No. 647,362. Patented Apr. 10, 1900.

C. W. BECK.

ACETYLENE GAS GENERATOR.

(Application filed Feb. 7, 1898.)

(No Model.)

FIG. 1

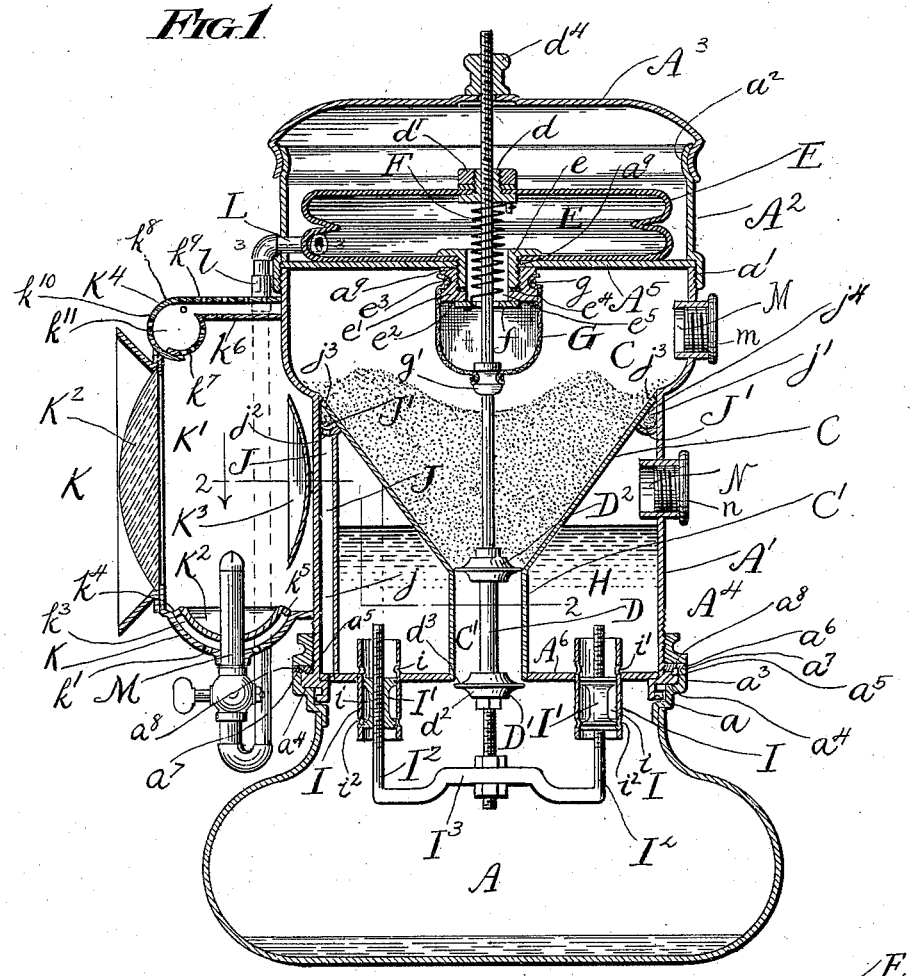


FIG. 2

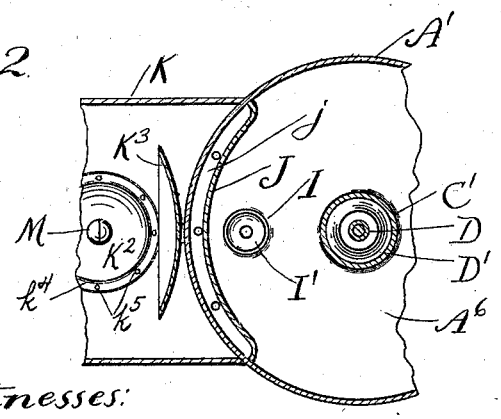


FIG. 3

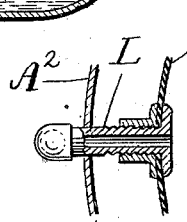
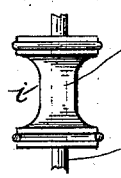


FIG. 4



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UNITED STATES PATENT OFFICE.

CHARLES W. BECK, OF CHICAGO, ILLINOIS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 647,362, dated April 10, 1900.

Application filed February 7, 1898. Serial No. 669,293. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. BECK, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Acetylene-Gas Generators, of which the following is a specification.

