No. 619,146. Patented Feb. 7, 1899.

J. A. DEUTHER.

ACETYLENE GAS GENERATOR.

(Application filed July 29, 1897.)

(No Model.)

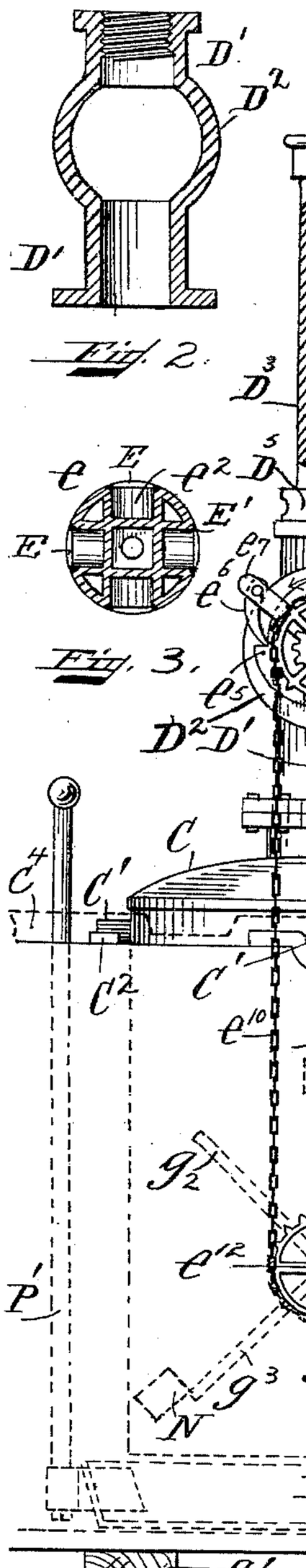

Fig. 2.

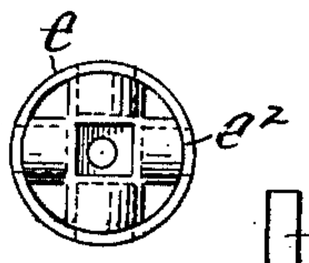

Fig. 4.

Fig. 3.

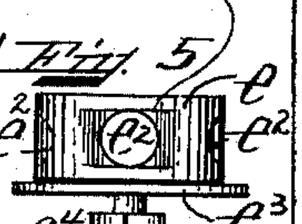

Fig. 5.

Fig. 1.

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UNITED STATES PATENT OFFICE.

JAMES A. DEUTHER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO JOHN JOYCE, TRUSTEE, OF ANDOVER, MASSACHUSETTS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 619,146, dated February 7, 1899.

Application filed July 29, 1897. Serial No. 646,319. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. DEUTHER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Gas-Generators, of which the following is a specification.

My invention relates to the generation of illuminating or other gas from calcium carbid or other chemical substances, which when brought into contact with water or other liquid generate a hydrocarbon or other gas; and the object is to automatically control the generation of said gas by feeding a determined or a varying quantity of said calcium carbid or analogous compounds to the liquid by mechanism controlled by the rise and fall of the gasometer. In commercial and practical use it is necessary that such automatic mechanism should not only be operative with exact amounts of calcium carbid, but should also be operative with varying amounts of calcium carbid or with calcium carbid of varying degrees of efficiency, for the reason that in the commercial fabrication of calcium carbid in the electric-arc furnace the product is not always of uniform character, by which is meant that all portions of the same output of or different outputs of the furnace do not conform in efficiency. This and other objects are accomplished by mechanism hereinafter described.

My invention consists of certain novel features hereinafter described, and particularly pointed out in the claims.

Figure 1 is a side elevation of my improved gas-generator with the storage-chamber for the calcium carbid partly in section. Fig. 2 is a sectional view of the chamber surrounding the feeding mechanism which receives the calcium carbid from the storage-chamber. Fig. 3 is a central sectional view through the wheel which constitutes the feeding mechanism for feeding the carbid from the storage-chamber to the gas-generating chamber. Fig. 4 is a side view of the wheel which constitutes the feeding mechanism for the carbid. Fig. 5 is a plan view of the mechanism for operating the wheel which constitutes the feeding mechanism for feeding the carbid from the storage-chamber to the gas-generating chamber.

Like letters of reference refer to like parts throughout the several views.

