

July 24, 1934.

G. M. DEMING

1,967,294

GAS GENERATOR

Filed March 22, 1932

3 Sheets-Sheet 1

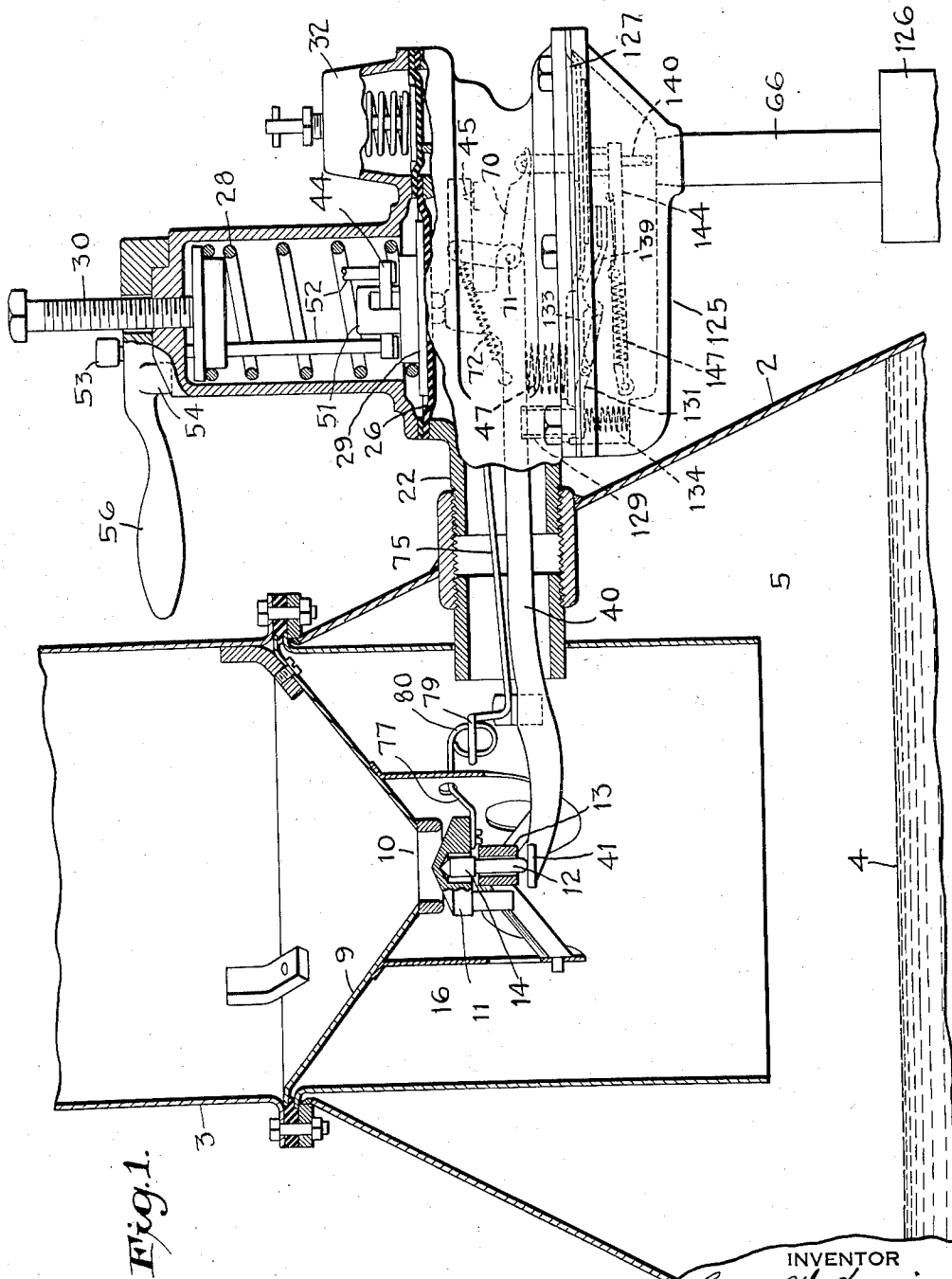


Fig. 1.