This invention relates to improvements in acetylene-gas generators, and refers more specifically to an improved generator wherein the carbid and the liquid are each fed into a saturating-chamber in small graduated quantities and at such frequent intervals and in such manner that the generation of gas is practically continuous.

Among the objects of the invention are to provide improved means for controlling the conflux of gas-generating elements, whereby the rate of generation is kept substantially equal to the rate of consumption, and permitting the generation to be arrested almost instantly, thus avoiding waste and at the same time rendering it possible to make the generator exceedingly compact, to render such control or regulation of the feed automatic and dependent upon the consumption of the gas, to provide a construction in which both the carbid and the liquid are discharged into a saturating or generating chamber in regulated quantities and in such manner that each charge of liquid will be practically all transformed into gas or absorbed by the residue, to provide an improved feed mechanism for feeding the pulverulent carbid which is specially constructed to prevent access of the vapors caused by generation to the carbid and consequent clogging of the feed mechanism, and to provide an apparatus of generally simplified, improved, and more effective construction which is convenient of use and in which the liability of accidental explosions is reduced to a minimum or entirely obviated.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and will be readily understood, reference being had to the accompanying drawings, in which—

Figure 1 illustrates a preferred embodiment of my present invention in the form of a bicycle-lamp, the view being taken in axial section. Fig. 2 is a fragmentary horizontal sectional view taken on line 2 2 of Fig. 1 and looking downwardly. Fig. 3 is a fragmentary sectional view taken on line 3 3 of Fig. 1. Fig. 4 is a detail of one of the liquid-feed pistons.

Referring to the drawings, the generator is therein shown as consisting of three principal members or sections embracing a fount or base A, desirably made relatively large in diameter and correspondingly shallow, a central section A′ of generally-cylindric form united at its lower end with the fount by means of an ordinary bayonet-joint a, and an upper section A^2, united with said middle section by means of an ordinary screw-threaded joint a'. The upper end of the upper section is closed by means of a cap or slip-cover A^3, herein shown as made of convex form and arranged to telescope at its lower edge over the upper edge of the upper section, the said upper end being conveniently and as shown herein grooved slightly, as at a^2, and the lower edge of the cap correspondingly curved inwardly, so as to engage the groove and hold the cover in position.

In order to form a gas-tight joint at the point of juncture of the middle section with the fount, packing devices are provided, constructed and arranged as follows: The upper end of the fount, within which the lower end of the middle section telescopes, is provided with an annular enlargement a^3, within which is formed a step or shoulder a^4, which serves to support an annular horizontally-projecting rib or flange a^5, formed upon the exterior of the middle section and so located that its upper surface lies in substantially the same plane with the upper edge of the fount.

a^6 designates a packing-ring or gasket arranged to rest upon the said rib and the upper edge of the font in such manner as to cover the joint between the two, and in order to compress said packing-ring against the seat thus formed a compressing-ring A^4 is threaded upon the exterior of the middle section immediately above said annular rib, the lower end of said ring being made wide enough to form a compressing-face adapted to act upon the gasket throughout its entire width. In order to insure a more perfect sealing of the joint by the said gasket, the upper edge of the fount is brought to a blunt knife-edge a^7, and a similar knife-edge a^8 is formed upon the upper surface of the rib, so that when the gas-

ket is forced against its seat these sharp edges will sink into it and form a gas-tight joint, even though pulverized carbid or residue should get into the joint and prevent the gasket from resting closely against its seat.

C designates a hopper-shaped carbid-receptacle arranged to occupy the upper part of the middle section, the funnel-shaped lower end of said receptacle terminating in a cylindric discharge-chute C′, within which is arranged to reciprocate a feed-stem D, carrying a pair of disk-shaped feed pistons or valves D′ D², respectively.

A⁵ designates a horizontal partition secured permanently in the lower part of the upper member A² and provided centrally with an aperture a^9.

E designates a collapsible gas-tight bag, preferably of soft rubber, arranged to rest upon said partition and having its lower side arranged to communicate with the carbid-receptacle conveniently and as herein shown by means of a hollow-headed screw *e*, the stem of which is passed downwardly through the opening a^9, while its head inside of the gas-bag is arranged to clamp the latter securely against the partition A⁵ around the said opening therein.

e′ designates a hollow nut threaded upon the lower projecting end of the screw *e* and provided with an internal annular shoulder e^2, between which and the end e^3 of said screw is interposed a packing e^4. The passage e^5, formed through the said nut and screw, is of a diameter somewhat greater than the thickness of the feed-stem D, and the latter is arranged to pass upwardly through said passage, through the opposite side of the gas-bag, and out through the cover of the generator. At the point where the stem passes through the upper side of the bag it is positively secured to the latter, conveniently by means of a clamping-screw *d*, threaded upon the stem and having its head arranged within the bag, and a nut *d′*, threaded upon the exterior of the screw and serving to clamp the interposed bag between itself and the head of the screw *d*.

