Dec. 15, 1942. E. H. SMITH 2,305,203

ACETYLENE GENERATOR

Filed Feb. 10, 1941 3 Sheets-Sheet 1

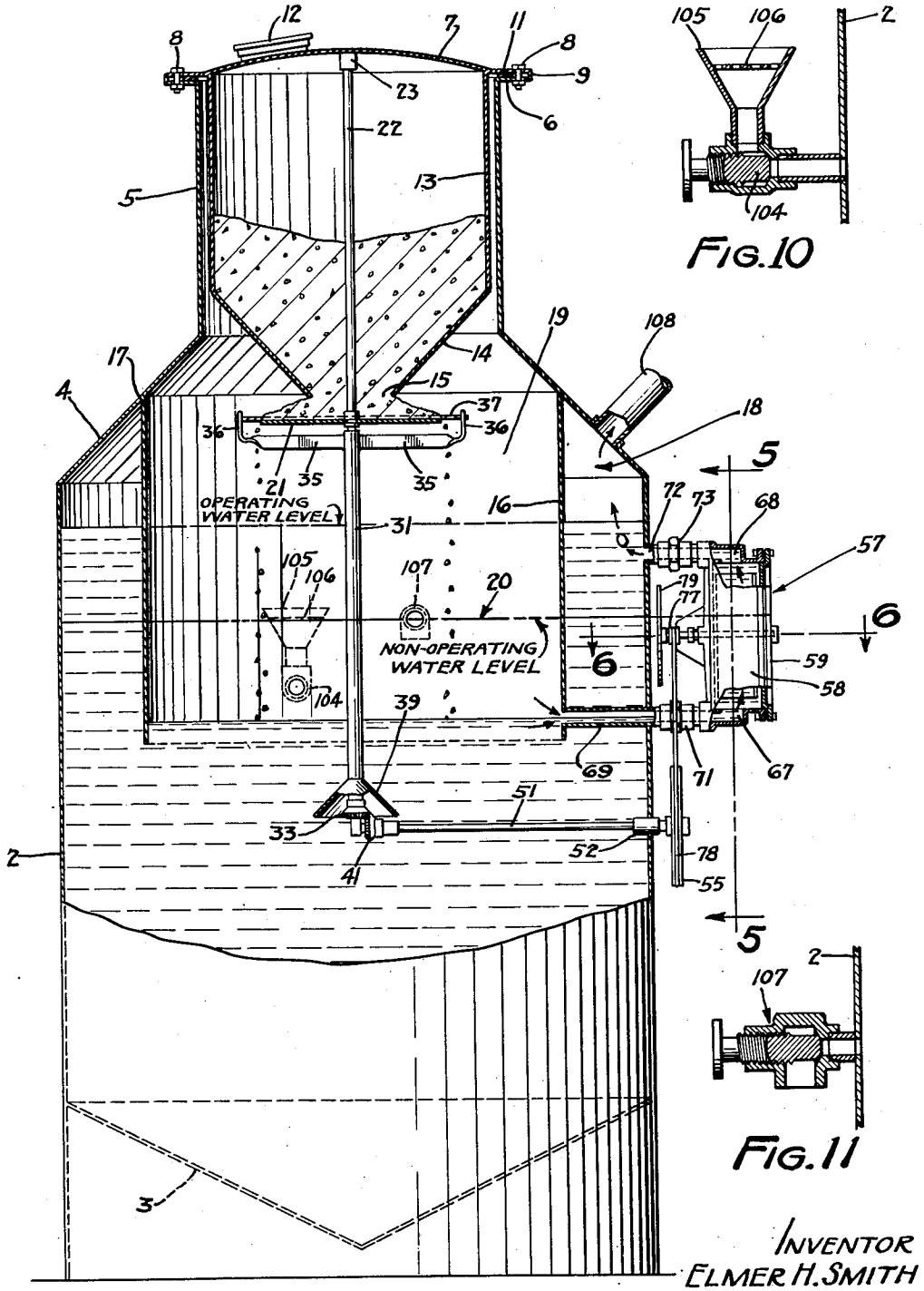