A represents a tank of suitable material containing water or other liquid and having a cover for closing the top, and said tank rests on the cross-beams A′, supported by the base B. Within the tank A there is located the gas-generating chamber C, open at the bottom and provided with side lugs C′, resting in suitable bearing C^2, by means of which said gas-generating chamber C is supported in position. The top of the gas-generating chamber C is provided with a neck D, to which is securely connected the chamber D′, having an enlarged section D^2. The storage-chamber D^3 for holding boxes or tablets of calcium carbid is open at the bottom and communicates with the chamber D′ and is provided with a suitable cover D^4 to prevent the atmosphere from affecting the stored carbid. Around the lower portion of the storage-chamber D^3 there is securely fastened the sleeve D^5, having suitable holes D^6, into which suitable pins may be placed for the purpose of securing the chamber D^3 to the chamber D′ by securing the lower end of the chamber D to the top of the chamber D′ in order to secure the same firmly together.

Within the enlarged portion of the chamber D′ there is located the wheel *e*, fast on the shaft *e*′, and is provided with four pockets e^2. The wheel *e* works in the chamber D^2 with a tight joint, whereby the gas or aqueous vapor which may be in the gas-generating chamber C cannot have access to or affect the stored carbid, and when said storage-chamber is being recharged the air cannot pass into said generating-chamber on account of the tight joint between the wheel *e* and the inner surface of the enlarged portion D^2 on account of the absence of any passage for air or gas between the gas-generating chamber C and the storage-chamber D^3. Fast on the shaft *e*′ and in front of the wheel *e* is a plate e^3, which is adapted to be attached by suitable bolts to the enlarged section D^2 of the chamber D′ when said wheel is inserted within said chamber, thereby retaining said wheel within said chamber during its rotation. Fast on the shaft *e*′ and to the front of the plate e^3 is located a wheel e^4, provided with stops e^5, into

which the pawl e^6 falls at determined intervals, and said pawl is carried by the lever e^7, fast on the hub of the pinion e^8, which is loose on the shaft e'. The sprocket-wheel e^9 is made fast on the shaft e', and around it is located the sprocket-chain e^{10}, which passes downwardly and around the sprocket-wheel e^{11}, fast on the shaft e^{12}. On said shaft e^{12} and within the chamber C is located the shelf g, having four leaves g', g^2, g^3, and g^4, preferably made of wire closely meshed. These leaves are relatively inclined and form receptacles.

Projecting from the enlarged portion D^2 is an arm F, on which there is pivotally mounted at F' the segment-gear F^3, provided with suitable teeth adapted to work with the gear-wheel e^8, fast on the shaft e'. The periphery of the wheel e around the pockets e^2 is slightly recessed, as shown at E, and the edge is rounded to cause the periphery to slip easily against the lower box or tablet of the pile of boxes or tablets of carbid contained in the storage-chamber D^3, so that the wheel after receiving a box or tablet is not caught by the next box or tablet and prevented from moving.

The gas generated in the gas-generating chamber C passes by the pipe H to the bell J' of the gasometer J, resting on the beams A^2, and a suitable valve H' is located in said pipe. A check-valve H^2 is provided in said pipe H, opening toward the gasometer and adapted to permit the passage of gas during its generation and to prevent the pressure in the bell of the gasometer from exerting pressure on the gas in the gas-generating chamber. The gas is conducted from the gasometer J through the pipe J^3 for use. The bell J' bears in its vertical movements against the friction-rollers J^2, secured to the gasometer J. To the top of the bell J' there is secured a bracket K, to which is secured at K' the vertical rod L, having bottom guide-rolls L^2 on a cross-beam L^3, supported by the brackets L', fastened to the beams O, which are braced by suitable rods O' and top beams O^2. About midway of said rod L there is secured the friction-roller M, adapted to engage as the gasometer falls with mechanism hereinafter described.

The carbid is formed into tablets or placed in boxes N, of metal or paper, having perforations N', or the boxes may be made of paper of such an absorbent nature as to permit of water having as ready access to the carbid as if the boxes were perforated.

P represents a vessel for receiving the boxes after the carbid has been decomposed, and by means of a suitable handle P' said vessel may be removed from time to time to remove the waste-boxes or residue which may be collected therein. With this arrangement it is not necessary to stop the apparatus in order to remove any residue and the air has no access to the gas-generating chamber C during the time of removing said residue vessel.

