FIG. 4.

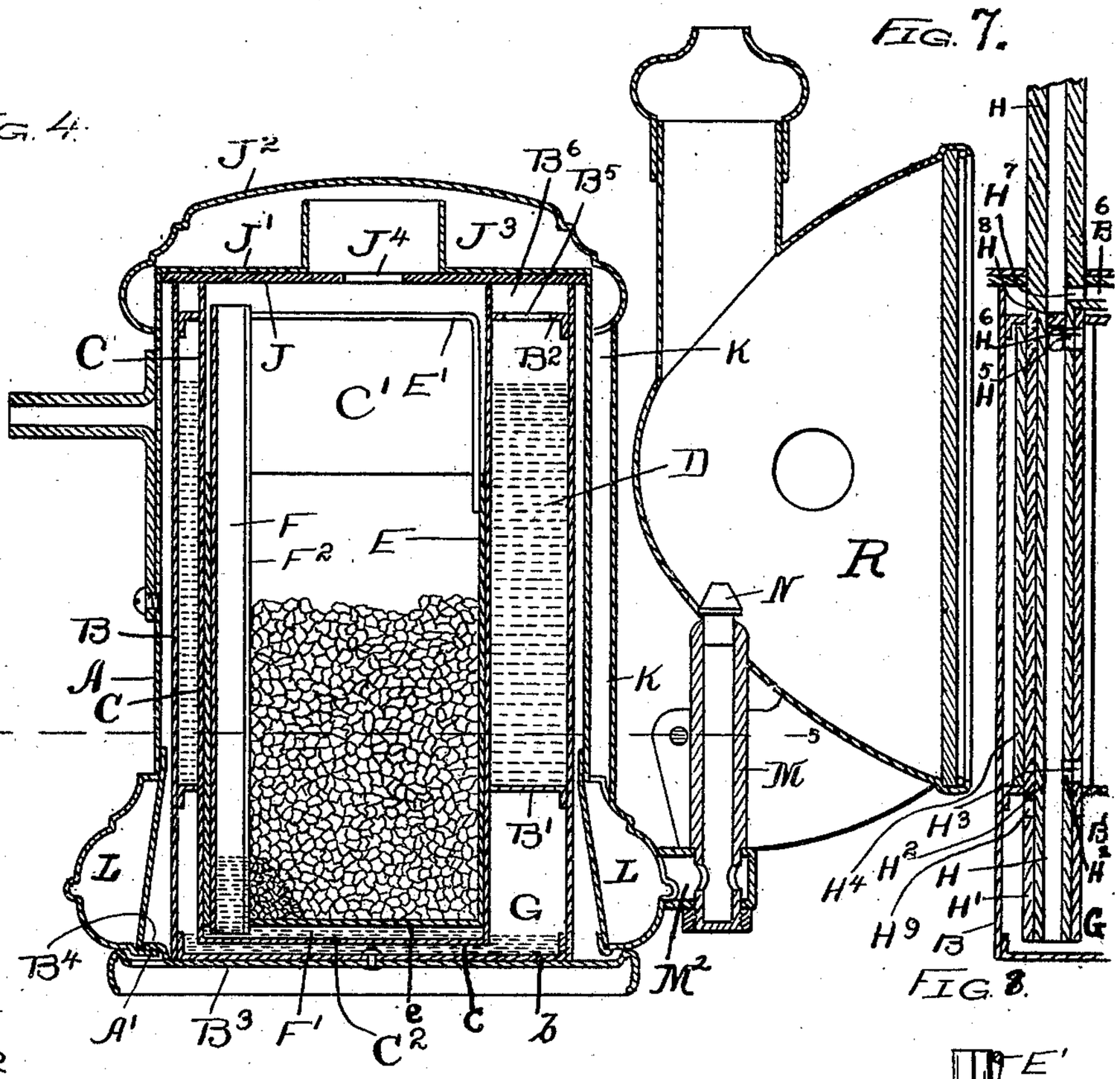


FIG. 7.

FIG. 8.

FIG. 6.

