No. 626,272. Patented June 6, 1899.

A. DAVIS.

ACETYLENE GENERATOR.

(Application filed July 25, 1898.)

(No Model.) 3 Sheets—Sheet 1.

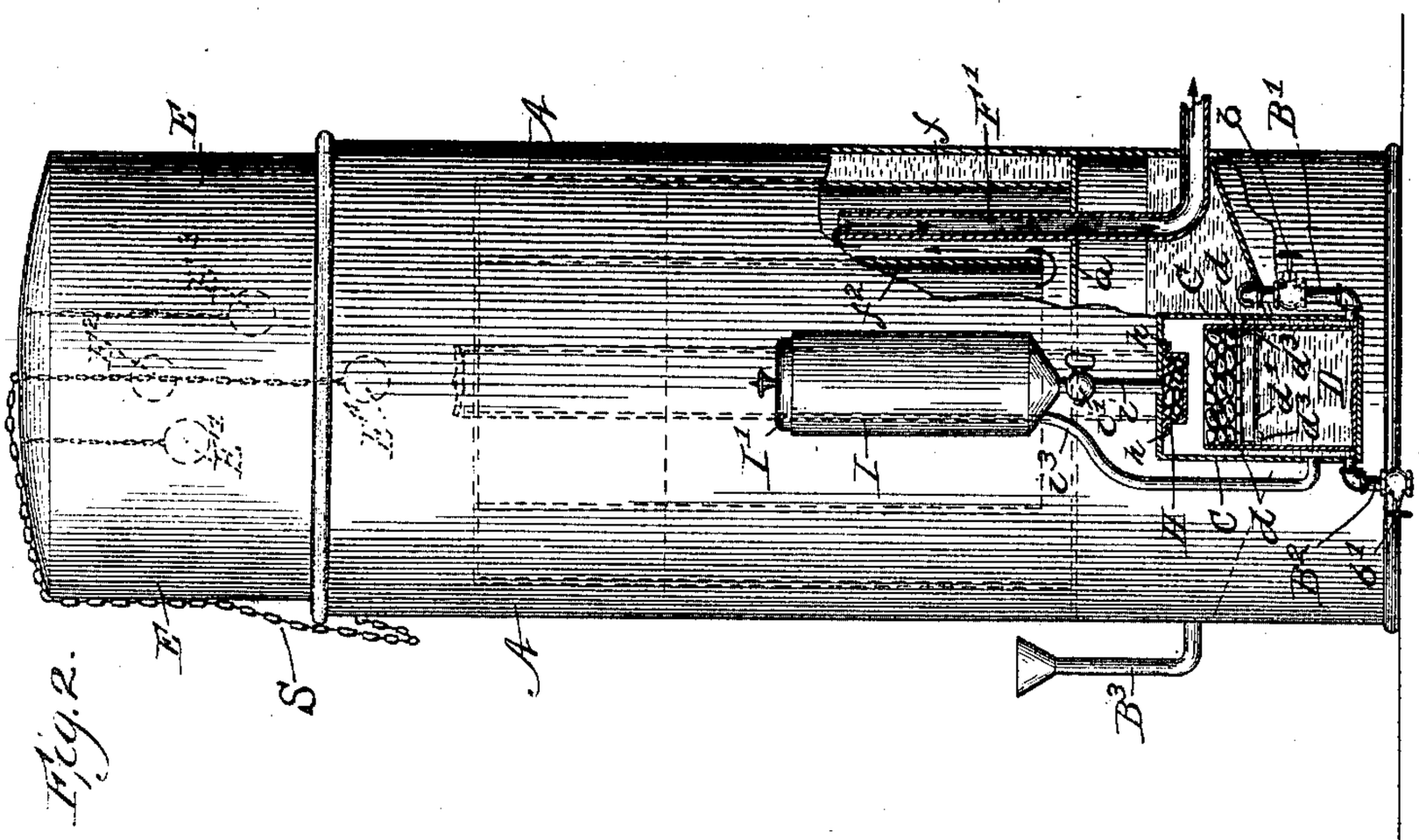

Fig. 2.