The function of the shelf g in the gas-generating chamber C is to support the calcium carbid before reaching the refuse-chamber until the decomposing liquid has had time to thoroughly disintegrate the calcium carbid. Further, it permits of the calcium carbid being disintegrated below the surface of the water, and as the acetylene gas is somewhat purified by its passage upward through the water, and at the same time the acetylene gas is delivered comparatively cool to the gasometer. The gas being generated at a point between the surface and the bottom of the water, it is also assured that the temperature of the gas will not reach a temperature sufficiently high to cause its ignition or polymerization. By means of said shelf the calcium carbid is kept free from the residue of the previously-decomposed carbid, and thus complete disintegration is assured, and, as the shelf revolves coincidently with the wheel, there is provided a clean surface to receive the charge of carbid to be decomposed, and the shelf in its partial or total revolution will reach a position where the residue or refuse on said shelf will be discharged into refuse or residue vessel P. Thus carbid is rendered easy of disintegration, whereas if the carbid was brought into contact with the residue of previously-decomposed carbid it would dehydrate such residue as would be in contact with the calcium carbid, thereby surrounding the carbid to be decomposed with a material which would retard the decomposition of said carbid.

Should sufficient powdered carbid be delivered to the water, gas would be rapidly generated at the surface of the water and at a rate to raise the temperature of the water to a boiling-point and under certain conditions bring about the ignition or polymerization of the gas. With this shelf compact carbid, even in a fragmentary or pebbly form, may be delivered to the water, as the gravity of carbid in these forms would cause it to fall through the water until its fall was arrested by the shelf, and said compact fragmentary carbid could not fall off the shelf into chamber P until completely disintegrated, when the residue or refuse would be discharged into the refuse vessel by the revolution of the shelf, thereby obviating the necessity of the gas passing upwardly outside the gas-generator, and thereby preventing its escape into any other channel than that connected with the gasometer. Thus the shelf g insures the generation of the gas in a cool and purified condition and its complete decomposition and at the same time generates the gas at a point where it insures the gas being delivered to the gasometer. The calcium carbid falling on a surface always free from the residue of previously-decomposed carbid cannot become embedded in said residue, thereby rendering uncertain the rate of decomposition of calcium carbid. This feature of generating acetylene gas at a point

above the bottom of the water in the gas-generating chamber is of utmost importance and is one of the features of my invention.

It is a well-known physical fact that gases will diffuse at a rate proportionate to their specific gravity and pressure. It is evident in obedience to this law that a certain amount of gas will pass upwardly through and from the surface of the water, which seals the rising-and-falling bell J′ of the gasometer J. Likewise the water outside and surrounding the gas-generating chamber will permit of diffusion through and from the surface of the water surrounding the gas-generating chamber. To obviate diffusion from these two causes, the rising-and-falling bell J′ of the gasometer J is sealed with a flexible packing J^4, which is secured to the inside upper edge of the lower chamber of the gasometer, and the tank in which is located the generator is also sealed with a removable cover C^4.

As shown in Fig. 1, the gasometer is at about its lowest position, as there are always a certain number of feet of gas in the bell for its lowest position and a new box of carbid N has just dropped from one of the pockets e^2 into the gas-generating chamber C, as shown in dotted lines, while the box previously dropped into said chamber when discharged into the refuse vessel P is held against the sides of the gas-generating chamber, so that by having four leaves the carbid dropped by the wheel *e* is not discharged into the refuse vessel P until another charge of carbid is being delivered between two of the leaves, so that complete decomposition of the carbid in each box is assured before the box is discharged to the vessel P. Now with the parts in the position shown in Fig. 1, with a box just dropping into the gas-generating chamber, as soon as gas is generated the bell J′ will rise and the end F^4 of the segment-gear F^2 will move upwardly by reason of the weight Q and the teeth of said gear will turn the pinion e^8 around and move the pawl e^6 upwardly over the cam-wheel e^4 until said pawl falls into the uppermost notch e^5, and as the gas is used and the bell falls the roller M in the downward movement of the bell J′, bearing on the end F^4 of the segment-gear F^2, causes the teeth of the segment-gear to turn the pinion e^8 and the cam-wheel e^4 in the direction indicated by the arrow, which brings another pocket e^2 around and over the neck D and another box drops into the gas-generating chamber between two of the leaves of the supporting-shelf *g*. The pockets e^2 are each preferably arranged parallel with the notches e^5, so that the position of the notches indicates the position of the pockets, and, as shown in the drawings, the position of the lower notch indicates that a pocket e^2 has come into alinement with the neck D and a box has been dropped therefrom, and the position of the upper notch indicates that a pocket e^2 is in alinement with the storage-chamber D^3 and is receiving a box or tablet therefrom. In this construction the wheel *e* rotates always in one direction, and each pocket as it deposits its box or tablet of carbid to the gas-generating chamber comes around under the chamber D^3 and receives another box or tablet.