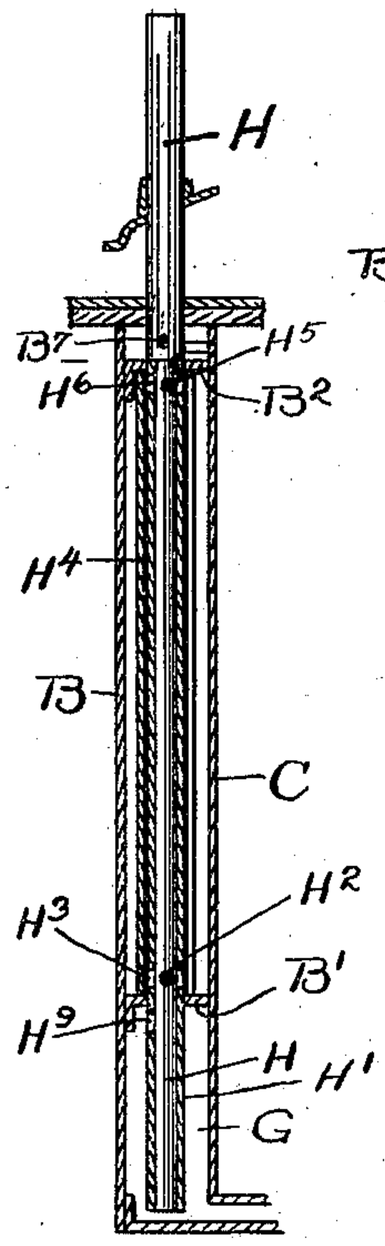
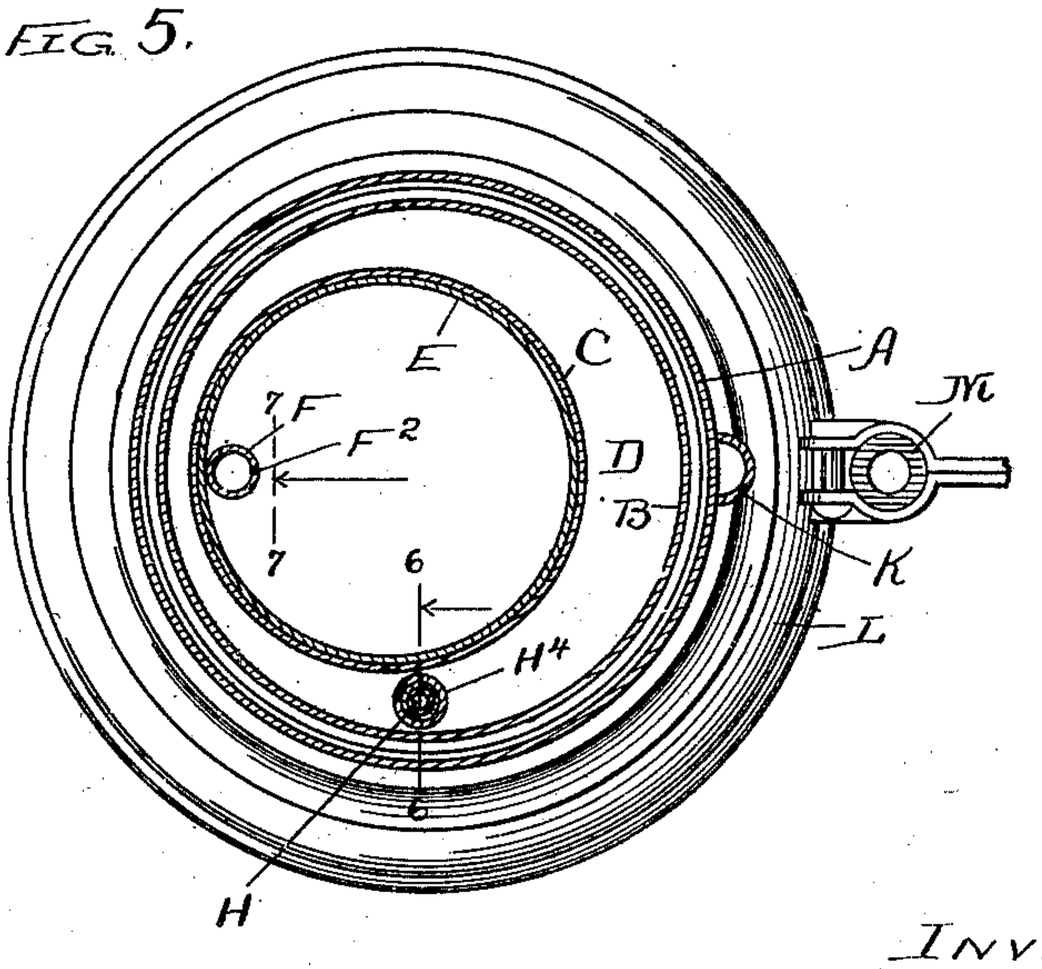
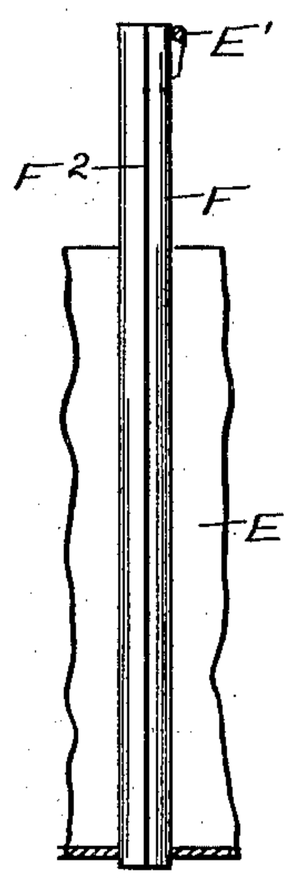