The reciprocation of the feed-stem is effected by the alternate partial inflation and deflation of the gas-bag, and in order to provide a tension which will tend to keep the bag deflated and will maintain a substantially-uniform flow of gas to the burner independently of the fluctuations of gas generation a coiled contractile spring F is arranged upon the stem D within the gas-bag, the upper end of said spring being attached to the head of the screw *d* and the opposite end being arranged to extend down through the hollow screw *e* and attached to a cross-bar *f*, secured across the lower end of the nut *e′*.

In order to prevent the dust and pulverized carbid from passing from the hopper up into the gas-bag and at the same time provide a construction which will not interfere with the free movement of the feed-stem, a closely-woven or felted cloth bag G is arranged around said stem immediately below the partition A⁵, one side of said bag being tied or otherwise secured around a circumferential groove *g*, formed in the nut *e′*, while the opposite side of the bag, through which the stem passes, is similarly secured to the latter, conveniently by being tied around a grooved collet *g′*, mounted upon the stem. It will be understood that the gas will readily pass through the bag G, but that the dust and carbid will be effectually excluded.

A⁶ designates a second horizontal partition, secured permanently in the lower end of the middle section of the generator at a point coincident with the lower end of the discharge-chute, which latter is constructed to extend through the diaphragm, said partition thus forming, in conjunction with the side walls of the generator and the hopper, an annular chamber H, adapted to contain liquid. In order to discharge liquid from this reservoir automatically and in controlled quantities upon each reciprocation of the carbid-feeding mechanism, mechanism is provided constructed and arranged as follows: I designates discharge-tubes extending through the diaphragm A⁶, so as to stand vertically therein, with their ends projecting both above and below the partition. Within each of said tubes is arranged to reciprocate a valve I′, having the form of a piston provided with packing at each end, so as to fit accurately within its tube, and having a reduced portion or annular recess *i* between its ends, adapted to accommodate a measured quantity of liquid. i' i^2 designate inlet and outlet apertures formed in the sides of the tubes at points above and below the partition, respectively, said apertures being located at a distance apart slightly greater than the axial length of the recess of the piston, so that when the piston-valve is raised high enough to admit liquid to the recess the lower or outlet ports will be closed, and, vice versa, when the piston is lowered sufficiently to permit the liquid to escape therefrom the inlet-ports will be closed. The pistons are mounted upon vertically-arranged parallel stems I², connected at their lower ends with a yoke I³, which is carried by the lower end of the feed-stem D, the connection between said parts being made detachable and adjustable, so that the generator may be readily taken apart when necessary and in order that the piston-valves may be adjusted in proper relation to the carbid-feeding mechanism to insure a discharge of liquid coincident with the discharge of carbid.

In order to provide a passage for the gas from the saturating or generating chamber upwardly to the carbid-hopper, a vertical partition J is arranged to extend from the horizontal partition A⁶ upwardly to the under side of the hopper at the front side of the generator and concentrically with, but at a short distance from, the interior of the generator-casing, (see detail Fig. 2,) so as to form a narrow passage *j* of a width equal to the

diameter of the headlight-casing K, affixed to the outside of the generator proper, the object of this construction being to utilize the gas-passage as an insulating-space, which will prevent the transmission of the heat from the headlight to the liquid-reservoir.

J′ designates an annular partition extending across the angle between the side wall of the generator and the funnel-shaped bottom of the hopper, so as to form a triangular-shaped annular chamber j'. The gas-passage j is arranged to communicate with this annular chamber through a plurality of apertures j^2, and from the annular chamber the gas is permitted to escape into the upper part of the hopper through a circumferential series of inlet-apertures j^3. In order to prevent access of carbid to the annular chamber, the latter is shown as filled with a packing of fibrous filtering material j^4.