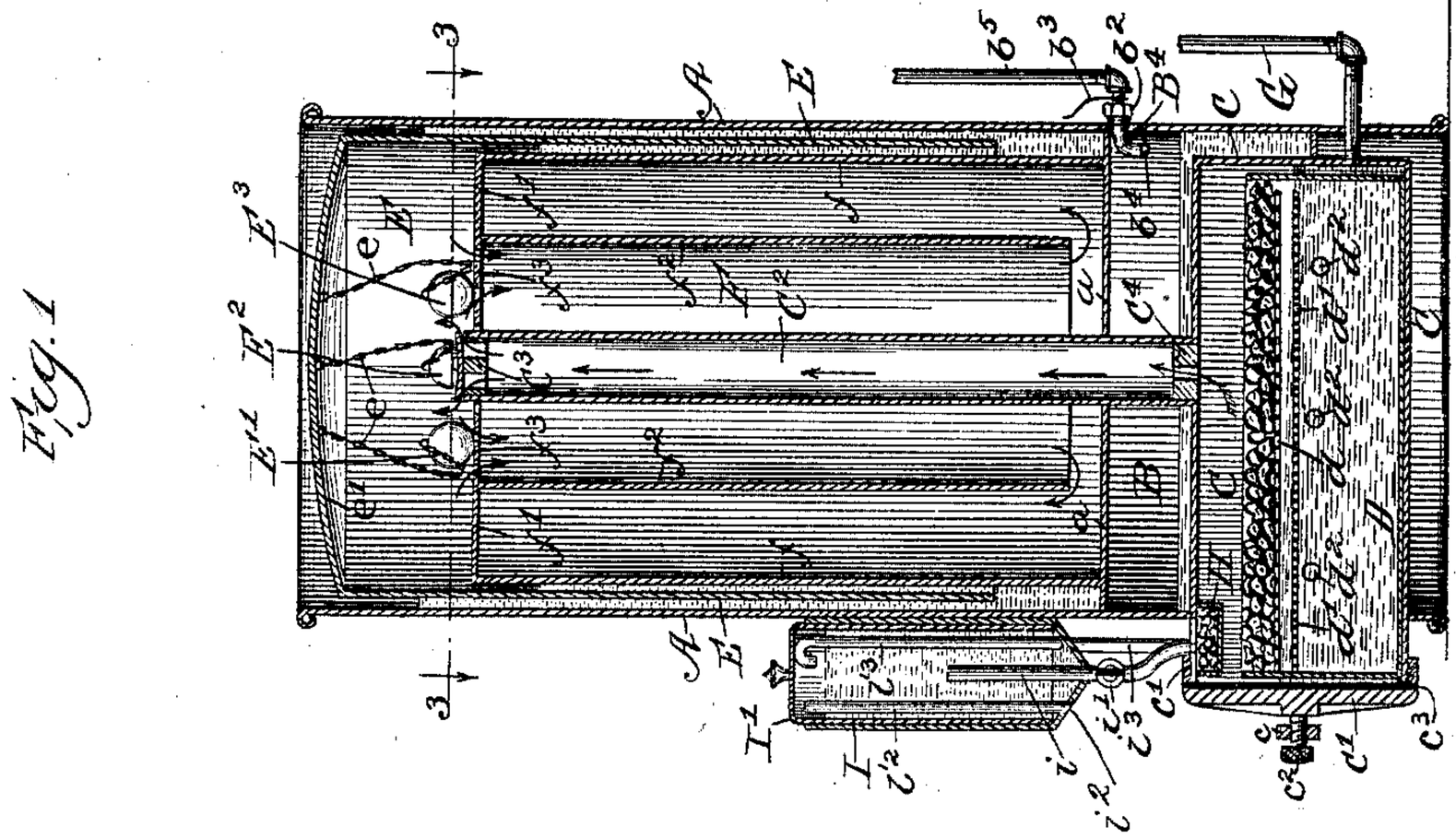

Fig. 1.

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S. B. Weir

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ACETYLENE GENERATOR.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 4

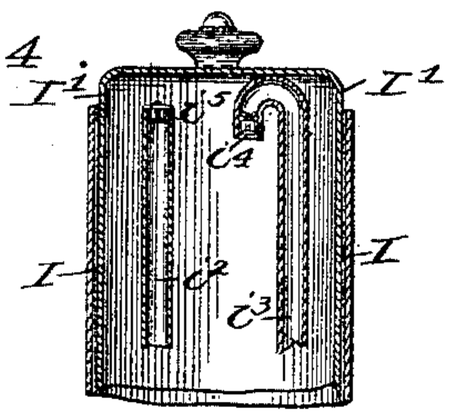


Fig. 5.

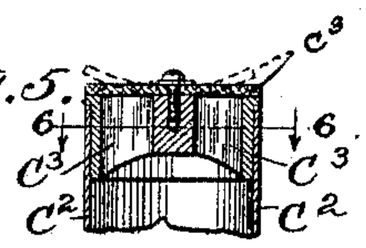


Fig. 6

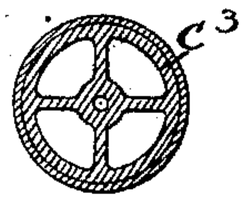


Fig. 3

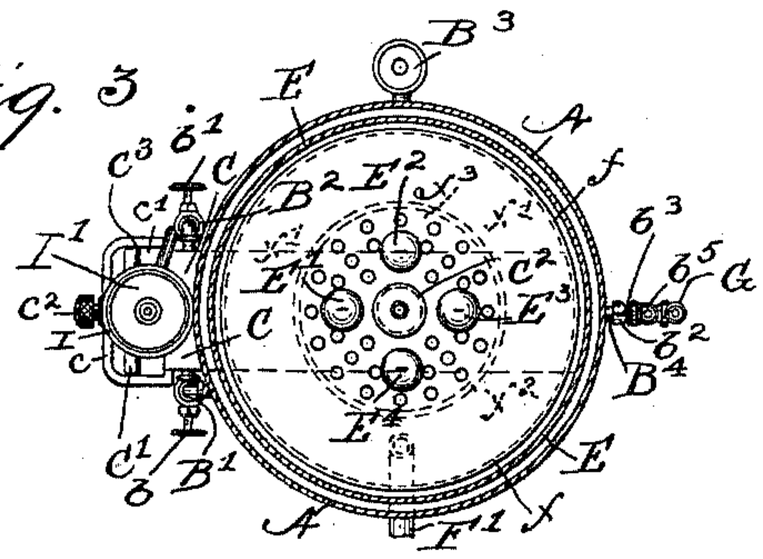


Fig. 7.

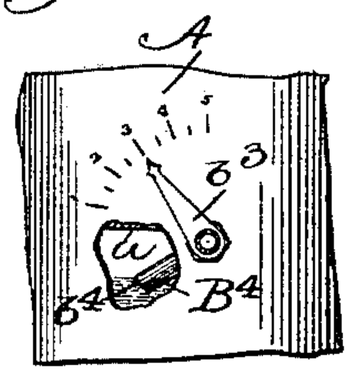


Fig. 8.

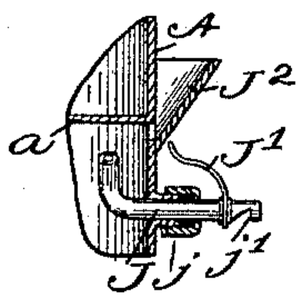
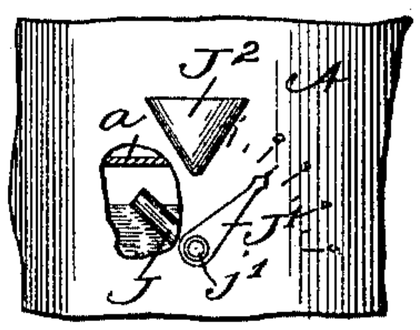


Fig. 9.



Witnesses:
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J B Keir

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No. 626,272. Patented June 6, 1899.

A. DAVIS.

ACETYLENE GENERATOR.

(Application filed July 25, 1898.)

(No Model.) 3 Sheets—Sheet 3.