FIG. 5.





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UNITED STATES PATENT OFFICE.

EMIL A. PAULI, OF CHICAGO, ILLINOIS, ASSIGNOR OF FOUR-FIFTHS TO JOHN HEWITT, ORLANDO S. GAUCH, DAVID J. WILSON, AND CHARLES T. BLACKFORD, OF SAME PLACE.

ACETYLENE-GAS-GENERATING LAMP.

SPECIFICATION forming part of Letters Patent No. 627,705, dated June 27, 1899.

Application filed January 19, 1899. Serial No. 702,679. (No model.)

To all whom it may concern:

Be it known that I, EMIL A. PAULI, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Acetylene-Lamps, of which the following is a specification.

This invention is an improvement in self-generating and self-regulating acetylene-gas producers especially designed for portable lamps, and particularly as an improvement upon the lamp described and claimed in my application, Serial No. 689,398, filed August 24, 1898.

The objects of the present invention are, first, to lighten the lamp by lessening the amount of "dead" water necessarily carried therein and enlarging the main air-cushioning chamber; second, to make the generating-chamber deeper without increasing the height of the lamp, thereby prolonging the service period of the lamp from a single charge; third, to provide a novel rotary cut-off and venting-valve; fourth, to enable the air-cushioning chamber to be drained, if desired; fifth, to improve the construction of the parts so that the operation of removing and replacing the generating portion of the apparatus within the casing will be simplified; sixth, to convert the exterior annular air-chamber into a gas-cooling chamber and attach it permanently to the casing, and, finally, to remove the slitted feed-tube from the center to the side of the carbid-holder, thereby facilitating the removal of residuum from the holder and at the same time preventing the water entering the generating-chamber from directly contacting with the carbid in the holder, and also thereby preventing the water in the generating-chamber below the carbid-holder being forced up or down therein by inertia when the lamp is suddenly raised or lowered.

The invention therefore consists in the novel combinations of parts and novel features of construction hereinafter claimed and explained in detail in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved lamp. Fig. 2 is a detail bottom plan view of the generating portion of the apparatus, showing part of the devices whereby it is secured within the casing. Fig. 3 is a detail bottom plan view of the casing, showing the other portion of the means for securing the generating apparatus therein. Fig. 4 is a central vertical section through the complete lamp. Fig. 5 is a transverse section on line 5 5, Fig. 4. Fig. 6 is a detail section on line 6 6, Fig. 5, showing the tubular supply and vent valve, the same being closed. Fig. 7 is a similar enlarged view showing the valve open. Fig. 8 is a detail view of the slitted tube in the carbid-holder.

The casing A of the apparatus may be cylindrical in form and ornamented to give it a pleasing appearance as a bicycle-lamp, and it may be provided with any suitable supporting or suspending devices for attaching it to a bicycle. This casing is open at bottom, but is closed at top by a plate J′, over which is a dome J^2, the intermediate space forming a gas-storing chamber J^3, which communicates with a hollow annular chamber L at the base of the casing. This chamber L somewhat resembles the "chamber A′" in my aforesaid application; but in this case it is connected to and forms part of the casing and is used as a gas-cooling chamber, whereas in my aforesaid application the "chamber A′" was connected to the generating portion of the apparatus and used as an auxiliary air-chamber. By the improved construction I obtain a larger gas storing and cooling chamber and facilitate the attachment and removal of the generating apparatus from the casing. To one side of chamber L is connected a short vertical pipe M, provided at top with the burner N, the reflector-hood R being pivotally supported on the pipes M M^2, as indicated in the drawings, when the device is used as a bicycle or portable lamp.