From the gas-bag the gas passes out through a suitable pipe L, connected at its inner end with a substantially-immovable part of the bag, in the present instance at one side thereof near the bottom, which rests upon the partition A^5 and which extends thence out through the side wall of the upper part of the generator and then downwardly outside of the headlight and to the lower end of the burner-nozzle M, arranged in the bottom of the headlight, a union l being provided in said pipe adjacent to its point of exit from the generator in order to facilitate the taking apart of the latter.

The headlight K may obviously be of any suitable construction; but that herein shown is of novel design and embraces a cylindrical casing K′, having its axis arranged horizontally and having its rear end conform to and attached to the cylindrical side wall of the generator. At its lower side it is provided with a convex or basin shaped portion k, through the center of which the burner-nozzle projects and within which it is seated, said portion k being foraminated or provided with a plurality of air-inlet apertures k' to admit air to the burner. k^2 designates a baffle-plate shaped to correspond to the form of the part k and secured so as to form an intervening space k^3 between itself and the latter, conveniently by having its periphery turned outwardly and downwardly and soldered to the subjacent part, as indicated at k^4. Through the downturned flange last described are formed a plurality of air-inlets k^5. Any suitable lens, as K^2, may be secured in the front end of the headlight-casing, that shown herein being of the ordinary plano-convex form, and a reflector K^3, also of common construction, is mounted at the rear end of the headlight behind the burner-nozzle.

K^4 designates a baffle-hood arranged at the upper side of the headlight and comprising an inner baffle-plate k^6, having a flat horizontal portion directly above the burner-jet imperforate, and in front of this a downwardly and inwardly curved portion k^7 of foraminated construction. Outside of and at a short distance from the inner plate is arranged an outer cap-plate k^8, having a flat portion k^9, which overlies the corresponding portion of the inner plate k^6, but is foraminated, and a front downwardly and outwardly curved portion k^{10}, which forms, in conjunction with the corresponding portion of the inner plate, a cylindric chamber k^{11}. The cylindric chamber and communicating space thus formed effectually baffle the ingress of air-currents and at the same time permit the escape of the products of combustion.

The construction and arrangement of the carbid-controlling disk or feed pistons D′ D^2 constitute an important feature of the present invention. Each of said disks consists of a body portion d^2, of soft rubber or analogous yielding material substantially impervious to vapors, made relatively thick at its center and tapered from thence radially outward, both above and below, to form a comparatively-thin flexible periphery d^3, which is of a diameter sufficiently greater than the interior of the chute C′ to form a vapor-tight closure when in position therein. The lowermost of said disks is so located upon the feed-stem that when the gas-bag is partially deflated the further descent of the feed-stem will carry the disk below the end of the chute and open the latter, so as to permit the pulverulent carbid to escape gradually, while the upper disk is so located with relation to the lower one that as the discharge end of the chute is opened the inlet end of the same will be closed. Vice versa, when the gas generated by the discharge of carbid reinflates the gas-bag the feed-stem will be lifted, so as to interrupt the further discharge of carbid from the chute, and the upper disk will be carried up, so as to admit carbid from the hopper into the chute to take the place of that last discharged. This cutting off of the carbid from the chute by the upper disk not only absolutely prevents the discharge of more than a given quantity upon any single reciprocation of the feed-stem, but also facilitates the flow of the carbid by preventing the crowding forward of that in the hopper and consequent packing action. It is also to be noted that the reciprocation of the pistons causes the upper one to act as an agitator to keep the carbid loose and in condition to flow freely.

In the construction of the generator the capacity of the piston-valves which discharge the liquid will be so adjusted that only enough liquid will be discharged at each reciprocation of the feed mechanism to moisten thoroughly the quantity of carbid discharged at the same reciprocation, so that no free liquid will remain in the saturating-chamber to splash about or to flow through the gas-passages to the hopper in case the lamp should

be accidentally overturned. This is a feature of great importance, and especially so when embodied in a portable lamp, like the bicycle-lamp, for instance, herein shown.

In order that the feed mechanism may be positively locked in closed position when desired, the protruding end of the feed-stem is shown as threaded and provided with a thumb-nut d^4, which may be screwed down against the cover to hold the stem in uplifted position.

Filling-apertures M N are provided in the sides of the carbid-receptacle and liquid-receptacle, respectively, said apertures being herein shown as conveniently closed by means of screw-caps *m n*, respectively.

The operation of the apparatus has been so fully indicated in connection with the description of the details of mechanism that it will be understood without further repetition.