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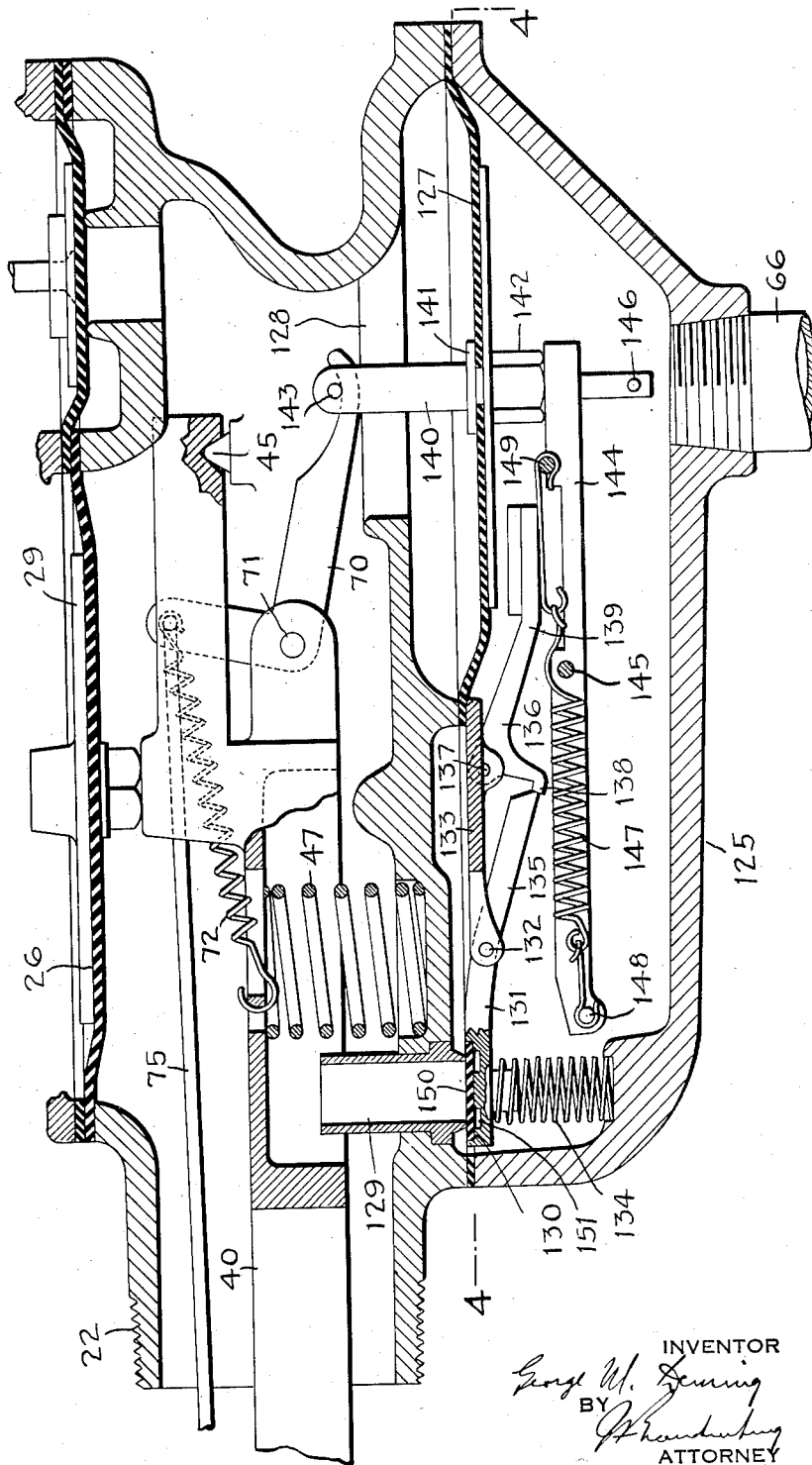
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3 Sheets-Sheet 2

Fig. 2.



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3 Sheets-Sheet 3

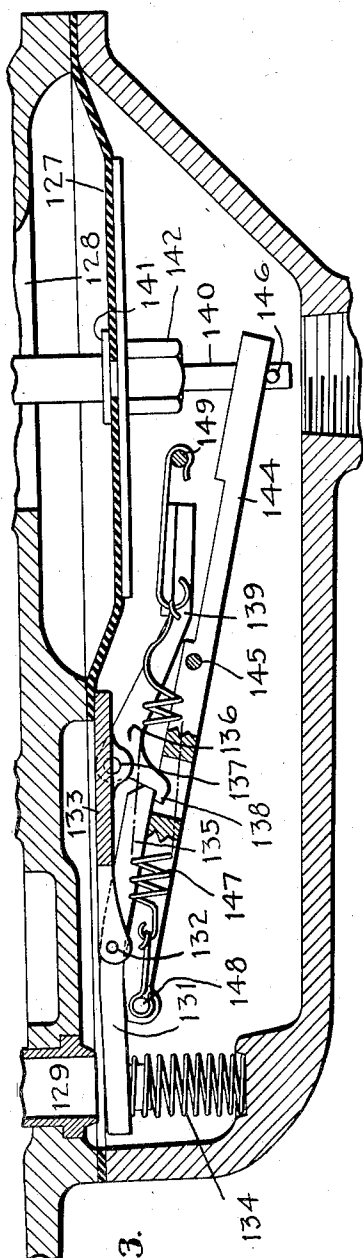


Fig. 3.