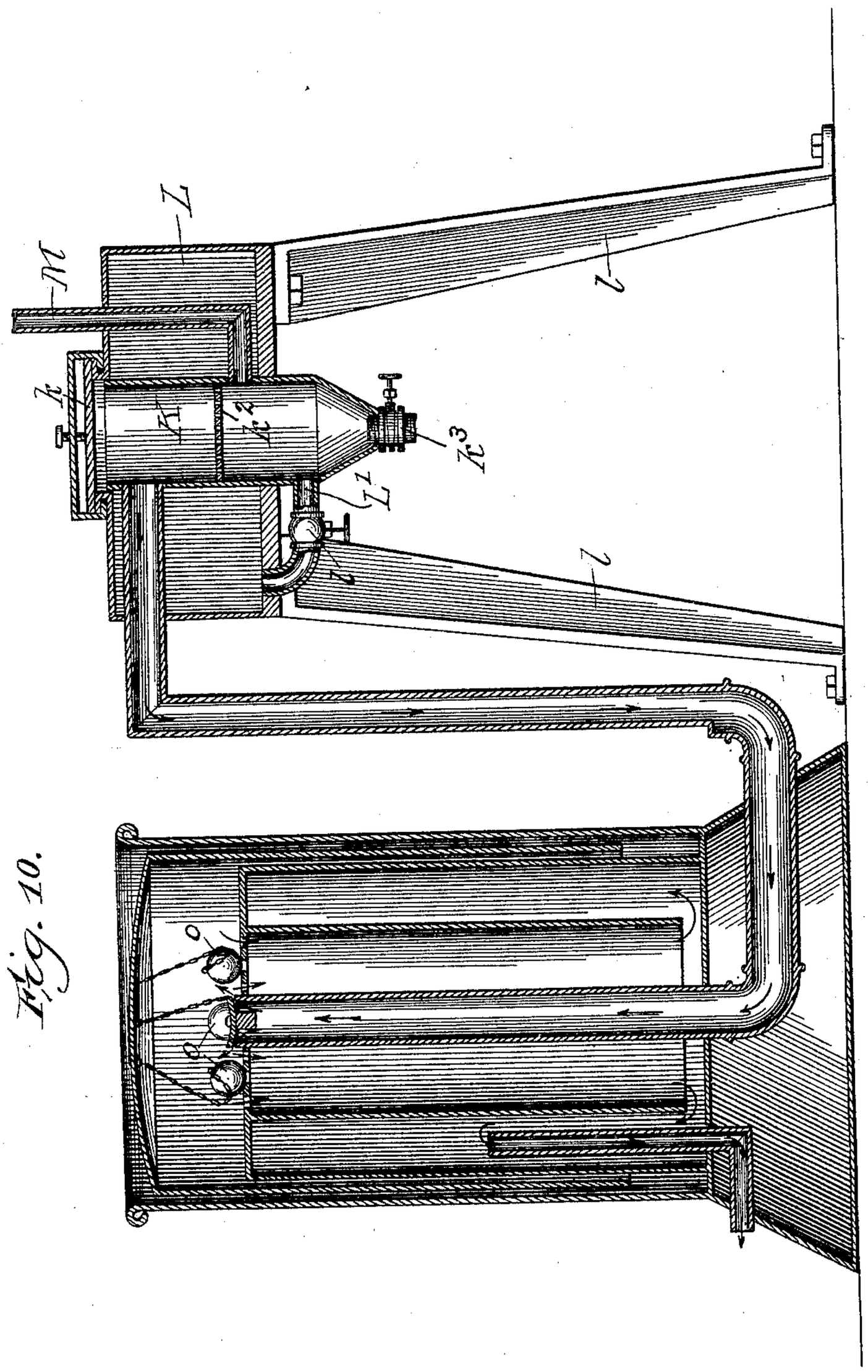

Fig. 10.

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UNITED STATES PATENT OFFICE.

AUGUSTINE DAVIS, OF CHICAGO, ILLINOIS.

ACETYLENE-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 626,272, dated June 6, 1899.

Application filed July 25, 1898. Serial No. 686,759. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTINE DAVIS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Acetylene-Generators, of which the following is a specification, this application being a continuation of my previous application, Serial No. 614,303, filed December 3, 1896.

This invention relates to improvements in gas-generators of a type designed more particularly for use in the manufacture of acetylene gas from metallic carbids and water, but also adapted for other purposes of like nature; and the invention consists in the matters hereinafter set forth, and more particularly pointed out in the following claims.

Among the objects of my invention are to provide a generator in which the production of gas is automatically regulated to afford a supply at all times proportionate to the consumption and at a pressure which varies only between such narrow limits that the steadiness of the flame at the burners is not materially affected by such variations, to provide a generator which can be recharged without dimming or extinguishing the lights and without permitting an objectionable escape of gas or fumes into the apartment in which the apparatus is located, and to provide a construction in which the gas will be generated and maintained at a comparatively low temperature and have its contained moisture condensed and removed before passing to the mains.

A still further object of the invention is to provide an apparatus which is safe and economical in operation, cheap in construction, simple and serviceable in all its parts, and capable of being readily understood and cared for by the average householder.

To these ends a generator embodying my invention is provided with a generating or carbid chamber to which water is admitted at a point below the charge of carbid under a determined head or water column and from which the gas resulting from the reaction of the water on the carbid passes to the mains or burners through a receiver that increases and decreases in capacity with the increase and decrease in gas-pressure throughout the system and serves to vary such pressure accordingly as the supply of gas generated is greater or less than the demands of consumption. The extent to which the water rises in the generating-chamber and hydrates the carbid, and consequently the rapidity of gas generation, is automatically regulated by the reaction of the gas at receiver-pressure upon the surface of the water forced into the generating-chamber under the predetermined head. When the generation of gas becomes more rapid than is necessary to supply the burners, the receiver temporarily takes up the excess and by its increasing resistance affords an increasing gas-pressure, which forces back the water in the generating-chamber away from the carbid, and thus checks the generation of gas. When the generation of gas is insufficient for the demands of consumption, the gas within the receiver is forced out to supply the deficiency, and the gas-pressure decreases until the rising water affects the carbid enough to furnish the necessary increase in the volume of gas generated. In practice such receiver desirably consists of an ordinary gas-holder or inverted bell provided with a liquid seal within an inclosing tank and so arranged with reference to one or more weights or other pressure-increasing devices that a material increase of pressure on the contained gas necessarily results as the bell rises. The liquid seal for the bell is, as a further improvement, provided in an annular chamber, into which the sides of the bell dip, and the space inclosed by such annular sealing-chamber and beneath the bell constitutes a cooling, condensing, and mixing chamber for the gas, to which the sealing-chamber thus affords a water-jacket. The lower part of the generating-chamber is connected with the water-supply chamber by a valved passage and in an approved form is surrounded by the water-chamber and kept cool thereby. A gas-outlet leads from the upper part of the generating-chamber into the bell or gas-holder, and a removable receptacle or drawer is desirably provided in said chamber to receive the charge of carbid and retain the residuum or waste thereof, so that the generator may be recharged and cleaned at substantially a single operation after the generating-chamber is emptied of water through a suitable valved discharge-pipe. During this recharging operation a check or valve or equivalent seal in