The gas-generating portion of the apparatus is detachably fitted within the casing and comprises a water-tank, a generating-chamber, an air-cushioning chamber, and a cut-off and venting valve, which are formed as follows:

B designates a cylinder adapted to fit neatly and closely within the casing A. Within this cylinder B is a smaller cylinder C, preferably

located eccentrically thereto and supported therein by means of upper and lower annular partitions B′ B², which are tightly fitted to the inner wall of cylinder B and outer wall of cylinder C and may be soldered or otherwise secured thereto so as to hold the cylinder C securely within the cylinder B. The cylinder B is closed at bottom by a plate *b* some distance below partition B′, and the lower end of cylinder C, which extends close to the plate *b*, is also closed by a plate *c*, which, however, has a small inlet-opening c^2, preferably in its center, as shown.

The interior of cylinder C forms the generating-chamber C′. The annular space between the cylinders B C and partitions B′ B² forms the water-tank D, and the annular space between plate *b* and partition B′, below the water-tank and surrounding the lower end of the generating-chamber, forms the air-cushioning chamber G. Water can be supplied to the tank D through an opening B⁵ in the partition B², Fig. 4.

The upper edges of cylinders B and C are flush, and when the generating apparatus is properly secured within the casing the upper edges of said cylinders fit gas-tightly against a packing J on the under side of head J′ of the casing, so that there is no communication between the water-tank and generating-chamber, nor can gas escape from the latter.

I have illustrated a simple and effective means of securing the generating apparatus within the casing in Figs. 2, 3, and 4.

To the bottom *b* of the generating apparatus is pivoted a rotatable plate B³, which is provided with struck-up segmental ledges B⁴, Fig. 2, adapted to engage with inwardly-projecting ledges A′ on the casing, Fig. 3, one or both sets of ledges being inclined to form cam-surfaces, so that when the generating apparatus is inserted in place and the plate B³ turned the ledges B⁴ will ride up upon the ledges A′, and thus secure the generating apparatus within the casing and at the same time force the upper edges of the cylinders B C tightly against the gasket or packing J. When it is desired to remove the generating apparatus, the plate B³ is rotated backward so as to disengage the ledge B⁴ from ledges A′ and permit the generating apparatus to be slipped downward out of the casing. When removed from the casing, the tank D can be readily filled with water through the opening B⁵ and the carbid can be supplied to the generating-chamber C′. I preferably employ a removable carbid-holder E in this generating-chamber, said holder being cylindrical and of a diameter to fit closely within the cylinder C and closed by a bottom plate *e;* but it is open at top and provided with a bail E′ to facilitate its insertion in and removal from the generating-chamber.

Secured within and to one side of the holder is a slitted tube F′, which opens through the bottom *e* close to the bottom *c* of the generating-chamber and extends up nearly to the top thereof, as shown. This tube is slitted on the inner side, so as to admit water laterally to the carbid in the manner described in my previous application.

The generated gases pass from the chamber C′ to the storing-chamber J³ through an opening J⁴ in the packing J and head J′ of the casing, as shown.

It will be observed that the air-cushioning chamber G in the present instance is entirely below the tank and surrounds the lower end of the generating-chamber, there being only a very thin space between the bottoms of the generating and air chambers to permit the passage of water or gas from the bottom of the air-cushioning chamber into the generating-chamber. A body of air is constantly confined in this cushioning-chamber G and serves as a buffer or cushion between the water in the tank and the gas in the generating-chamber, lessening and preventing shocks and fluctuations in the light, substantially as described in my previous application, only sufficient water being admitted into chamber G to maintain the necessary supply to the carbid.