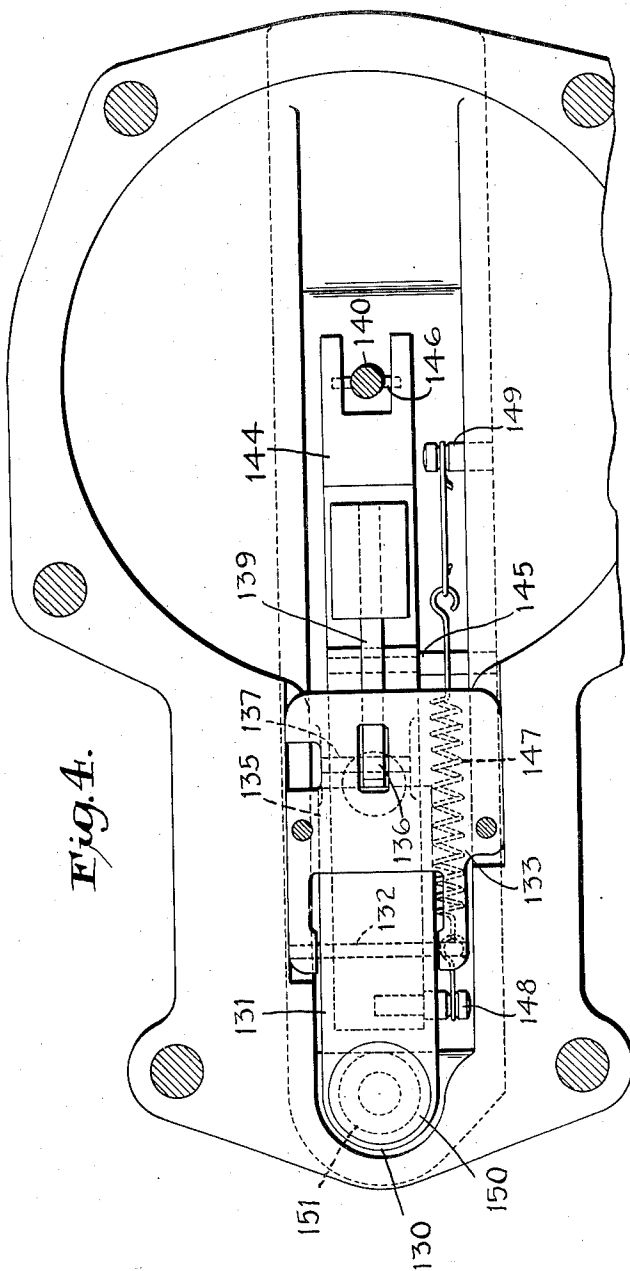


Fig. 4.

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GAS GENERATOR

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Application March 22, 1932, Serial No. 600,433

6 Claims. (Cl. 48—38)

This invention relates to gas generators in which solid material is fed and dropped into a body of liquid, by reaction with which gas is generated. Specifically, the invention relates to acetylene generators.

The invention relates more particularly to a generator in which a valve or feed device at the outlet of the carbide hopper is agitated automatically to produce the feed. Objects of the invention are: ease and economy of manufacture, dependability of operation, uniformity of pressure of the gas supplied to torches or other consuming devices, high quality of regulation throughout a wide range of gas flows from very low to very high, simplicity of mechanism coupled with capability of remaining in good working order indefinitely, and sturdiness to withstand use in the field of rough handling.

The generator illustrated herein is similar in much of its mechanism to that disclosed in my copending application Serial No. 600,431 but the matters claimed herein are not limited to the specific mechanism.