FIG. 1

FIG. 10

FIG. 11

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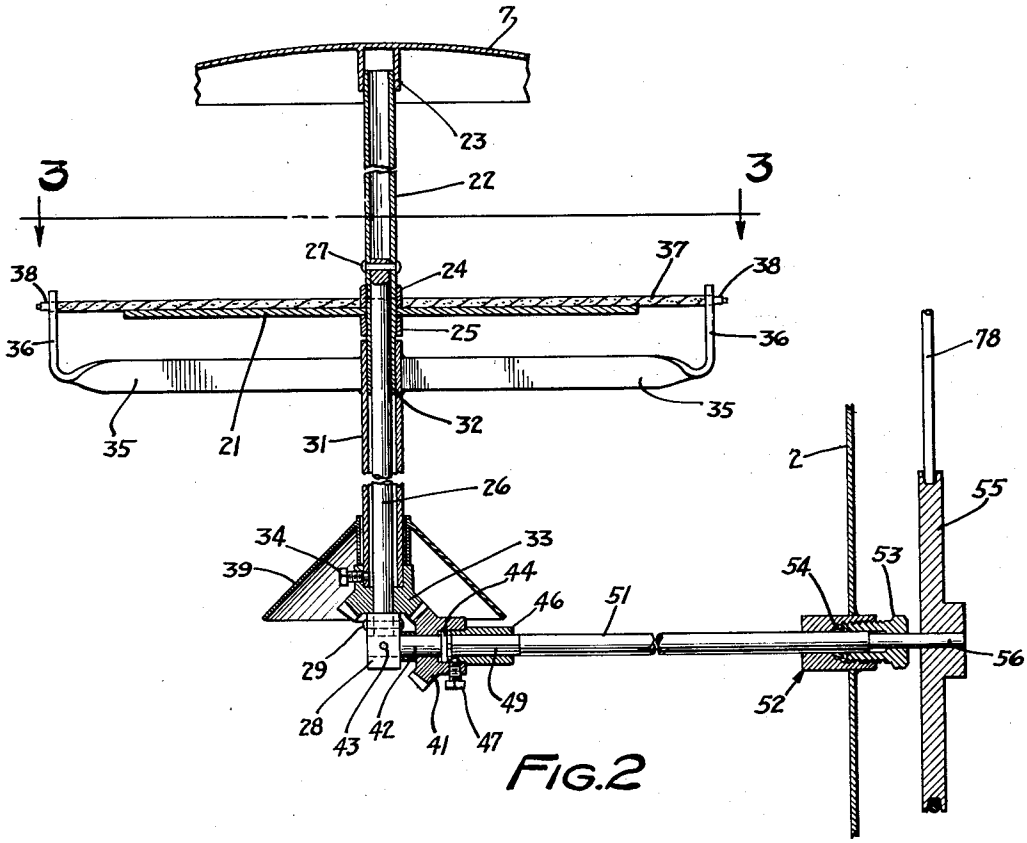