the gas-outlet pipe prevents the gas in the bell from being forced back through the generating-chamber into the apartment or building which contains the apparatus, and the gas within is in the meantime fed out to the burners under normal pressure and without disturbing their action. An auxiliary supply of carbid, arranged to be suddenly and independently hydrated, may conveniently be provided to generate a large volume of gas sufficient to fill the bell and supply the lights during the recharging operation in cases where the normal supply in the bell would be liable to prove insufficient. Means are also herein shown as provided for forcing the air into the generating-chamber previous to recharging to insure the expelling of all gas therefrom, so that no gas or odor will enter the room when the chamber is opened, and the gas-holder is especially arranged to secure a thorough mixing with a large volume of gas of whatever air may thus be blown through into the receiver or may be contained within the generating-chamber when the latter is again closed after the recharging operation. To carry off the gas thus expelled from the generating-chamber by forcing air therein, a relief or blow-off pipe leads out of the generating-chamber to the open air or a suitable flue from a point in the generating-chamber below the normal water-level, so that it is normally sealed thereby. When the generator is to be recharged, the water is first drained off from the generating-chamber sufficiently to expose the relief-pipe, after which the gas is free to pass off through said pipe. Said relief-pipe further serves an even more important function in limiting the pressure which may arise within the generator, for when the pressure of gas becomes great enough to force the water in the generating-chamber below the mouth of the release-pipe it is thereafter free to escape through said pipe, and any increase of pressure beyond this point then becomes impossible.

My invention will be more fully understood from the following detailed description of a generator practically embodying my improvements, taken in connection with the accompanying drawings, illustrative thereof, and in which—

Figure 1 is a sectional side elevation of one form of apparatus, showing the gas-holder as only slightly raised. Fig. 2 is a front elevation, partly in section, showing the gas-holder in the position it occupies when filled with gas to nearly its full capacity. Fig. 3 is a top plan section taken on line 3 3 of Fig. 1. Fig. 4 is a fragmentary detail of the air-pump, showing the arrangement of the air inlet and outlet pipes and their valves. Fig. 5 is a vertical sectional detail of the gas-outlet valve. Fig. 6 is a transverse section thereof, taken on line 6 6 of Fig. 5. Fig. 7 is a fragmentary side elevation showing the adjustable vent for the water-chamber. Figs. 8 and 9 are fragmentary details, in section and side elevation, showing an overflow device which may be used as an alternate construction. Fig. 10 is a sectional side elevation of a form of generator more particularly adapted for large plants.

In said drawings, A designates an outer casing or tank, the base of which is divided off to provide a water-supply chamber B and a generating-chamber C. The latter is herein shown as extending diametrically through the water-supply chamber and projects at one end through the wall of said chamber, where it is provided with a door or cover C′, by removing which free access may be had to the interior of the generating-chamber.

Any suitable fastening devices may be used for securing the cover C′ in place—such, for example, as a yoke *c*, the ends of which are inturned to catch behind a band *c′*, that surrounds the end of the chamber C and through the center of which a clamping-screw c^2 is passed. A gasket c^3 is provided between the cover C′ and the end of the chamber, so that when the cover is clamped into place by the yoke and screw a secure and gas-tight joint is insured.

D designates a removable receptacle or drawer fitting loosely within the generating-chamber C and provided at a distance above its bottom with one or more screens or gratings *d* and *d′*, which are preferably supported on cleats d^3, that permit of their ready removal. The charge of calcic or other carbid or the like is placed upon the upper grate *d*, or it may be the only grate, and as the carbid is disintegrated by the action of the water the waste will drop through the meshes of the grating and be retained in the bottom of the drawer. The second and lower grating *d′*, if employed, will be located slightly below the upper grating *d* and will be made of finer mesh, so as to catch any pieces of unexhausted carbid which may slip through the apertures of the upper grating *d* and retain them until thoroughly hydrated by the further action of the water.

Water is admitted to the generating-chamber from the water-supply chamber B through an inlet-pipe B′, controlled by a valve *b*, and an exhaust-pipe B^2, controlled by a valve *b′*, permits said chamber to be drained when desired. Apertures d^2 in its side walls admit water to the drawer D at a point slightly below the gratings *d* and *d′*, but high enough above the bottom of the drawer to normally prevent the escape of the waste material which may have collected therein. The water-chamber B is filled through any suitable supply passage or pipe B^3 to the depth required to furnish the desired head. As herein shown, said filling-pipe B^3 enters at a point below the normal water-level, and the extent to which the chamber will be filled when water is poured freely into the said pipe is determined by an adjustable vent-pipe B^4. Said vent-pipe passes out of the wall of the chamber through a stuffing-box b^2 and is free

to rotate therein. Its inner end is turned or bent at an angle, and to its outer end is secured a pointer b^3, that may also serve as a handle by which the pipe is oscillated. The vent-pipe enters chamber B at a point just beneath the top wall a thereof, and the open mouth b^4 of its inner end will stand closely adjacent to said wall or at a greater or less distance below the same, according to the position in which pointer b^3 is turned. A suitable graduated scale is provided on the outside of the casing in proximity to the end of the pointer, and consequently enables the position of the vent to be determinately adjusted with accuracy, and the depth of water within the chamber will obviously be limited according to this adjustment, since the air remaining in the chamber above the open end b^4 of the vent-pipe will prevent further entrance of water after said end is submerged. A pipe b^5 may, if desired, lead off from the outer end of the vent-pipe to a suitable flue or other connection with the outer air, so as to prevent any possible odor of gas within the water-chamber from entering the apartment in which the apparatus is located, the coupling or connection between the pipe b^5 and vent-pipe being such as to not interfere with the rotary adjustment of the latter.