By having the bottom of the generating-chamber close to the bottom of the cushioning-chamber I am able to dispense with the pipe for conducting water from the bottom of the cushioning-chamber to the generating-chamber, (shown in my previous application,) and by having the inlet C² in the center of the bottom of the generating-chamber and placing the slitted tube F at the side of the carbid-holder I prevent direct contact between the water entering the generating-chamber and the carbid and form a transverse passage between the bottom of the holder and the generating-chamber, through which water must pass after it enters the generating-chamber and before it can contact with the carbid. By this construction the water in the generating-chamber is confined so that it cannot be jolted onto the carbid by inertia due to the vibration or shaking of the lamp when attached to a bicycle. At the same time the gas has absolute and direct control over the water in the generating-chamber and in the slitted tube F and, as described in my previous application, can cut the water off from the carbid without necessarily excluding it from the generating-chamber. The water is admitted from the tank to the air-cushioning chamber and provision made for the relief of any dangerous pressure of gas without injury to the apparatus by means of an improved form of cut-off and vent valve, which I shall now describe.

A pipe H′ extends from a point close to the bottom plate *b* up through the partition B′ to the partition B², passing through the cushioning-chamber G and tank D, as shown in Figs. 6 and 7. Closely fitted within this pipe H′ is a rotatable tubular valve H, which extends entirely through pipe H′, and also extends above the same and through the chamber J³ to a point above the chamber J², so that

it can be operated from the exterior of the apparatus. The portion of valve H which extends through storing-chamber J^3 may, if desired, be surrounded by a sleeve secured in said chamber to prevent escape of gas therefrom. The pipe H′ is provided, just above partition B′, with an opening H^3, with which an opening H^2 in valve H is adapted to register when the valve is properly turned to admit water into the cushioning-chamber G, as shown in Fig. 7. Pipe H′ is also provided with an opening H^6 just below the partition B^2, which is adapted to register with the opening or openings H^5 in the valve H. Above opening H^5 the valve is closed by a partition H^8, and above this partition there is an opening H^7 in the valve communicating with the annular space B^6 above partition B^2 and exterior to the generating-chamber, as shown in Fig. 4. The valve H may be provided with a stop or indicator to show when it is turned on or off.

The tubular valve H is removable from the casing with the generating portion of the apparatus. It may also be withdrawn from the generating apparatus if it is desired to cleanse it or if it should be desired to empty the air-cushioning chamber G of the little water which is trapped therein. In the latter case the lamp would be inverted, then the valve H withdrawn, and the water in the cushioning-chamber, which is then supported by the partition B′, will escape into and through the pipe H′ through a small passage H^9 in the side of said pipe just below the partition B′. (See Fig. 6.) This passage H^9 is always closed when the valve H is in position.

In some cases a split tube H^4 may be placed around pipe H′ between the partitions B′ B^2.

The operation of the lamp is substantially as follows: The valve H is first turned so as to cut off communication between the openings H^2 and H^3. Then the generating portion of the apparatus is removed from the casing. The tank D is then filled with water through the opening B^5, and the holder E is removed, charged with carbid, and replaced in the generating-chamber. The generating apparatus is then repositioned and secured in the casing, and when it is desired to start the lamp the valve H is turned so as to register openings H^2 H^3. Water then enters the air-cushioning chamber G; but the inflow is soon checked by the trapping and compression of the air therein, yet sufficient water will enter the chamber G to rise through the inlet C^2 into the generating-chamber C′, where it will pass between bottoms *c* and *e* laterally to the tube F and rising therein will contact the carbid through the slit thereof just at that point where it can do so most effectively, as described in my aforesaid application. The generated gases rise from chamber C into chamber J^3 and pass down through pipe K to the cooling-chamber L and thence through pipes M^2 and M to the burner N. While there can only be a small quantity of water at any time in the chamber G, owing to the constant air-cushion therein, nevertheless water may flow continually through said chamber from the tank to the generating-chamber, the supply being regulated automatically by the pressure of gas. The device is exceedingly sensitive in operation, as every variation of pressure is immediately exerted upon the water in tube F and the generating-chamber, and any sudden voluminous generation of gases or sudden inflow of water due to inertia or violent shaking of the apparatus is cushioned by the air in chamber G, so that a steady flame will always be maintained, substantially as described in my aforesaid application. If there should be an abnormal generation of gas in such quantity as to force all the water out of the generating-chamber and back through the air-cushioning chamber, the pressure will be relieved by the water and gas forcing back through valve H and openings H^5 H^6 into the tank D, and thence through opening B^2, passage B^6, and opening H^7 again into the valve H, above the plug H^8, and thence to the atmosphere. If this generation should occur after the valve H was turned so as to cut off the supply of water, the gas could still rise through the valve to plug H^8 and escape through openings H^5 and H^6 into tank above the water and then through opening B^5 and passage B^6 to the opening H^7 above the plug H^8 and out into the atmosphere. Thus under all conditions, whether the lamp be lighted or not or whether the water-supply be cut off or not, ample provision is made against explosion.