A particular object of the present invention is to provide an acetylene generator having an agitator of inexpensive construction, which agitator is powerful in its action on the carbide feed device and does not require liquid for its operation. The agitator has a flexible diaphragm subject to differentials in gas pressure, and a valve for closing an orifice through which gas is discharged at intervals from a chamber at the generator side of the diaphragm to a chamber at the outlet side. This valve is held either opened or closed and is actuated or controlled by spring mechanism or its equivalent so as to create an intermittent discharge, said mechanism being brought into play by the movement of the diaphragm. The resulting vigorous diaphragm action is transmitted through suitable linkage to the feed device.

Other objects and features of the invention will become apparent from the drawings and from the body of the specification.

In said drawings:

Fig. 1 is a view partly in elevation and principally in vertical section of a generator embodying the invention, the body of the generator and the hopper both being largely broken away;

Fig. 2 is a vertical section through the agitator, the mechanism being shown in a transitory condition;

Fig. 3 is a similar, more fragmentary view, showing the mechanism in a different condition; and

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 2.

A portion of the tank body of the generator, containing the generating chamber, is marked 2, and a portion of the carbide hopper is marked 3. The normal water level in the body is marked 4, above this being the gas space 5.

The hopper has a sloping bottom 9 containing a broad feed opening 10, preferably defined by a lip or spout. The feed of carbide and its delivery to the body of water is controlled by a valve, which term is to be understood in a broad sense, and a suitable part of the valve is agitated to cause the carbide to be fed in accordance with the consumption of gas taken from the generator. The part which is agitated may be of the kind shown in the accompanying drawings or of different kind, see, for example, my copending application Serial No. 600,434.

In the illustrated embodiment, a valve plate 11 is supported beneath the hopper spout so as to sustain the carbide, and is capable of being oscillated about a vertical axis. The top of the valve plate slopes gently from the center, and in its under side there is a cavity to receive the pointed head 14 of a valve stem 12, the shank of this stem being guided in the hub 13 of a spider, which is supported by a collar 16 projecting downward from the hopper.

A gas limb 22 is carried by the upper part of the generator body, from which it extends laterally, the interior of the limb being in communication with the gas space of the generator. A lever 40 extends within this limb and into the generator body, where its terminal 41 underlies the valve stem 12, for the purpose of raising and lowering the valve plate 11 to vary the size of the carbide feed passage. This lever is fulcrumed at its outer end, at 45, and is acted upon by two opposing springs 28 and 47, the former tending to lower the feed valve plate and the latter tending to raise it. The spring 28, which may be termed a regulating spring, is the more powerful, and acts upon the lever 40 through a diaphragm 26, which closes an opening in the top of the gas limb. When the gas pressure in the generator rises somewhat, its effect upon the diaphragm reduces the pressure of the regulating spring on the lever, allowing the spring 47, which may be termed a compensating spring, to move the lever in the direction to bring the valve plate 11 closer to the hopper spout, or even to close it entirely. Conversely, when the gas pressure decreases somewhat, the spring 28 exerts more stress on the lever, and in so doing lowers

the valve plate. These provisions tend to maintain a uniform working pressure in the generator, which pressure can be varied by the adjusting screw 30.

5 The carbide feed can be locked by turning the handle 56 of a cam 54 which coacts with cam surfaces on top of the regulator spring bonnet. As fully described in my copending application Serial No. 600,431, this causes the cam to act on
10 the heads 53 of rods 52, the lower ends of which are connected to a cross-bar 44 that passes through a slotted opening in the boss 51 of a diaphragm plate 29. This back-checking of the regulator spring permits the compensating spring
15 47 to press and hold the valve plate 11 against the edge of the carbide opening 10.

Another bonnet 32 contains a relief valve.

An agitator mechanism casing 125 is applied to the under side of the gas limb 22. A gas off-
20 take pipe 66 connects this chamber with the usual flash-arrester chamber 126, from which the gas passes to the service line or main. A flexible diaphragm 127 is clamped at its margin between the limb 22 and the casing 125, so that
25 one side is exposed to the generator pressure, through an opening 128 in the bottom wall of the limb, while its opposite side is exposed to what may be termed the outlet gas pressure.

Gas is discharged at short intervals into the
30 casing 125 through a nozzle 129, to pass out through the pipe 66. The port through the nozzle is opened and closed by a valve 130 on the end of a valve arm 131, which is pivoted at 132 on a plate 133 fixed in the upper part of the
35 casing 125. A spring 134 presses the valve against the lip of the nozzle. The valve arm 131 has a tail 135 to coact with a detent 136, which is pivoted at 137 on the plate 133. When the valve 130 is closed, the nose 138 of the detent
40 rests against the tip of the tail 135 of the valve arm. When the valve is open, this tail is caught by the shoulder of the nose 138, with the result that the valve is held open for a brief time against the stress of the valve-spring 134. The detent
45 has an arm 139 which is sufficiently weighted to cause the detent to act automatically to engage and detain the valve arm.