The gas resulting from the action of the water upon the carbid within the generating-chamber passes upwardly through an outlet-pipe C^2 into a gas-holder E, located within the upper portion of the tank or casing A. Said gas-holder is usually made in the form of an inverted cylindric bell open at its lower end and having its lower edges submerged within a suitable liquid, preferably water, so as to be sealed thereby. Said liquid seal is, furthermore, herein shown as provided within an annular space formed between the wall of the casing A and an inner cylindric wall f, which extends upwardly nearly the full height of the bell. A top wall f' covers the inner cylinder f and forms therewith an inner cooling and mixing chamber F of considerable capacity.

To insure a proper mixing of the gas, an inner cylindric wall f^2 depends within the chamber F from its top wall f' nearly to the bottom a thereof. The gas entering the bell through the outlet-pipe C^2 passes into the mixing-chamber F through apertures f^3, located in the top wall f' within the circumference of the cylindric wall f^2 and passes thence downwardly beneath the lower edges of said cylindric wall into the surrounding annular portion of the chamber and finally out to the mains or burners through a pipe F', that is preferably carried downwardly through the water-chamber to effect a further cooling of the gas. Any suitable check-valve C^3—such, for example, as that shown in detail in Figs. 5 and 6, where the valve proper is formed by a flexible leather or similar disk c^3—is provided in the gas-pipe C^2, which leads to the gas-holder, for the purpose of preventing any escape of the gas from the holder to the generating-chamber when the latter is opened.

E', E^2, E^3, and E^4 designate weights arranged in such manner as to be applied in succession to the gas-holder E as the latter rises. As herein shown, said weights are conveniently located within the gas-holder and are connected by chains e of different lengths with the top wall e' of said holder, so that as the holder rises they are picked up in succession and remain suspended in the manner shown in Fig. 2 until the holder sinks as it becomes emptied of gas. In the lower position of the holder, or when it contains but little gas, these weights rest upon the top wall f' of the mixing-chamber F, and the holder is thus relieved of their weight.

The working of the apparatus thus described is generally as follows: A charge of carbid C C is placed upon the supporting-grating d of the drawer D. Said drawer is then slid into the generating-chamber C and the cover C' put in place and fastened by the locking devices hereinbefore described. The water-supply chamber B is filled through the pipe B^3 to the extent permitted by the vent-pipe B^4, which is adjusted to limit the water-level to the height desired. The generator is now charged ready for operation, which will immediately proceed upon the opening of the valve b to admit water to the generating-chamber. As the water rises within said chamber it enters the receptacle D through the apertures d^2, and its contact with the carbid contained therein immediately starts the generation of acetylene gas, which passes off through the pipe C^2 and valve C^3 into the gas-holder and thence through the mixing-chamber F to the mains and burners. The rising of the water within the generating-chamber, however, is speedily checked by the pressure of gas developed, which pressure reacts on the surface of the water to force the latter downward against the head afforded by the water column of the supply-chamber B. It will therefore be obvious that the normal gas-pressure throughout the system will be determined by the height of said water column, and the latter will depend upon the proper proportioning of the apparatus for the particular service for which it is intended, variations within reasonable limits being, however, provided for by the adjustable vent-pipe B^4 or equivalent device for limiting the extent to which the chamber can be filled. For example, if a pressure of gas equal to a water column of two and one-half inches is desired the water-chamber will be so proportioned in its capacity as compared with the capacity of the generating-chamber that when the valve b is opened and the water runs into the generating-chamber the water-level in the water-chamber will stand, substantially, two and one-half inches above the water-level in the generating-chamber when it rises high enough to touch the charge of carbid. The tendency of the head in the water-chamber

will be to force the water higher in the generating-chamber; but this tendency will be overcome as soon as the pressure of gas generated equals a water column of two and one-half inches, and any increase of gas-pressure beyond this amount will force back the water from the generating-chamber into the water-chamber, and by leaving the carbid unsubmerged check the generation of gas until the pressure of gas is again reduced to the two and one-half inches desired.

Obviously the gas-holder or bell, which will be of such weight as to normally balance the pressure of gas desired, will take up any excess of gas generated above the demands of consumption without otherwise affecting the operation until it rises high enough to lift the first weight E′, whereupon its increased resistance will cause an increase in back pressure upon the surface of the water within the generating-chamber and by lowering the water-level in the manner before described tend to check the generation of gas until by the lowering of the bell and the decrease of pressure the water rises into contact with the carbid again. In case, however, the mass of sponge, or, in other words, the carbid which has been previously wetted, should continue to give off a greater amount of gas than is being fed to the burners the bell will continue to rise and gradually take up the succeeding weights E^2, E^3, and E^4, thereby gradually increasing the pressure to such an extent as to insure the lowering of the water in the generating-chamber to a point at which the carbid is completely out of contact therewith.