FIG. 2

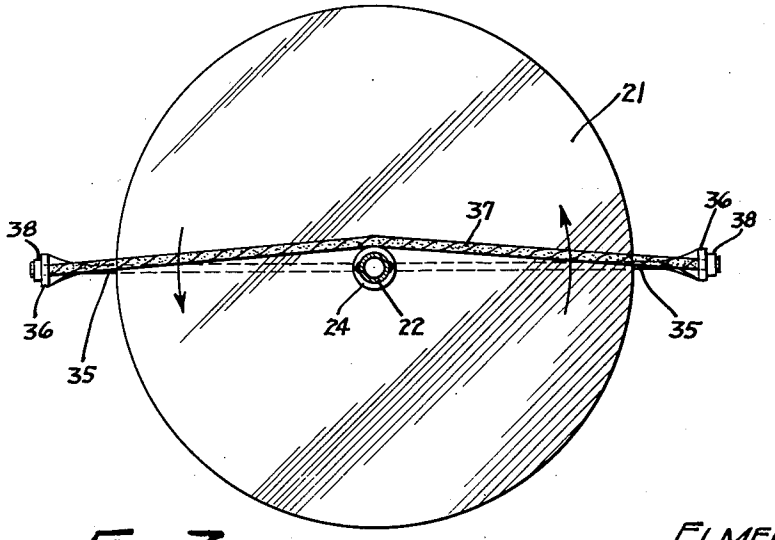


FIG. 3

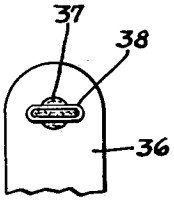


FIG. 4

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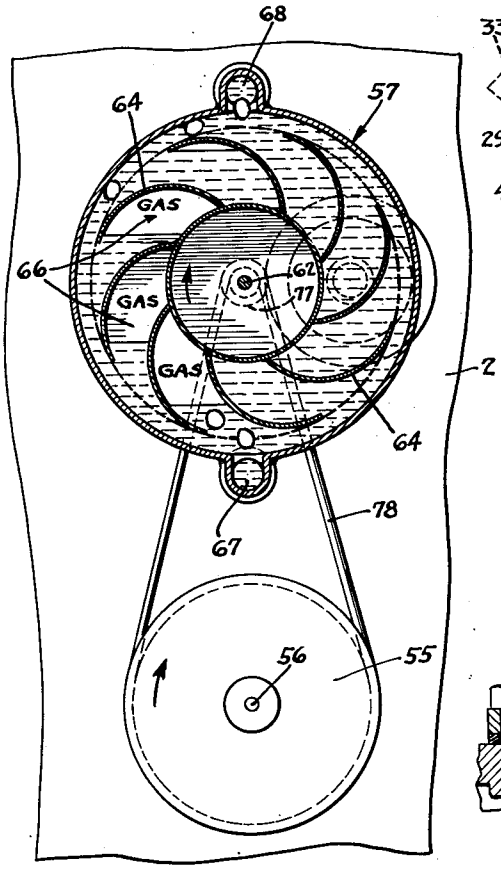


FIG. 5

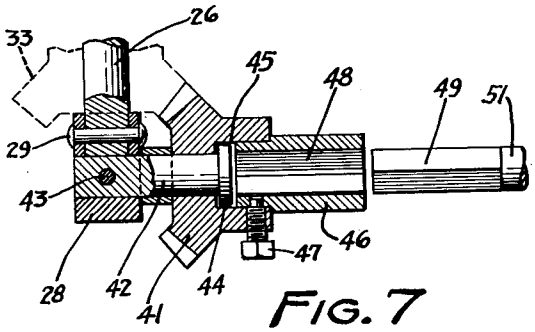


FIG. 7

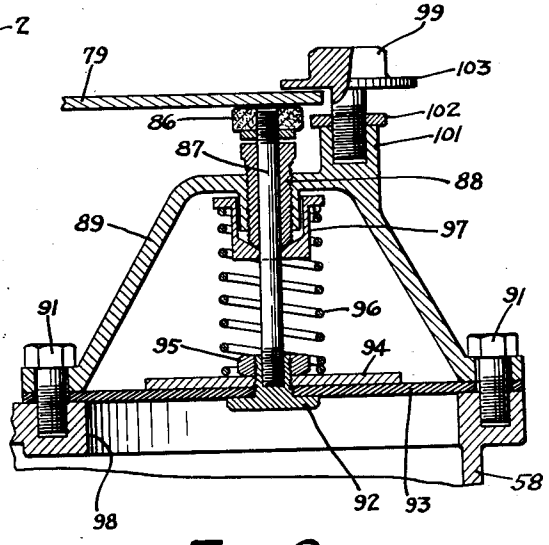


FIG. 8

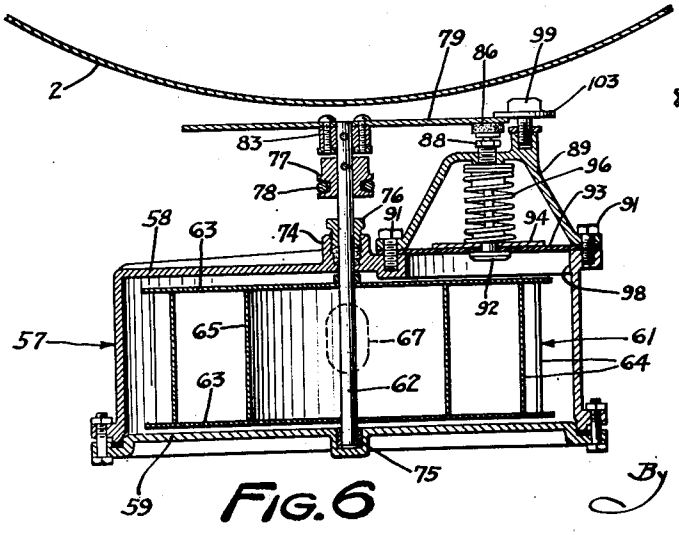


FIG. 6

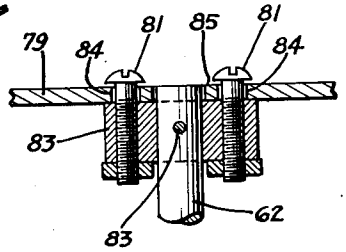


FIG. 9

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GAS HEATING AND
ILLUMINATING,

Patented Dec. 15, 1942

2,305,203

UNITED STATES PATENT OFFICE

2,305,203

ACETYLENE GENERATOR

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Application February 10, 1941, Serial No. 378,177

8 Claims. (Cl. 48—52)

This invention relates to new and useful improvements in acetylene generators.