From the foregoing description it will be seen that I have improved on the lamp in my previous application in the several particulars noted at the beginning of this specification. These improvements are important and while simplifying the construction also render the lamp practically non-explodable, however carelessly handled.

The mode of operation of this lamp is substantially identical with that described in my previous application, and I have therefore deemed it unnecessary to enlarge thereupon herein.

Having thus described my invention, what I therefore claim as new is—

1. In an acetylene-lamp, the combination of an annular water-tank, a generating-chamber within and extending below said tank, an air-cushioning chamber containing a body of confined air below the tank and surrounding the lower end of the generating-chamber, a pipe for conducting water from the tank to a point near the bottom of the cushioning-chamber, and an inlet from the cushioning-chamber to the generating-chamber, said inlet being near the bottom of said generating-chamber and below the top of the cushioning-chamber, for the purpose and substantially as described.

2. The combination of the water-tank, a generating-chamber, and means for admitting

water from the tank into the bottom of the generating-chamber, at about the center thereof; with a carbid-holder in said generating-chamber and having an imperforate bottom above the water-inlet opening to said chamber, and a lateral slitted feed-tube, in said holder, at one side thereof, said slitted tube opening through the bottom of the holder to one side of the inlet-opening of the generating-chamber, for the purpose and substantially as described.

3. The combination of the tank, the air-cushioning chamber, the generating-chamber extending into the cushioning-chamber and nearly to the bottom thereof, and having a substantially central inlet-opening in its bottom near the floor of the cushioning-chamber, and means for admitting water from the tank into the lower portion of said cushioning-chamber; with a carbid-holder in said generating-chamber, having an imperforate bottom above and close to the inlet-opening of the generating-chamber, and a slitted feed-tube attached to one side of the holder and opening through the bottom thereof to one side of the said inlet-opening, substantially as described.

4. In an acetylene-lamp, the combination of a water-tank, an air-cushioning chamber below it, a generating-chamber extending into the air-cushioning chamber and near the floor thereof and having a substantially central inlet-opening in its bottom near the floor of the cushioning-chamber, a pipe depending from the bottom of the tank to near the floor of the cushioning-chamber for admitting water from the tank into said chamber, and a valve for cutting off the water-supply through said pipe.

5. In an acetylene-lamp, the combination of a water-tank, an air-cushioning chamber below the tank, a generating-chamber within and extending below the tank into the air-cushioning chamber and near the floor thereof and having a substantially central inlet-opening in its bottom, near the floor of the cushioning-chamber, a pipe depending from the bottom of the tank to near the floor of the cushioning-chamber, for admitting water from the tank into said chamber, and a valve for cutting off the water-supply through said pipe; with a removable carbid-holder in the generating-chamber, having a closed bottom, a slitted feed-tube in, and secured to one side of, said holder, said tube opening through the bottom of the holder, so as to allow water to pass from under the bottom of the holder into the carbid therein, substantially as described.

6. In an acetylene-lamp, the combination of the water-tank, a generating-chamber within and extending below said tank, an air-cushioning chamber below the tank and surrounding the lower end of the generating-chamber, a pipe for conducting water from the tank to a point near the bottom of the cushioning-chamber, and an inlet from the cushioning-chamber to the generating-chamber, near the bottom of said chambers; with a carbid-holder closely fitted in said generating-chamber and having an imperforate bottom above the water-inlet opening to said chamber, and a lateral slitted feed-tube, in said holder, at one side thereof, said slitted tube opening through the bottom of the holder, for the purpose and substantially as described.