It will be noted that the construction of the generator is such that the liquid contained in the reservoir can by no possibility reach the carbid-hopper except by passing through the generator-chamber, and inasmuch as the apparatus will be so regulated that only as much liquid will be discharged at any one time as will be decomposed by the carbid and fully absorbed by the residue there will therefore be no surplus liquid free to flow into the carbid-hopper in case the lamp should be overturned. In other words, the residue in the bottom of the generating-chamber will be in the form of a moistened, but not saturated, mass, from which the liquid will not readily flow, if at all. It is further to be noted that the form of the generator-chamber is such that should the generator be overturned, so as to lie upon its side, any liquid which might tend to drain from the moistened residue would go in the bulge sides of the chamber, which would then be lowermost, and that it will therefore be impossible for liquid to reach the hopper unless the generator be completely inverted and not even then if the amount of liquid discharged into the generating-chamber be properly regulated. This is a feature of the utmost importance, since it practically renders explosions impossible, and the generator is therefore perfectly safe in the hands of the most unskilled persons.

While I have herein shown what I deem to be a preferred embodiment of the present invention, yet it will be understood that the details thereof may be modified without departing from the spirit of the invention, and I do not therefore wish to be limited to the precise details shown, except as made the subject of specific claims.

I claim as my invention—

1. In an acetylene-gas generator comprising a saturating-chamber and a carbid-receptacle from which the carbid in pulverulent form is transferred to the saturating-chamber, a feed mechanism comprising a discharge-passage leading from the carbid-receptacle having an elongated portion of substantially-uniform size and a reciprocatory feed-piston having yielding margins fitting said elongated portion, whereby the carbid may be transferred to the saturating-chamber without access of vapors of generation to the carbid-receptacle except during the time that the discharge therefrom is taking place.

2. In an acetylene-gas generator comprising a saturating-chamber and a carbid-receptacle from which the carbid in pulverulent form is transferred to the saturating-chamber, a feed mechanism comprising a discharge-passage leading from the carbid-receptacle having an elongated portion of substantially-uniform size, a reciprocatory feed-piston having yielding margins fitting said elongated portion and a closure arranged to close the inlet end of the passage when the discharge end thereof is opened.

3. A feed mechanism for feeding pulverulent carbid and the like, comprising a carbid-receptacle provided with an elongated discharge-passage, a reciprocatory stem arranged to extend through said passage, and a plurality of feed-pistons mounted upon said stem each having yielding margins fitting said passage, and forming closures which seal said passage throughout a substantial part of their movement therein.

4. A feed mechanism for feeding pulverulent carbid and the like, comprising a carbid-receptacle provided with a discharge-passage, having an elongated portion of substantially-uniform size and a reciprocatory feed-piston having a rubber margin fitting said passage.

5. A feed mechanism for feeding pulverulent carbid and the like, comprising a carbid-receptacle provided with an elongated discharge-passage, a stem arranged to extend through said passage, and a soft-rubber piston mounted upon said stem having a relatively-thick central portion and outwardly-tapering thin margin adapted to fit said passage.

6. In an acetylene-gas generator, the combination of a carbid-feeding mechanism embracing a reciprocatory feed-piston, a gas-generating chamber into which said carbid-feeding mechanism discharges, an expansible gas-receptacle in communication with the generating-chamber, operative connections between the gas-receptacle and carbid-feeding mechanism whereby the latter is operated by pressure of gas generated, a liquid-feeding apparatus directly connected with, and operated by said feed-piston and arranged to discharge into the saturating-chamber, whereby a measured quantity of liquid is discharged into the generating-chamber each time the carbid-feeding mechanism is operated.

7. In an acetylene-gas generator, the combination of a generating-chamber, a feed mechanism for feeding pulverulent carbid, comprising a carbid-receptacle provided with an elongated discharge-passage discharging into said generating-chamber and a reciprocatory feed-piston having yielding margins

fitting said passage, means operated by pressure of gas generated for reciprocating said feed-piston, a liquid-feeding apparatus arranged to discharge into the generating-chamber, and interconnections between the carbid-feeding mechanism and liquid-feeding mechanism, whereby a measured quantity of liquid is discharged into the generating-chamber each time the feed-piston is reciprocated.