The operation of an acetylene generator, as is well known, is dependent upon the feeding of carbide into the water contained in the generator casing. In commercial generators the carbide feeding mechanism is usually automatically controlled by variations in the gas pressure within the generator. Such interruption of the generation of gas within the generator is usually accomplished by interrupting the operation of the carbide feeding mechanism. It is therefore highly desirable that means be provided for automatically controlling the feeding of the carbide into the water, by the flow of gas to the service line, whereby when the demand for gas increases, more rapid feeding of the carbide takes place, and when the demand decreases, or is entirely interrupted, the carbide feeding mechanism is correspondingly interrupted.

In the present invention, I utilize a novel gas operated motor comprising a rotor having a plurality of pockets in its periphery adapted to receive gas and water from the generating chamber, whereby the buoyancy of the gas received in said pockets at one side of the rotor will cause the latter to rotate. The rotor has a driving connection with the carbide feed plate of the hopper, whereby the carbide is fed from the hopper into the water when the motor is operated. The motor herein disclosed, is located exteriorly of the generator casing whereby it is readily accessible, and whereby it may readily be removed from the generator, if necessary without otherwise dismantling the generator.

An object of the present invention therefore, is to provide an acetylene generator of simple and inexpensive construction comprising few operating parts and all of said parts being readily accessible.

A further object is to provide a generator of the class described, comprising a gas operated motor located exteriorly of the generator casing and having a suitable brake adapted to be actuated by variations in the pressure in the motor, whereby when the flow of gas to the service line is interrupted, the brake will be actuated to automatically interrupt operation of the motor and the carbide feeding mechanism.

A further object of the invention is to provide a gas operated motor for acetylene generators adapted to be actuated by the flow of gas from the gas generating chamber thereof to the usual gas storage chamber of the generator, and said motor having a driving connection with the carbide feeding mechanism, comprising a friction disk adapted to be engaged by a brake element having an operative connection with a pressure responsive member adapted to be actuated by variations in gas pressure within the motor casing, whereby when the pressure is increased, as when the flow of gas from the generator is interrupted, said brake element will automatically engage and interrupt rotation of the friction disk, whereby operation of the carbide feeding mechanism is interrupted, until the pressure within the motor is again decreased by withdrawal of gas from the storage chamber.

Other objects of the invention reside in the novel construction of the gas operated motor and its connections with the gas generating and storage chambers of the generator; in the simple drive provided between the motor and the carbide feed sweep; in the provision of the diaphragm-operated brake element for engaging the friction disk of the motor to control the operation thereof; in the arrangement of the motor upon the generator, whereby when the level of the water in the generator becomes diminished to a predetermined quantity, the operation of the motor is automatically interrupted; and, in the arrangement of the carbide filler opening, whereby when the cap thereof is removed for the introduction of fresh carbide into the hopper, the motor cannot be operated until the cap has again been secured in position to close the filler opening.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

Figure 1 is an elevational view of a generator, partially broken away to more clearly illustrate the embodiment of the invention therein;

Figure 2 is a fragmentary view showing the driving connection between the motor and the carbide sweep;

Figure 3 is a sectional plan view on the line 3—3 of Figure 2;

Figure 4 is an enlarged detail view showing the means for securing the carbide sweep to its support;

Figure 5 is a detail sectional view on the line 5—5 of Figure 1;

Figure 6 is a detail sectional view on the line 6—6 of Figure 1;

Figure 7 is an enlarged detail sectional view showing the driving connection between the horizontal and upright shafts of the carbide feeding mechanism.

Figure 8 is an enlarged detail sectional view

showing the pressure responsive brake element for engaging the friction disk;

Figure 9 is a view showing the connection between the friction disk and the motor shaft; Figure 10 is a detail sectional view showing the water filler valve; and Figure 11 is a detail sectional view of the water overflow valve.

In the selected embodiment of the invention here shown, there is illustrated in Figure 1, for purposes of disclosure, an acetylene generator comprising a casing 2 having a bottom wall 3 and an upper conical wall 4 terminating at its upper end in a cylindrical dome 5 whose upper wall portion is shown formed with an outwardly turned flange 6. A suitable cover member 7 is seated on the flange 6 and may be suitably secured thereto by bolts 8. The cover 7 is preferably formed with an annular downwardly turned flange 9 which fits over the outer marginal edge of the flange 6 to axially aline the cover 7 with the dome 5. A gasket 11 may be interposed between the cover member 7 and flange 6 to provide a leak-proof joint therebetween. The cover member 7 has a suitable filler opening normally closed by a cap 12.