To secure a more gradual action of the water upon the charge of carbid as the water-level changes, and consequently a better regulation of pressures throughout the system, the screen or grating which supports the charge of carbid is preferably and as herein shown inclined slightly, so that the water as it rises wets the carbid gradually from one end to the other and as gradually withdraws therefrom. This effect is increased by the presence of the second or lower grating d', the mesh of which is finer than the mesh of the upper or main grating d. As the carbid disintegrates under the action of the water it falls through the upper grating in pieces still large enough to lodge on the lower grating and as yet not completely exhausted, and a certain amount of gas will continue to be generated as long as these are submerged. When, however, the pressure becomes great enough, it forces the water below the second screen also, and thus cuts off the generation from this source. A choked outlet-pipe for the gas as it leaves the generating-chamber is provided by inserting a plug C^4, having a bore of small diameter, in the gas-outlet pipe C^2 at the point of its departure from the generating-chamber and will also aid regulation by retarding any sudden flow of gas and so increasing the gas-pressure and driving back the water from the carbid more quickly. At the same time, the presence of this choked outlet does not prevent the outlet-pipe as a whole from being made of ample cross-sections not liable to become clogged by fouling. As a further and practically important improvement, moreover, a relief or blow-off pipe G leads out of the generating-chamber at a point far enough below the normal water-level to be ordinarily sealed by the water and is conducted off to a flue or to the outer air in the same manner as the pipe b^5. The upward movement of the bell is limited by a chain S or other suitable stop, and if the pressure of gas should not be checked by the lowering of the water within the chamber, but should continue to increase, it will force said water down until the mouth of the relief-pipe G is uncovered, and thereupon the excess will be relieved through the passage thus afforded. The absolute safety of the apparatus is thus insured, since by no possibility can the pressure of gas within the generator rise beyond the point at which it will be relieved through the pipe G.

When the charge of carbid is exhausted, a new supply may be readily provided by removing the cover of the generating-chamber, withdrawing the drawer, and refilling the same after emptying off the refuse. During this operation the supply of gas stored within the receiver will continue to pass to the burners under the same head as before and without disturbing their action in any way. As a further improvement, moreover, to be used in case the supply of gas within the receiver would be liable to become exhausted before the recharging operation is completed, I provide means for suddenly liberating a large volume of gas, so that the receiver can be filled just previous to the recharging operation and the contingency above referred to avoided. H designates an auxiliary carbid-receptacle of small capacity, provided in the upper portion of the generating-chamber above the main charge of carbid and herein shown as made in the form of a small drawer removably supported upon cleats h at the upper and outer end of the chamber. I is a small water-tank placed above the generating-chamber and discharging into the latter through a pipe i, controlled by a valve i'. The point of entrance of the pipe i is directly above the auxiliary carbid-support H, so that when the valve i' is opened a portion of the water in the tank I is immediately discharged upon the carbid contained in said auxiliary support and saturates it, thereby producing a large volume of gas almost instantly. This sudden increase in generating capacity serves to fill the bell, after which the recharging operation may be proceeded with.

A still further improvement of great practical importance consists in the means provided for driving off all the gas which remains in the generating-chamber at the time the latter is opened to be recharged. Such means consists of any suitable air-pump arranged

to force air into the generating-chamber, and is herein shown as provided in connection with the auxiliary tank I by providing a suitable bell I′ within the said tank, together with suitable air inlet and outlet pipes i^2 and i^3. The outlet-pipe i^3 leads from the upper part of the bell I′ to a point in the generating-chamber below the normal water-level, so that it is ordinarily sealed thereby, and said pipe is also provided with a suitable valve i^4, as shown in Fig. 4, by which any back pressure of gas will be prevented when the pump is operated without regard to such seal. The inlet-pipe i^2 leads from the outer air to a point in the bell above the level of the water in the tank and is also provided with a valve i^5, by which any outflow through said pipe is prevented. With this construction it will be obvious that when the bell is reciprocated air will be drawn in through the pipe i^2 at each stroke and alternately therewith will be forced out through the valved outlet-pipe i^3 into the generating-chamber. When it is desired to recharge the apparatus, it is therefore only necessary to drain off the water in the generating-chamber until the relief-pipe G is uncovered and to then operate the air-pump described until all gas remaining in the generating-chamber has been forced out through said relief-pipe in order to completely prevent such gas from escaping into the apartment when the generating-chamber is opened. The capacity of thus being recharged while in full operation, so far as supplying gas to the burner is concerned and without affecting in any way the lights at said burners, without requiring any duplication of apparatus, and in a manner avoiding all possibility of fouling the atmosphere of the room or building with the odors of acetylene gas, is one of the most important practical features of my improved generator, although the main feature of the invention consists in the broad idea of regulating the generation according to the demands of consumption by admitting the water-supply to the generating-chamber at a point below the carbid-support under a determinate head or water-column acting in opposition to the pressure of gas generated as influenced by an expansible gas-receiver arranged to produce an increasing pressure with increased capacity, and I desire to be understood as comprehending within my invention any form of apparatus in which regulation is thus effected. The means for providing the increased receiver-pressure may obviously be varied widely and may include any arrangement of weights or springs or other pressure-increasing devices found convenient, although the arrangement hereinbefore described is practically convenient and effective for the purpose.

A further feature of practical importance is that the operation of replenishing the carbid involves at the same time the removal of the waste or residuum thereof, so that it is impracticable for the carelessness of an attendant to permit the generator to become foul and clogged thereby. Furthermore, the construction is such that whatever volume of air enters the chamber during the recharging operation is completely mixed with a vastly-larger volume of gas contained in the receiver and mixing-chamber before described, and the burners consequently do not show a blue flame after the recharging operation, as would otherwise be the case. In passing from the generator to the mains the path of the gas is so circuitous that such thorough mixing of the air and gas is insured, and inasmuch as the gas is removed from contact with the water immediately upon leaving the generating-chamber and is exposed in its passage to the mains to a large area of wall-surface, much of which is exposed to the outer air and a large portion of which is water-jacketed, all moisture becomes condensed as the gas is cooled, and said gas enters the mains in a dry condition and at a temperature but little above that of the surrounding atmosphere. Additional devices for cooling and drying the gas may obviously be provided, but in practice have proved unnecessary. The absolute safety of the generator is insured by the relief-pipe leading from the generating-chamber, which limits the pressure ordinarily to but a few ounces per square inch. The water seal around the gas-holder will be replenished from time to time, as found necessary, but is maintained in a large degree by the moisture which condenses on the walls of the receiver and trickles downwardly into the sealing-chamber.