To prevent the end F^4 of the segment-gear F^2 from rising to a greater height than is necessary to make it operate, a stop *d* is provided to prevent its rising beyond the desired point. This construction obviates the necessity of a roller similar to the roller M being placed at a point below the end F^4, whereby the rising of the bell would cause this supposed lower roller to engage with the under side of the end F^4 of the segment-gear F^2 to cause it to rise and carry on an operation similar in function to that brought out by the use of the weight Q. Therefore this weight Q in operating the feeding mechanism prevents the gasometer being bound in its rise, thereby interfering with the free working of the rising bell J′.

It is evident that were another roller similar to the roller M placed below the end F^4 of the segment-gear F^2 to cause the rising of the end F^4 of the segment-gear F^2 an amount of carbid would be required to be fed at each operation to insure the rising bell J′ rising to a height to cause the roller assumed to be below the bottom F^4 of the segment-gear F^2 to rise to a height to bring the pawl mechanism to a point to engage with the next uppermost notch.

It is evident that should a charge of carbid cause the gasometer to rise to its full height naturally in its descent the roller M will impinge on the arm F^4 of the segment-gear F^2 and cause the feeding mechanism to operate. It is also evident that if a less charge of carbid was delivered by the feeding mechanism it would also cause the roller M to rise high enough to permit the weight Q to cause the arm F^4 of the segment-gear F^2 to go high enough to bring the pawl into contact with the next uppermost notch of the feed mechanism, and so it is obvious that charges of varying amounts of carbid or of carbid of varying degrees of efficiency may be delivered to the gas-generating chamber and cause the gasometer to rise sufficiently high to make the feeding mechanism operative, or a charge may be delivered which causes it to rise to its full height, and it will also be operative.

It is obvious that the wheel *e* instead of rotating in a vertical plane could be arranged to rotate in a horizontal plane.

I do not limit myself to the arrangement and construction shown, as the same may be varied without departing from the spirit of my invention.

Having thus ascertained the nature of my invention and set forth a construction embodying the same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a gas-generating apparatus, the combination of a gas-generating chamber for hold-

ing water or other liquid, a storage-chamber for holding gas-generating material, feeding mechanism for feeding the material from the storage-chamber into the gas-generating chamber, a shelf pivoted in said gas-generating chamber for receiving the material from said feeding mechanism and for holding the same above the bottom of the gas-generating chamber and adapted to turn in a vertical plane, a gas-receiver connected with said generating-chamber and adapted to be moved by the pressure of the gas contained therein, and mechanism connected with said feeding mechanism and said shelf and actuated by said gas-receiver for operating said feed mechanism to introduce fresh gas-generating material into the generating-chamber and for turning said shelf to remove the residue of the gas-generating material from contact with the fresh material from the feeding mechanism.

2. In a gas-generating apparatus, the combination of a generating-chamber, a rotatable shelf mounted in said chamber, a storage-chamber for holding the gas-generating material, a rotatable feeding mechanism for feeding the gas-generating material from said storage-chamber into said generating-chamber, a gas-receiver connected with said generating-chamber and adapted to be moved by the pressure of the gas contained therein, and mechanism actuated by said gas-receiver and operating said feeding mechanism and said shelf.

3. In a gas-generating apparatus, the combination of a gas-generating chamber for holding water or other liquid, mechanism for feeding gas-generating material into said chamber, a rotatable shelf mounted in said chamber and consisting of a plurality of relatively-inclined leaves forming receptacles adapted to receive the gas-generating material from said feeding mechanism, and means for rotating said shelf to move successively said receptacles into positions to receive the gas-generating material from the feeding mechanism and also to move successively said receptacles to relieve them of the residue of the gas-generating material that has been decomposed so that said residue will not contact with fresh material.

4. In a gas-generating apparatus, the combination of a gas-generating chamber for holding water or other liquid, mechanism for feeding gas-generating material into said chamber, a rotatable shelf mounted in said chamber and consisting of a plurality of relatively-inclined leaves forming receptacles, and means for intermittently operating said feeding mechanism and for intermittently rotating said shelf to move successively said receptacles into positions to receive the gas-generating material from said feeding mechanism and also to move successively said receptacles to positions to relieve them of the residue of the gas-generating material so that said residue will not come in contact with the fresh material.