A carbide hopper, generally designated by the numeral 13, is secured to the cover 7 and is positioned within the dome 5 of the generator. The hopper has a cone-shaped bottom 14 provided with a discharge opening 15, through which the carbide is fed from the hopper.

A cylindrical wall 16 is provided within the generator casing 2, and has its upper marginal edge secured to the conical wall 4 in leak-proof relation, as shown at 17 in Figure 1. The cylindrical wall 16 is spaced inwardly from the casing wall 2, and extends downwardly into the casing, as shown, and is open at its bottom. The casing 2 is filled with water to the normal water level indicated at 20 in Figure 1, whereby the water provides a closure for the lower open end of the wall 16. The inner wall member 16 cooperates with the water level 20 to provide a gas generating chamber 19.

An important feature of the invention resides in the means provided for feeding carbide from the hopper 13 into the water in the lower portion of the gas generating chamber 19, and, as shown in Figures 1 and 2, comprises a feed plate 21 secured to a tubular hanger or rod 22 having its upper end secured to the cover 7, as indicated at 23. The feed plate 21 is secured to the lower end of the hanger 22 by suitable collars 24 and 25, whereby the feed plate is supported in fixed relation directly below the discharge opening 15 of the hopper.

A rod 26 has its upper end fitted into the lower end of the hanger 22 and may be secured therein by a rivet 27. The lower end of the rod 26 is shown provided with a block or fitting 28, which may be secured thereto by a rivet 29. A tubular shaft 31 has its upper end rotatably supported on the depending end portion 32 of the hanger 22. A bevel pinion 33 is secured to the lower end of the tubular shaft 31 by a suitable screw 34, and is bored to fit the stationary rod 26, which provides a bearing therefor. The downward thrust of the tubular shaft 31 and pinion 33 is carried by the fitting 28 secured to the lower end of the rod 26.

Oppositely disposed arms 35 are secured to the tubular shaft 31 and have their outer end portions 36 bent upwardly to provide supports for a carbide sweep 37. The sweep 37 has its ends suitably secured to the upturned ends 36 of the arms 35, as shown at 38 in Figures 2 and 4. The sweep 37 may be a flexible cord or other suitable element and is preferably engaged with the upper surface of the stationary feed plate 21, as best shown in Figure 2. In the operation of the apparatus, the sweep 37 is rotated with respect to the disk 21 and thereby sweeps portions of the carbide from the feed plate into the water contained in the lower portion of the gas generating chamber 19, as will subsequently be described. A suitable guard 39 is provided with the pinion 33. The tubular shaft 31 is driven by a pinion 41 rotatably mounted on a stud 42 having one end secured in the fitting 28 by such means as a pin or rivet 43. The stud 42 has a flanged head 44 received in the socket 45 in the pinion 41, whereby said pinion is inseparably connected to the pinion 33, as will readily be understood.

A suitable sleeve or bushing 46 is shown having one end fixed in the bore 45 of the pinion 41 by a suitable lock screw 47. The sleeve 46 has a square socket 48 adapted to receive the squared terminal 49 of a drive shaft 51, the opposite end portion of which is rotatably supported in a suitable bearing, generally designated by the numeral 52. A suitable packing nut 53 is received in threaded engagement with the outer end of the bearing member 52 adapted to compress a suitable packing 54 against the shaft 51 to prevent gas leakage through the bearing 52. A suitable sheave 55 is secured to the outer end portion 56 of the drive shaft 51, as shown in Figure 2.

Another important feature of the invention resides in the novel means provided for driving the shaft 51 to feed carbide from the hopper 13 into the water in the gas generating chamber 19. As best shown in Figures 1, 5, and 6, the means provided for thus driving the shaft 51 comprises a gas operated motor, generally designated by the numeral 57. This motor comprises a casing 58 which is open at one side. A cover 59 provides a closure for the open side of the casing. A suitable rotor 61 is secured to a shaft 62 within the casing 58. The rotor comprises spaced disks 63, between which a plurality of curved vanes 64 are interposed. The lower edges of said vanes are secured to a cylindrical member 65 which cooperates with the vanes 64 and disks 63 to provide a plurality of peripheral pockets 66 in the rotor adapted to receive gas from the gas generating chamber 19, as will subsequently be described.

The casing 58 of the motor has a gas intake 67 at its lower portion and a gas outlet 68 at its upper portion. The gas intake 67 is connected to a conduit 69 by a suitable union or coupling 71. The conduit 69 communicates with the lower portion of the gas generating chamber 19, when the generator is operating. The gas outlet 68 communicates with the annular gas storage 18 through a connection or conduit 72 having a suitable union 73 therein.