8. In an acetylene-gas generator, the combination of a generating-chamber, a feed mechanism for feeding pulverulent carbid comprising a carbid-receptacle provided with an elongated discharge-passage discharging into the generating-chamber, a reciprocatory feed-piston having yielding margins fitting said passage, means operated by pressure of gas generated for reciprocating said feed-piston, a source of liquid-supply, a discharge tube or cylinder communicating with said source of liquid-supply and arranged to discharge into the generating-chamber, a piston-valve reciprocating in said cylinder and interconnections between said piston-valve and the reciprocatory feed-piston of the carbid-feeding mechanism, whereby a measured quantity of liquid is discharged into the generating-chamber upon each reciprocation of the carbid-feeding piston.

9. The combination to form an acetylene-gas generator, of a three-part generator-casing, comprising a lower receptacle forming a generating-chamber, an intermediate section detachably connected with the lower section, a carbid-receptacle arranged in the upper part of said intermediate section and having a hopper-shaped bottom provided with an elongated discharge-passage discharging into the generating-chamber, a liquid-reservoir surrounding the lower part of the carbid-hopper and discharge-duct thereof, an upper section connected with the upper end of the intermediate section, a horizontal partition separating said intermediate and upper sections, an expansible gas-receptacle mounted upon said partition within the receptacle, a carbid-feeding piston arranged to control the discharge from the carbid-hopper and provided with a stem extending upwardly through the carbid-hopper and partition above the same and positively connected with a movable part of the expansible gas-receptacle, a discharge-tube communicating with the liquid-reservoir and arranged to discharge into the generating-chamber, a piston-valve in said discharge-tube, interconnections between the piston-valve and feed-stem of the carbid-feeding mechanism, a gas-passage for the escape of gas from the generating-chamber to the expansible gas-receptacle, and a gas-outlet leading from the gas-receptacle out through the walls of the generator.

10. The combination to form an acetylene-gas generator, of a three-part generator-casing, comprising a lower receptacle forming a generating-chamber, an intermediate section detachably connected with the lower section, a carbid-receptacle arranged in the upper part of said intermediate section and having a hopper-shaped bottom provided with an elongated discharge-passage discharging into the generating-chamber, a liquid-reservoir surrounding the lower part of the carbid-hopper and discharge-duct thereof, an upper section connected with the upper end of the intermediate section, a horizontal partition separating said intermediate and upper sections, an expansible gas-receptacle mounted upon said partition within the receptacle, a carbid-feeding piston arranged to control the discharge of the carbid-hopper and provided with a stem extending upwardly through the carbid-hopper and partition above the same and positively connected with a movable part of the expansible gas-receptacle, a discharge-tube communicating with the liquid-reservoir and arranged to discharge into the generating-chamber, a piston-valve in said discharge-tube, interconnections between the piston-valve and feed-stem of the carbid-feeding mechanism, a gas-passage for the escape of gas from the generating-chamber to the expansible gas-receptacle, a gas-outlet leading from the gas-receptacle out through the walls of the generator, and a headlight mounted upon the generator and having its burner in communication with the gas-outlet of the generator.

11. The combination to form an acetylene-gas generator, of a three-part generator-casing, comprising a lower receptacle forming a generating-chamber, an intermediate section detachably connected with the lower section, a carbid-receptacle arranged in the upper part of said intermediate section and having a hopper-shaped bottom provided with an elongated discharge-passage discharging into the generating-chamber, a liquid-reservoir surrounding the lower part of the carbid-hopper and discharge-duct thereof, means for discharging liquid from the liquid-reservoir to the generating-chamber, an upper section connected with the upper end of the intermediate section, a horizontal partition separating said intermediate and upper sections, an expansible gas-receptacle mounted upon said partition within the receptacle, a carbid-feeding piston arranged to control the discharge of the carbid-hopper and provided with a stem extending upwardly through the carbid-hopper and partition above the same and positively connected with a movable part of the expansible gas-receptacle, a vertical partition arranged to extend from the bottom of the liquid-reservoir upwardly to the under side of the hopper concentrically with, but at a short distance from, the interior of the casing and having its lateral margins turned outwardly and secured against the interior of the casing so as to form a relatively wide and narrow gas-passage extending from the generating-chamber to the carbid-hopper, gas-

inlets at the lower and gas-outlets at the upper end of said gas-passage, a gas-passage leading from the carbid-hopper to the interior of the expansible gas-receptacle, a headlight mounted upon the exterior of said generator at a point opposite the wide gas-passage leading from the generating-chamber to the carbid-hopper, and a gas-pipe leading from the expansible gas-receptacle to the burner of the headlight.

Signed by me at Chicago, Illinois, this 5th day of February, 1898.

CHARLES W. BECK.

Witnesses:
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