In Figs. 8 and 9 I have shown a construction for limiting the height of water in the water-chamber which may be used as an alternate construction to the adjustable vent heretofore described. The overflow-pipe J is bent at its inner end at an angle to its main body portion, which passes through a stuffing-box j in the same manner as the vent-pipe B^4. Said pipe J is, however, located some distance below the top wall of the water-chamber, and its open inner end may be raised into the vicinity of said top wall or may be turned down into the horizontal plane of the stuffing-box to limit the level of water, as desired, the position of the overflow being determined, as in the previous construction, by the indications of a pointer or handle J′ on an adjacent scale. The filling-nozzle in this case conveniently consists of a half-funnel J^2, soldered to the outside wall of a tank and opening into the water-chamber at its lower end or apex. When water is poured into the funnel, the pipe J will obviously serve first as a vent and then as an overflow after its open end is submerged, so that no matter how much water is poured into the chamber it will speedily run off to the level indicated by the pointer on the gage or scale. The outer end of the pipe is further herein shown as provided with a whistle j', which will sound until the inflowing water rises to the level of

the overflow and fills the whistle, the cessation of its note being an additional warning to the attendant that the proper supply of water has been reached.

The apparatus shown in Fig. 10 is substantially the same in principle as that previously described, but has the generating and storage parts separated instead of being combined in a single structure, this style of generator being more especially designed for large plants for municipal lighting and the like. The generating-chamber K in this case is provided within a water-chamber L, conveniently supported upon legs or standards *l*. A removable cover *k* in the top of the generating-chamber permits the carbid to be shoveled in, and the carbid-support k^2 is made a stationary part instead of being provided in a removable receptacle. The waste of the carbid falling through the supporting-grating k^2 accumulates in the bottom of the generating-chamber, which latter converges in funnel shape to a valved aperture k^3, by opening which the entire waste may be drawn off into a bucket or car conveniently placed beneath it. Water is admitted to the generating-chamber from the water-chamber through a pipe L′, controlled by a valve *l*′, and a relief-pipe M insures the safety of the apparatus, as in the construction previously described. The gas generated is conducted through a pipe into a gas-holder O, provided with a plurality of weights *o*, as before, and the operation of this form of apparatus is substantially similar to that of the device first illustrated and need not be further described.

It will of course be understood that various changes may be made in the several features of construction herein shown as embodying my improvements without involving any departure from the underlying principles thereof, although the particular devices shown are in each case convenient and serviceable for the purpose intended, and are accordingly included in specific as well as broad claims.

I claim as my invention—

1. An acetylene-generator provided with a generating-chamber having a support for carbid, means for supplying a head of water to the chamber at a point beneath the carbid-support that it may rise thereto, an expansible gas-receiver, and means for automatically increasing the pressure of the receiver with its increased capacity, the receiver being arranged and connected to exert such increased pressure against the head of water through the generating-chamber, to control or depress its level relatively to the carbid-support.

2. An acetylene-generator provided with a generating-chamber, a gas-outlet leading from the generating-chamber to an expansible gas-receiver, means for supplying a head of water to the generating-chamber at a point below the gas-outlet, means for adjustably limiting the head of water supplied, and means for automatically increasing the pressure of the receiver as it increases in capacity so as to thereby control the hydration of the carbid by varying the water-level in the generating-chamber.

3. In a gas-generating apparatus, the combination of a water-chamber and a generating-chamber located in fixed relation to the water-chamber and having a continuous water connection with the water in the water-chamber when the generator is in operation, and means for determinably varying the initial water-level in said chamber to regulate the head of water supplied.

4. In an acetylene-gas generator, the combination with a generating-chamber having a carbid-support set to be immersed by a head of water admitted to said chamber, of a water-chamber supplying said head of water to the generating-chamber at a point below said support, an adjustable outlet-pipe in the water-chamber for determining the maximum water-level therein, and an indicator whereby the position of the outlet-pipe can be adjusted at will to predetermine the head of water supplied.

5. In an acetylene-generator, the combination with a generating-chamber having a carbid-support set to be immersed by a head of water admitted to said chamber, of a water-chamber supplying said head of water to the generating-chamber at a point below said support, and means for limiting the maximum level of water in said chamber, comprising a pipe passing out through a stuffing-box and revoluble therein and having its inner end deflected out of its axis of rotation, and an indicator on the outer end of the pipe whereby the position of its inner end can be determined.

6. An acetylene-generator provided with a generating-chamber, means for supplying a head of water to said chamber from below the charge of carbid, means for adjustably varying the head of water supplied, a floating gas-receiver, and one or more heavy bodies arranged to be lifted in succession by the receiver as it rises to produce an increasing gas-pressure acting in opposition to the head of water to regulate the hydration of the carbid.

7. An acetylene-generator provided with a generating-chamber, a water-supply chamber communicating with the generating-chamber below the charge of carbid, an expansible gas-receiver affording with increase of capacity an increase of gas-pressure acting in opposition to the head of water afforded by said supply-chamber, and means for adjustably limiting the maximum water-level in the supply-chamber.

8. An acetylene-generator provided with a generating-chamber, a water-supply chamber communicating with the generating-chamber below the charge of carbid therein, an expansible gas-receiver affording an increase of gas-pressure with increase of capacity, and means for adjustably limiting the maximum water-level in the supply-chamber, comprising an outlet-pipe passing out of the cham-

ber through a stuffing-box in which it is revolubly mounted, the inner end of the pipe being deflected out of its axis of rotation, and an indicator enabling the position of the pipe to be accurately adjusted.

9. An acetylene-generator provided with a generating-chamber and a water-chamber opening into the lower portion of the generating-chamber, a carbid-support within the generating-chamber above the water-inlet, an auxiliary carbid-support within the generating-chamber above the first support, a water-receptacle discharging independently into the generating-chamber at a point adjacent to the auxiliary support, and a valve controlling the discharge of said receptacle, whereby the auxiliary charge of carbid can be independently hydrated at will.

10. The combination with a closed generating-chamber having a support for calcic carbid, of means for supplying a head of water to the chamber at a point below the carbid-support, an expansible gas-receiver provided with means for affording increased pressure with increased capacity, and a relief-pipe leading directly out of said closed chamber at a point below the normal level of water therein but adapted to be uncovered when the maximum pressure afforded by the expansible receiver is approached.

11. The combination, with a generating-chamber and receiver, of means for forcing air into the generating-chamber, and a blow-off pipe normally closed by the water in the generating-chamber for conducting away the gas expelled by the air.