As best shown in Figure 6, the rotor shaft 62 is rotatably supported in bearings 74 and 75, provided respectively in the casing 58 and cover 59. The bearing 74 has a suitable packing nut 76 for preventing leakage of gas therethrough.

A small sheave 77 is secured to the shaft 62 exteriorly of the casing 57 and has a driving connection with the sheave 55 by a suitable belt 78. Thus, when the rotor 61 is rotated by the flow of gas through the motor casing 58, the shaft 51 will be driven which, in turn, drives the tubular shaft 31 and therefore the carbide sweep 37.

Another important feature of the invention

resides in the means provided for automatically controlling the operation of the motor 57 by variations in the pressure of the gas within the generator. The means provided for thus controlling the operation of the motor is best shown in Figures 6 and 8, and comprises a friction disk 79 which is loosely, but non-rotatably secured to the inner end of the rotor shaft 62, by suitable screws 81. By reference to Figure 9, it will be noted that the screws 81 are received in threaded engagement with a collar 82 fixed to the shaft 62 by such means as a pin 83. The screws 81 are received in apertures 84 provided in the friction disk 79, which apertures are slightly larger than the diameter of the screws to provide limited relative movement of the disk with respect to the collar 82. It will also be noted that the disk 79 has a central aperture 85 for receiving the terminal of the shaft 62. This aperture, in like manner, is slightly larger in diameter than the shaft. It will also be noted that the spacing between the inner faces of the heads of the screws 81 and the adjacent face of the collar 82 is such as to provide limited clearance for the disk 79. By thus supporting the disk on the shaft 62, it is free to move within certain limits, relatively to the shaft.

A brake element 86, preferably of fiber or some other suitable material, is secured to one end of a stud or rod 87, which is slidably supported in a bushing 88, adjustably mounted in a threaded socket provided in the wall of a suitable housing 89 secured to the inner wall of the motor casing 58 by suitable bolts 91, as clearly illustrated in Figures 6 and 8. The opposite end ofthe rod 87 is shown provided with a flanged head 92 which is secured to a diaphragm 93 by a suitable plate or washer 94 and nut 95. A spring 96 has one end seated against the washer 94 and its opposite end against a cup-shaped member 97, supported on the inner end of the bushing 88, whereby the tension in the spring 96 may be varied by adjustment of the bushing 88. The diaphragm 93 has its marginal edge secured between the flanged edge of the housings 89 and the rear wall of the motor housing 58, by such means as screws 91, whereby the one side of the diaphragm 93 is exposed to the pressure within the motor housing 61 through an opening 98 provided therein, as best shown in Figures 6 and 8.

The brake elevent 86 is actuated by movement of the diaphragm 93, caused by variations in the pressure within the motor 57, whereby when the gas pressure within the motor is increased to a predetermined figure, the diaphragm 93 is distorted and thus moves the brake element 86 into frictional engagement with the friction disk 79, as will be clearly understood by reference to Figures 6 and 8. To support the friction disk 79 against the pressure of the brake element 86, a flanged stud 99 is shown received in threaded engagement with a hub 101 of the diaphragm housing 89. The stud 99 is locked in adjusted position with respect to the hub 101 by a suitable lock nut 102. The stud 99 has a flange 103 which overhangs the marginal edge of the friction disk 79, whereby when the brake element 86 engages the disk 79, the stud 99 will resist outward movement thereof. The loose connection between the disk 79 and the rotor shaft 62 permits free rotary movement of the disk 79 between the flange 103 and friction element 86 when the motor is operating.

Operation

In the operation of the novel acetylene generator herein disclosed, the generator casing is filled with water through a suitable filler valve, generally indicated by the numeral 104, provided with a funnel 105, as shown in Figures 1 and 10. The funnel 105 is provided with a suitable screen 106, as best shown in Figure 10. An overflow valve, generally designated by the numeral 107, is also mounted in the casing wall and is located on a level coincident with the non-operating water level 20, indicated in Figure 1.

Before starting the generator, water is introduced into the casing 2 through the funnel 105, after opening the valves 104 and 107. When water begins to flow from the overflow valve 107, the two valves are closed and the operator then manually rotates the sheave 55 to cause the feed sweep 37 to feed a portion of the carbide from the feed plate into the water within the inner wall member 16, it being understood that the hopper has previously been supplied with carbide.