A stem 140 extends through the center of the diaphragm, and is affixed to it in a gas-tight
50 manner by a collar 141 and a nut 142. The upper portion of this stem is bifurcated and has a cross-pin 143 taking over the horizontal arm of a bell-crank lever 70. This lever is pivotally fulcrumed at 71 on the regulating lever 40, or it
55 could be fulcrumed on a stationary support. A spring 72 acts on the other arm of the bell-crank, or on any other part connected with the diaphragm, and tends to raise the diaphragm and the stem 140. The stem passes loosely through
60 an opening in a lever 144, which is pivotally fulcrumed intermediate its ends, at 145, in the casing 125. The nut 142 moves the lever 144 in one direction and a cross-pin 146 on the stem
65 moves it in the other direction, the distance between the nut and pin being greater than the thickness of the end of the lever upon which they act. A spring 147 is stretched between a
70 pin 148 on the other end of the lever 144 and a pin 149 fixed to the side of the casing 125. The relations are such that when the lever is moved past a dead center in either direction as the result of movement of the diaphragm, the spring 147 throws the lever. Thus, when the diaphragm 127 is depressed sufficiently by the generated gas
75 pressure in the chamber of the gas limb 22, the

contact 142 moves the right-hand arm of the lever 144 down and the left-hand end up until the direction of stress of the spring 147 comes in line with the center 145 and then passes slightly above it. The condition at this instant is the one illustrated in Fig. 2. Thereupon, the spring 147 throws the lever smartly to the position of Fig. 3. Conversely, when the diaphragm 127 flexes upward under the action of spring 72, the cross-pin 146 on the diaphragm stem lifts the right-hand end of the lever and lowers the left-hand end, until the direction of stress of the spring 147 is brought just below the center 145, whereupon the spring drives the lever abruptly to a position in which its right-hand is above and its left-hand below the positions shown in Fig. 2.

The provisions including the lever 144, which is carried alternately in opposite directions to and past a center by the contacts on the diaphragm stem 140, and is then urged onward by the spring 147, may be termed a reversible throw-over device. This device and other details of the mechanism may, naturally, take various forms. For convenience, the directions of movement of the lever 144 of the illustrated embodiment may be referred to as clockwise and counter-clockwise, respectively. In counter-clockwise movement under the action of the spring 147 or its equivalent, the right-hand arm of the lever strikes the arm 139 of the detent or latch 136, moving the latter so that its nose 138 is withdrawn from detaining engagement with the tail 135 of the valve arm 131, and this enables the spring 134 to close the valve 130. The abrupt clockwise movement of the lever causes its left-hand arm to strike the tail of the valve arm, in order quickly to open the valve wide, in which position it is caught and held by the detent 136.

The mode of operation of the specific embodiment of the agitator is, therefore, as follows: Let it be assumed that the valve 130 is closed. As gas is withdrawn from the flash-arrester chamber 126 for service, the pressure in the casing 125 decreases somewhat. At the same time the pressure in the generator and in the gas limb 22 may rise to some extent. The differential of gas pressures across the diaphragm 127, therefore, increases until, say, a value of about two inches of water pressure is reached. The differential overcomes the spring 72 and flexes the diaphragm downward, until this movement moves the reversible throw-over device past its critical position, at which moment (represented by Fig. 2) the energy stored in the spring 147 snaps the lever to the extreme position shown in Fig. 3, thereby suddenly opening the valve 130, to be caught and held open by the detent 136. Gas then passes from the generator to the outlet chamber 125, with the result that the pressure across the diaphragm is soon equalized, or equalized sufficiently to enable the spring 72 to flex the diaphragm in the reverse direction, which, in terms of the illustrative orientation, is upward. This movement swings the lever 144 past the critical or dead center position again, so that the lever is thrown by the spring 147 to the other extreme position, tripping the detent 136 and permitting the spring 134 to close the valve. This cycle is repeated as long as gas is withdrawn from the generator. The time interval between the opening and closing of the valve is brief. It will be evident that it is desirable that the spring 134 be strong enough not to yield to the generator pressure acting through the nozzle 129 against the valve. The frequency of the action

of the diaphragm motor will vary with the rate of flow of gas determined by the consumption.