7. In an acetylene-lamp, the combination of an annular water-tank, an air-cushioning chamber below the tank, a generating-chamber within and extending below the tank into the air-cushioning chamber and near the floor thereof and having a substantially central inlet-opening in its bottom near the floor of the cushioning-chamber, a pipe depending from the bottom of the tank to near the floor of the cushioning-chamber, for admitting water from the tank into said chamber, and a combined valve for cutting off the water-supply through said pipe and vent-tube for relieving overpressure of gas, said venting-valve extending through the tank; with a removable carbid-holder in the generating-chamber, having a closed bottom, a slitted feed-tube in, and secured to one side of, said holder, said tube opening through the bottom of the holder, so as to allow water to pass from under the bottom of the holder into the carbid therein.

8. In an acetylene-lamp, the combination of the tank, the cushioning-chamber below the tank, and the generating-chamber communicating with said cushioning-chamber, and the tubular water-cut-off and venting valve passing through said tank and communicating at one end with the atmosphere and at the other end with the cushioning-chamber near the bottom thereof, for the purpose and substantially as described.

9. In an acetylene-lamp, the combination of the water-tank and the generating-chamber; with a pipe having water-inlet and vent openings communicating with the tank, the tubular valve extending through said pipe, said valve being provided with openings adapted to respectively register with the water-inlet opening in the pipe when the valve is turned to open position and with a venting-opening in the pipe above the water when the valve is turned to closed position, for the purpose and substantially as described.

10. In an acetylene-lamp, the combination of the water-tank, the cushioning-chamber below the same, and the generating-chamber extending into the cushioning-chamber and having a water-inlet in its bottom near the floor of the cushioning-chamber; with a pipe extending through the tank and opening into the cushioning-chamber near the floor thereof, the tubular valve extending through said pipe, said valve being provided with supply-openings adapted to respectively register with the water-inlet opening in the pipe when the valve is turned to one position and with

the venting-opening in the pipe above the water when the valve is turned to close the water-inlet, for the purpose and substantially as described.

11. The combination of the tank, the generating-chamber and the cushioning-chamber having a substantially central inlet in its bottom near the floor of the cushioning-chamber, with a pipe depending into the cushioning-chamber, and provided with openings communicating with the bottom and top of said tank; a tubular valve in said pipe provided with openings adapted respectively to register with the openings in the pipe, when the valve is turned to opposite positions, the plug in said tubular valve, above the upper opening therein, and the vent-opening in said valve above the tank, substantially as described.

12. The combination of the tank, the generating-chamber within and extending through and below the tank, the cushioning-chamber below the tank and surrounding the lower end of the generating-chamber having a substantially central inlet in the bottom of the generating-chamber near the floor of the cushioning-chamber, and a pipe extending through the tank and depending into the cushioning-chamber, and provided with openings near the bottom and top of said tank, communicating therewith; with a tubular cut-off and vent valve in said pipe provided with openings adapted respectively to register with the upper and lower openings in the pipe, when the valve is turned to opposite positions, the plug in said tubular valve, above the upper opening therein, and the vent-opening in said valve communicating with the passage above the tank, substantially as described.

13. The combination of the casing having a gas-storing chamber in its upper end, an annular gas-cooling chamber around its lower end, and a passage connecting said chambers; with a water-chamber within the casing, an air-cushioning chamber below the water-chamber and communicating therewith; and a generating-chamber extending into the cushioning-chamber and communicating at top with the gas-storing chamber, and means for admitting water from the tank into this cushioning-chamber, and thence into the generating-chamber, for the purpose and substantially as described.

14. The combination of the casing having a gas-storing chamber in its upper end, an annular gas-cooling chamber around its lower end, and a passage connecting said chambers, an annular water-chamber within the casing, the air-cushioning chamber below the water-chamber and communicating therewith; and a generating-chamber within and extending through the tank and into the cushioning-chamber and communicating at top with a gas-storing chamber; with a pipe extending through said tank into the cushioning-chamber, and the tubular valve in said pipe extending from the cushioning-chamber through the tank and through the gas-storing chamber, so that it can be manipulated from the outside, said pipe and valve having openings adapted to register when the valve is turned, for the purpose and substantially as described.

15. The combination of the generating-chamber, the water-tank and the air-cushioning chamber, the pipe depending from the tank into the cushioning-chamber, adapted to admit water from the tank into the lower end of the cushioning-chamber, said pipe having an opening in the cushioning-chamber near the bottom of the tank; with a removable tubular water-cut-off valve in said pipe, closing the opening in the pipe within the cushioning-chamber so long as the valve remains in position, but permitting the cushioning-chamber to be emptied of water when the lamp is inverted and the tubular valve withdrawn.