As soon as a portion of the carbide is precipitated into the water, gas is generated within the chamber 19. The pressure of such gas forces the water level within the gas generating chamber 19 downwardly, until the conduit 69 leading from said chamber to the motor is partially opened, or at least, to an elevation whereby gas may flow from the gas generating chamber 19 into the motor casing through the conduit 69. Such flow of gas into the motor casing will cause the rotor to rotate in the direction indicated by the arrow in Figure 5, the gas passing through the motor entering the gas storage chamber 18 through the conduit 72 at the upper portion of the motor housing. As long as there is a demand for gas at the service line, indicated by the numeral 108 in Figure 1, gas will continue to flow from the gas generating chamber 19, through the motor 57, to the gas storage chamber 18, thereby causing the motor to continue to operate. When the demand for gas is subsequently interrupted, pressure will develop in the storage chamber 18 and in the motor housing, whereby the diaphragm 93 is distorted in a direction to cause the brake element 86 to frictionally engage the disk 79 and thereby interrupt rotation of the rotor 61. Such interruption of the rotor 61 will interrupt further feeding of carbide from the feed plate 21 into the water, as hereinbefore described. It will thus be seen that the operation of the carbide feed sweep 37 is controlled entirely by variations in the pressure of the gas in the housing of the motor 57.

By reference to Figure 1, it will be noted that the motor 57 is supported on the generator casing by the unions 71 and 73, whereby it may readily be removed therefrom as a unit, when necessary. The unique construction of the rotor permits the gas to readily flow through the motor, as indicated in Figure 5, said gas entering the rotor pockets 66 at one side of the rotor, whereby the buoyancy of the gas readily imparts rotary movement to the rotor to drive the carbide feeding mechanism. The diaphragm operated brake element 86 is very sensitive in operation, whereby the operation of the motor is accurately controlled in accordance with the demand for gas at the service line 108.

Another feature of the invention resides in the arrangement of the carbide hopper with respect to the gas generating chamber 19 and motor 57, whereby the motor cannot operate when the filler cap 12 of the carbide hopper is removed. This results because, when the cap 12 is removed, the gas pressure in the chamber 19 is released to the atmosphere through the hopper and the open car-

bide filler opening, as will readily be understood. Also, when the cap 12 is thus removed, the water in the generator will return to its non-operating level, indicated at 20 in Figure 1.

Another important feature resides in the fact that the generator must be filled to the proper water level before gas can be developed in the generating chamber 19 to operate the motor. In other generators now on the market employing gas operated motors for driving the carbide feeding mechanisms, the motor is usually supplied with water from exteriorly of the generator or, in other words, independently of the generator. In such gas operated motors, the water is gradually carried off with the gas, thereby partially emptying the motor housing with the result that said housing may become sufficiently emptied to prevent further functioning of the motor. This objectionable feature is entirely eliminated in the improved generator herein disclosed, in that the motor receives a constant supply of water from the generator through the conduit 69, whereby it will function so long as the water level within the generator is maintained more or less constant.

It will also be noted that the apparatus comprises few working parts, all of which are readily accessible. The drive shaft 51 may readily be removed from the generator casing by unscrewing the packing nut 53, after which the shaft may be withdrawn through the bearing 52, as the inner terminal 49 thereof has a sliding connection with the sleeve member 46, as shown in Figure 7. The remaining portion of the carbide feeding mechanism may be removed from the top of the generator by removal of the hopper therefrom, it being noted that the tubular shaft 31 and its associated parts are supported from the upper wall 7 of the hopper by the hanger 22.

In the accompanying drawings, I have shown the invention embodied in an acetylene generator of the stationary type, but it is to be understood that it may be embodied in other types of acetylene generators, where applicable, without departing from the scope of the invention.

I claim as my invention:

1. In a gas generator, a casing having water therein, means in the upper portion of the casing forming a gas generating chamber and a gas storage chamber, a carbide hopper above the water, means for feeding carbide from the hopper into the water in the gas generating chamber including a gas operated motor having a driving connection with the feeding means, an element rotatable with the motor, a brake element adapted to engage said rotatable element to control operation of the motor, and a pressure responsive device for actuating said brake element by variations in gas pressure within the motor.

2. In a gas generator, a casing having water therein, means in the upper portion of the casing forming a gas generating chamber and a gas storage chamber, a carbide hopper, means for feeding carbide from the hopper into the water in the generating chamber, said storage chamber having a gas take off connection, and a gas operated motor having a driving connection with said feeding means, said motor having connections with the generating chamber and storage chamber and whereby gas may flow from the generating chamber through the motor to the storage chamber, when the pressure in the generating chamber becomes greater than the pressure in the storage chamber, and whereby a differential in gas pressure between said chambers will cause operation of the motor and the carbide feeding means.