12. The combination, with a generating-chamber having a support for calcic carbid, of means for supplying a head of water to the chamber at a point below the carbid-support, a gas-receiver connected with the generating-chamber by a valved passage, means for forcing air into the generating-chamber, and an open relief-pipe leading out of the generating-chamber at a point below the normal water-level therein.

13. The combination, with a generating-chamber, of a relief-pipe normally sealed by the water in said chamber, means for drawing down the water to open the relief-pipe, and means for forcing air into the chamber to displace the gas therein and expel it through the relief-pipe.

14. The combination, with a water-chamber and a generating-chamber having a carbid-support and communicating with the water-chamber below said support, of a gas-holder connected with the generating-chamber by a valved passage, a relief-pipe leading out of the generating-chamber at a point below the water-level therein, a valved passage for draining the chamber, and an air-pump for forcing air into the chamber.

15. An acetylene-generator provided with a generating-chamber, a gas-holder connected with the chamber, means for supplying water to a principal charge of carbid within the chamber, an auxiliary charge of carbid normally free from water, a tank opening into the generating-chamber at a point adjacent to the auxiliary charge of carbid, a valve controlling the discharge of said tank, an inverted bell within said tank, a valved air-inlet opening into the bell, a valved air-outlet leading from the bell into the generating-chamber, and a relief-pipe leading out of the chamber.

16. The combination, with a generating-chamber, of an inverted gas-holding bell having its lower edges submerged in an annular sealing-chamber, a transverse partition extending between the inner walls of said sealing-chamber to form a mixing-chamber beneath, a depending partition reaching from said transverse partition to within a short distance of the bottom wall, a gas-inlet leading into the bell, apertures in the upper partition-wall on one side of the depending partition, and an outlet-pipe leading from the mixing-chamber at a point on the opposite side of the depending partition from said apertures.

17. An acetylene-gas apparatus, comprising a water-chamber, a generating-chamber within said water-chamber having a removable door or cover, a removable carbid-receptacle within the generating-chamber, a carbid-support in said receptacle, a valved passage opening from the water-chamber into the generating-chamber at a point below the carbid-support, a relief-pipe extending out of the generating-chamber at a point below the carbid-support, a discharge-passage opening out of the lower portion of the generating-chamber and controlled by a valve, and a valved outlet-pipe leading to a gas-receiver.

18. An acetylene-generator provided with a generating-chamber, a removable receptacle provided in its upper part with a carbid-supporting grating and closed in its lower portion so as to retain the waste, apertures in the receptacle above the bottom thereof but below the carbid-support, and means for supplying water to said chamber at a point below the carbid-support.

19. An acetylene-generator provided with a generating-chamber, an expansible gas-receiver affording increased pressure with increased capacity, a removable receptacle within the generating-chamber provided in its upper part with an inclined grating serving as a carbid-support and closed in its lower portion to retain the waste, means for supplying a head of water to the chamber from below the carbid-support, and apertures in the removable receptacle above its bottom and below the inclined grating.

20. A gas-generator provided with a generating-chamber having a removable receptacle with a primary carbid-support consisting of an upper grating and a subjacent parallel lower grating of finer mesh, the receptacle being closed in its lower portion to retain the waste and being provided with apertures in its side walls above said closed bottom portion but below the lower grating, and

means for supplying water to the generating-chamber at a point below the carbid-support.

21. In a gas-generator, a closable generating-chamber extending into a closed ventilated water-supply chamber provided with means for determining the head of water contained therein, and connected therewith by a valved opening for hydrating the charge of carbid by means of said head of water, and having a relief-pipe normally closed by the water in said generating-chamber.

22. In a gas-generator, a generating-chamber extending within a water-chamber and connected therewith by a valved passage, means for adjustably varying the head of water in said water-chamber, a carbid-support within the generating-chamber above said opening, and a connected expansible gas-receiver affording increased pressure with increased capacity.

23. The combination, with a generating-chamber and an expansible gas-receiver provided with means for affording an increased pressure with increased capacity, of a substantially plane primary carbid-support of open-work, inclined from the horizontal, and means for supplying a head of water to the chamber at a point below the carbid-support.

24. The combination, with a generating-chamber, of a primary carbid-support, consisting of an upper grating to receive the charge, and a lower grating of finer mesh but coarse enough to permit the fully-slaked carbid or lime to fall freely through it, arranged immediately beneath, parallel with and in close proximity to the upper grating, means for supplying a head of water to the chamber at a point below the carbid-support, and a gas-receiver connected with the chamber.

25. The combination, with a generating-chamber, of an inclined primary support for calcic carbid, consisting of an upper grating for the reception of the original and regular charge of carbid, and a lower grating of finer mesh but coarse enough to permit the fully-slaked carbid or lime to fall freely through it, arranged immediately beneath and parallel with the upper grating.

26. In an acetylene-gas generator, the combination with a generating-chamber having a primary carbid-support consisting of an upper grating which receives the charge and a lower parallel grating of smaller mesh in proximity thereto, means for supplying a head of water to said chamber from beneath the carbid-support, and an expansible gas-receiver provided with means for affording with increase of capacity an increase of gas-pressure acting in opposition to said head of water to regulate its height relatively to the carbid-support.

27. An acetylene-gas generator, provided with a generating-chamber containing an inclined primary carbid-support consisting of an upper grating to receive the original and regular charge of carbid and a parallel lower grating of finer mesh immediately beneath and in proximity thereto, means for supplying a head of water to said chamber from below the charge of carbid, an expansible gas-receiver, and an increasing resistance automatically applied to the receiver as its capacity increases to afford a variable pressure acting in opposition to the head of water to control or depress its level relatively to the carbid-support.

28. In a gas-generator of the class described, a closable generating-chamber, a removable drawer having a carbid-support and also constructed to retain the residuum, said generating-chamber being constructed to contain said drawer and also having a valved connection with a water-supply at a point below the level of the carbid-support, an independent valved discharge-opening arranged to drain the generating-chamber, and means for forcing air into the chamber to displace the gas therein.

In testimony that I claim the foregoing as my invention I affix my signature hereto, in the presence of two subscribing witnesses, this 16th day of July, A. D. 1898.

AUGUSTINE DAVIS.

Witnesses:
H. W. CARTER,
ALBERT H. GRAVES.