The fluctuations in the pressure differential across the diaphragm 127 cause it to flex up and down, and this action is communicated to a part of the carbide feed valve to agitate the latter and cause the carbide to be fed. The pressure fluctuations do not affect the high degree of steadiness and pressure uniformity of the gas delivered by the generator for consumption, since the fluctuations are small in magnitude, and, for all practical purposes, cease to exist in the course of the passage of the gas to the torches.

In the particular generator selected for illustration, the feed element that is agitated is the valve plate 11, to which a link 77 is eccentrically pivoted. This link is connected at 79, 80 with a rod or link 75, which extends inside the gas limb to the bell-crank 70, to the vertical arm of which it is connected.

When the diaphragm 127 is flexed downward, the linkage 70, 75, 77 oscillates the valve plate 11 in one direction. When the diaphragm is flexed upward, the linkage is operated by the spring 72 to oscillate the valve plate in the reverse direction. In general, springs may be replaced by weights.

A feed-valve agitator of the type that has been described, while involving a certain amount of mechanism over liquid-seal devices, can be made easily, at moderate expense, and is not subject to derangement. It has the advantages of being a powerful agitator and of requiring no liquid, and, therefore, no re-filling with liquid from time to time.

A feature of the valve 130 of this dry diaphragm agitator remains to be described. The sealing element of the valve consists of a disc 150 of soft rubber or other flexible or yielding material held in a recess of the valve arm 131, and this disc is not supported at the region where it seats against the lip of the nozzle 129. For this purpose, an annular cavity 151 is formed in the valve arm 131 underneath the disc. This construction insures against gas leaks through the valve even when the latter becomes coated with a considerable amount of lime dust.

While a preferred embodiment has been described in detail, it will be understood that numerous changes may be made without departing from the invention.

I claim:

1. In a gas generator having a hopper, a generating chamber, a feed device and a gas outlet; an intermittent gas discharge valve interposed between said generating chamber and said outlet, an agitator diaphragm, operating connections between said agitator diaphragm and said feed device, mechanism for opening and closing said gas discharge valve, and means operatively connected with said agitator diaphragm for initiating the operations of said mechanism for opening and closing the gas discharge valve.

2. In a gas generator having a hopper, a generating chamber, a feed device and a gas outlet;

an intermittent gas discharge valve interposed between said generating chamber and said outlet, an agitator diaphragm, operating connections between said agitator diaphragm and said feed device, and mechanism for actuating said gas discharge valve, said mechanism including a reversible throw-over device controlled by said agitator diaphragm.

3. In a gas generator having a hopper, a generating chamber, a feed device and a gas outlet; an intermittent discharge valve interposed between said generating chamber and said outlet, an agitator diaphragm, operating connections between said agitator diaphragm and said feed device, a spring for closing said valve, an automatic detent for holding the valve open, and a reversible actuating device to open the valve on one stroke and to release it from said detent on the reverse stroke, the operations of said actuating device being initiated by means of said diaphragm.

4. In a gas generator, having a hopper, a generating chamber, a feed device and a gas outlet; an intermittent discharge valve interposed between said generating chamber and said outlet, an agitator interposed between spaces communicating with the generating chamber and the outlet, respectively, operating connections between said diaphragm and said feed device, a spring acting on said diaphragm in opposition to the generator pressure, mechanism for opening and closing said valve, and means enabling said diaphragm and spring to initiate the operations of said mechanism.

5. In a gas generator having a hopper, a generating chamber, a feed device and a gas outlet, means for agitating said feed device comprising a nozzle between said generating chamber and said outlet, a valve cooperating with said nozzle, said valve comprising a carrier and a piece of flexible seating material on the carrier, the carrier having a cavity under the seating material at the region where it seats against the nozzle so that the seating material is not supported at this region, an agitator diaphragm, operating connections between said agitator diaphragm and said feed device, mechanism for opening and closing said valve, and means operatively connected with said diaphragm for initiating the operations of said mechanism.

6. In a gas generator having a hopper, a generating chamber, and a feed device; a gas off-take pipe, a casing through which the gas passes from the generating chamber to the gas off-take pipe, a valve for controlling the supply of gas into said casing, an agitator diaphragm exposed on one side to the gas pressure in the casing and on the other side to the gas pressure of the generating chamber, motion-transmitting mechanism between the agitator diaphragm and the feed device, and means controlled by the agitator diaphragm for intermittently operating the valve to cause pressure variations in the casing.

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