3. In a gas generator, a casing having water therein, means in the upper portion of the casing forming a gas generating chamber and a gas storage chamber, a carbide hopper, means for feeding carbide from the hopper into the water in the generating chamber, a fluid operated motor comprising a housing having a rotor therein, said motor being positioned in the same horizontal plane as the gas generating chamber, said housing having fluid connections with the generating and gas storage chambers whereby a differential in gas pressure within the generator casing will cause gas to flow from the generating chamber through the motor to the storage chamber, whereby the motor is operated to drive the carbide feeding means, and a pressure operated device for controlling the operation of the motor by variations in gas pressure within the motor.

4. In a gas generator, a casing, a carbide hopper in the upper portion thereof, an annular wall secured to and depending from the upper wall of the casing and spaced from the casing wall and providing a gas generating chamber surrounded by an annular gas storage chamber, water in said casing engaging the lower portion of said inner wall member to close the bottoms of said chambers, means for feeding carbide from the hopper into the water in the gas generating chamber, a gas operated motor having its intake connected with the lower portion of said annular wall member and its outlet communicating with the gas storage chamber, whereby when the level of the water in the gas generating chamber recedes to a predetermined level, by the generation of gas pressure therein, gas will flow through the motor into the gas storage chamber and thereby cause operation of the motor, whereby the carbide feeding means is operated, a friction disc driven by the motor, and a gas operated friction element adapted to engage said disc and interrupt operation of the motor, upon predetermined gas pressure in the motor, whereby the operation of the motor and said carbide feeding means is caused by a differential in gas pressure within the generator casing.

5. In a generator of the class described, a casing having water therein, a carbide hopper in the casing provided with a filler opening, a closure for said opening, an annular wall member secured to and depending from an upper wall of the casing, and spaced from the side wall thereof and cooperating therewith to provide a gas storage chamber, the interior of said annular wall member defining a gas generating chamber, the bottoms of said chambers being sealed by said water, means for feeding carbide from the hopper into the water in the generating chamber, a gas operated motor located exteriorly of the generator casing and having a driving connection with said feeding means, and said motor also being connected to said chambers, whereby a differential in gas pressure in said chambers, may cause the motor to operate and thereby drive the carbide feeding means, said carbide feeding means being so constructed and arranged as to allow the gas within the gas generating chamber to permeate the charge whereby the gas may be released to preclude motor operation when the said closure is removed from the filler opening.

6. In a generator of the class described, a casing having water therein, a carbide hopper in the upper portion of the casing, means within the casing forming a gas generating chamber

and a gas storage chamber, the bottoms of which are sealed by said water, means for feeding carbide from the hopper into the water in the generating chamber, a gas operated motor comprising a housing having its intake and outlet connected respectively with the gas generating chamber and gas storage chamber whereby water and gas may flow therethrough from the generating chamber to the storage chamber and thereby operate the motor, said motor being so arranged with respect to the water level in the gas generating chamber that when the water level in said gas generating chamber drops to a predetermined low level, the motor will automatically cease to operate and cannot again be operated to feed carbide until the water supply in the generator has been replenished.

7. In a generator of the class described, a casing having a carbide hopper therein, water in the casing, means within the casing forming gas generating and storage chambers, a fluid operated motor comprising a housing having a shaft rotatably mounted therein and provided with a rotor, said housing having fluid connections with the generating and gas storage chambers whereby gas may flow from the generating chamber through the motor to the storage chamber, a driving connection between said shaft and the carbide feeding means, a disc secured to said shaft and rotatable therewith, a diaphragm in communication with the interior of the motor housing and having a friction element operatively secured thereto adapted to frictionally engage said disc, said diaphragm being adapted to be actuated by variations in pressure within the motor housing, whereby when the pressure in the storage chamber reaches a predetermined figure, the diaphragm is distorted and thereby moves said friction element into engagement with said disc, whereby operation of the motor is temporarily interrupted.

8. In an acetylene generator, a casing having water therein, an annular wall member in the upper portion of the casing cooperating with the walls of the casing to define a gas generating chamber and a gas storage chamber, a carbide hopper, means for feeding carbide from the hopper to the water in the generating chamber, a fluid operated motor located exteriorly of the casing and having its intake communicating with the lower portion of the generating chamber when the latter is under pressure, the outlet of the motor communicating with the storage chamber whereby flow of gas from the generating chamber to the storage chamber will actuate the motor, a brake for controlling the operation of the motor, and a pressure responsive device made operable by variations in fluid pressure within the motor, thereby to actuate said brake and automatically interrupt operation of the motor, when a predetermined pressure is reached.

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