16. The combination of the water-tank, the generating-chamber extending therethrough, and the air-cushioning chamber surrounding the lower end of the generating-chamber, the pipe depending from the tank into the lower end of the cushioning-chamber, said pipe having an opening in the cushioning-chamber near but below the bottom of the tank, and also having openings in the tank near the top and bottom thereof; with a removable tubular cut-off and vent valve in said pipe, provided with openings adapted to register with the openings in the pipe within the tank, to admit water into the cushioning-chamber, said valve always closing the opening in the pipe within the cushioning-chamber so long as it remains in position, but permitting the cushioning-chamber to be emptied of water when the lamp is inverted and the tubular valve withdrawn.

17. In an acetylene-lamp, the combination of the casing, closed at its upper end but open at bottom and provided with segmental ledges near its lower end; with a removable generating apparatus containing the tank and generating-chamber adapted to fit within said cylinder, and a rotatable locking-plate attached to the bottom of said apparatus, and provided with segmental ledges adapted to engage with the ledges of the casing to lock the apparatus in position within the casing, for the purpose and substantially as described.

18. In an acetylene-lamp, the combination of the casing, closed at its upper end and having a storing-chamber at its upper end, and an annular gas-cooling chamber around its lower end and a passage connecting said chambers; with a generating apparatus containing the tank and generating-chamber adapted to fit within said casing, said generating-chamber being open at its upper end but closed when inserted in the casing, by the head of the latter, and means for locking said apparatus within the casing so as to hold the generator-gas tightly against the head of the cas-

ing, for the purpose and substantially as described.

19. The combination of the casing, closed at its upper end and having a storing-chamber thereover, and an annular gas-cooling chamber around its lower end and a passage connecting said chambers; and a generating apparatus comprising the tank and generating-chamber adapted to fit within said casing, said generating-chamber being open at its upper end but closed when inserted in the casing, by the head of the latter; with an annular series of segmental ledges on the lower end of the casing, and a rotatable plate attached to the bottom of the generating apparatus, and provided with ledges adapted to engage the ledges on the casing, so as to lock the generating apparatus therein and hold the upper end of the generating-chamber gas tightly against the head of the casing.

20. The combination of the casing closed at its upper end and open at its lower end, having a gas-storing chamber at its lower end and passages connecting the same with the burner, a cylinder removably fitted in said casing, closed at bottom, a second cylinder within the first cylinder, closed at bottom and forming the generating-chamber, the annular partitions between the cylinders and forming a water-tank, and an air-cushioning chamber exterior to the cylinder below the tank, the pipe extending through said tank, and into the cushioning-chamber, and provided with inlet-openings in the tank, and the valve extending through said pipe and into the cushioning-chamber and also extending through the head of the casing, the valve being provided with openings adapted to register with the air-inlet and with vent openings, said cylinder, with the tank, generating-chamber, air-cushioning chamber and valve being detachable as one piece from the casing, substantially as described.

21. The combination of the casing closed at its upper end and open at its lower end, and a gas-storing chamber and passages connecting the same with the burner and the annular locking-ledges on the lower end of the casing; a cylinder removably fitted in said casing, closed at bottom, a rotatable plate pivoted to the bottom of said chamber and having a series of ledges adapted to engage the ledges of the casing and to lock the cylinder therein, a second cylinder within the first cylinder, closed at bottom and forming the generating-chamber, the annular partitions between the cylinders and forming a water-tank, and an air-cushioning chamber exterior to the cylinder below the tank; with the pipe extending through said tank, and into the cushioning-chamber, and provided with inlet-openings in the tank, and the valve extending through said pipe and into the cushioning-chamber and also extending through the head of the casing, the valve being provided with openings adapted to register with the air-inlet and with venting openings; said cylinder, with the tank, generating-chamber, air-cushioning chamber and valve, being detachable as one piece from the casing, substantially as described.

22. The acetylene-lamp wherein are combined the shell A, the cylinder B closed at the bottom and detachably secured in the shell, the cylinder C supported in cylinder B above the bottom of the latter by partitions B′ and B², and the removable carbid-holder E fitting said cylinder C, and provided with a water-feed tube, said cylinders B and C forming the sides and said partitions the top and bottom of the water-reservoir, substantially as specified.

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Witnesses:
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H. M. MUNDAY.