5. In a gas-generating apparatus, the combination of a gas-generating chamber for holding water or other liquid, a mechanism for feeding gas-generating material into said chamber, a rotatable shelf mounted in said chamber and consisting of a plurality of relatively-inclined leaves forming receptacles, and means for intermittently and simultaneously operating said feeding mechanism and rotating said shelf to move successively said receptacles into positions to receive the gas-generating material from said feeding mechanism and also to move successively said receptacles to positions to relieve them of the residue of the gas-generating material so that the fresh material will not contact with the residue.

6. In a gas-generating apparatus, the combination of a gas-generating chamber for containing water or other liquid, mechanism for feeding gas-generating material into said chamber, a rotatable shelf mounted in said chamber and consisting of a plurality of relatively-inclined leaves forming receptacles, a gasometer having a movable bell, a pipe connecting said gasometer with said generating-chamber, and mechanism actuated by said bell for operating said feed mechanism and for rotating said shelf to move successively said receptacles into positions to receive the material from said feeding mechanism and also to move successively said receptacles to positions to relieve them of the residue of the material so that fresh material will not contact with the residue.

7. In a gas-generating apparatus, the combination of a gas-generating chamber, a storage-chamber for holding the gas-generating material, a passage connecting said chambers, a shaft journaled in said passage, a wheel having pockets mounted in said shaft within said passage and controlling the latter, a wheel carrying a series of stops coincident with said pockets and mounted on said shaft for regulating the movement of said shaft to insure the registration of said pockets with the openings of said passage, a pinion-gear journaled on said shaft, a pawl carried by said gear and adapted to engage with said stops, and means for rotating said pinion-gear.

8. In a gas-generating apparatus, the combination of a gas-generating chamber, a storage-chamber for holding gas-generating material, a passage connecting said chambers, a shaft journaled in said passage, a wheel having pockets mounted on said shaft within said passage for controlling the latter, a wheel carrying a series of stops coincident with said pockets and mounted on said shaft for regulating the movement of said shaft to insure the registration of said pockets with the openings of said passage, a pinion-gear journaled on said shaft, a pawl carried by said pinion-gear and adapted to engage with said stops, a pivoted lever, a segmental gear carried by said lever and engaging with said pinion-gear, and means for operating said lever.

9. In a gas-generating apparatus, the combination of a gas-generating chamber, a storage-chamber for holding gas-generating material, a passage connecting said chambers, a shaft journaled in said passage, a wheel having pockets mounted on said shaft within said passage and controlling the latter, a wheel having a series of stops coincident with said pockets mounted on said shaft for regulating the movement of said shaft to insure the registration of the said pockets with the openings of said passage, a pinion-gear journaled on said shaft, a pawl carried by said pinion-gear and adapted to engage with said stops, a pivoted lever, a segmental gear carried by said lever and engaging with said pinion-gear, and a gas-receiver connected with said generating-chamber and adapted to be moved by the pressure of the gas therein and operating said lever.

10. In a gas-generating apparatus, the combination of a generating-chamber, a shaft journaled in said chamber, a shelf carried by said shaft, a sprocket-wheel mounted on said shaft, a storage-chamber for holding the material to be treated, a passage connecting said chambers, a shaft journaled in said passage, a wheel having pockets mounted on said latter shaft within said passage and controlling the latter, a sprocket-wheel mounted on said latter shaft, a sprocket-chain connecting said sprocket-wheels, and means for rotating one of said shafts.

11. In a gas-generating apparatus, the combination of a generating-chamber, a shaft journaled in said chamber, a shelf carried by said shaft, a sprocket-wheel mounted on said shaft, a storage-chamber for holding the material to be treated, a passage connecting said chambers, a shaft journaled in said passage, a wheel having pockets mounted on said latter shaft within said passage and controlling the same, a sprocket-wheel mounted on said latter shaft, a sprocket-chain connecting said sprocket-wheels, a wheel having stops mounted on said latter shaft, a pinion-gear journaled on said latter shaft, a pawl carried by said pinion-gear and adapted to engage with said stops, a pivoted lever, a segmental gear carried by said lever and engaging with said pinion-gear, and means for operating said lever.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 20th day of July, A. D. 1897.

JAMES A. DEUTHER.

Witnesses:
E. L. HARLOW,
A. L. MESSER.