(No Model.) 2 Sheets—Sheet 1.

A. K. STEIN.

APPARATUS FOR GENERATING ACETYLENE GAS.

No. 599,270. Patented Feb. 15, 1898.

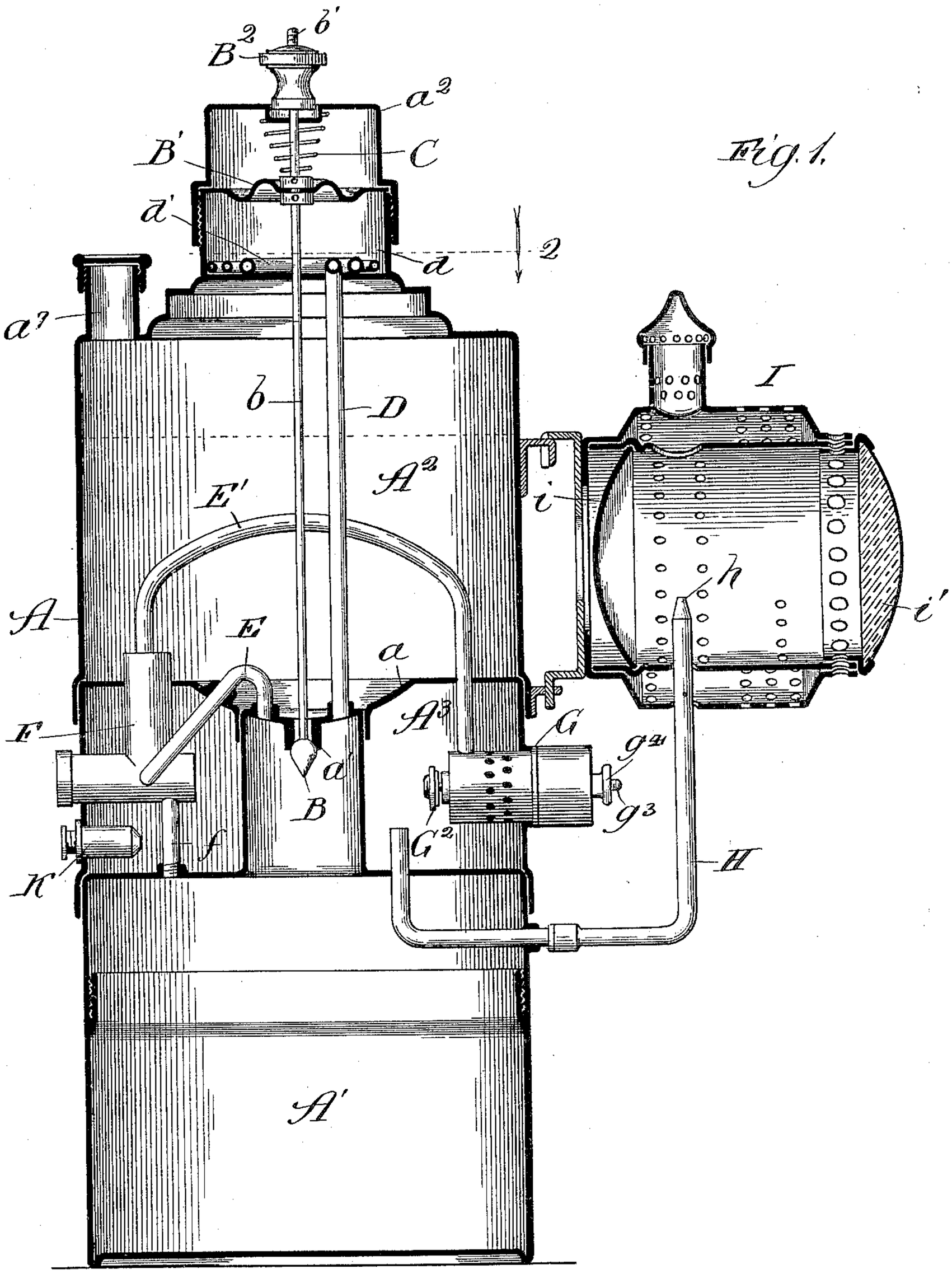

Fig. 1.

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(No Model.) 2 Sheets--Sheet 2.

A. K. STEIN.

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Fig. 2.

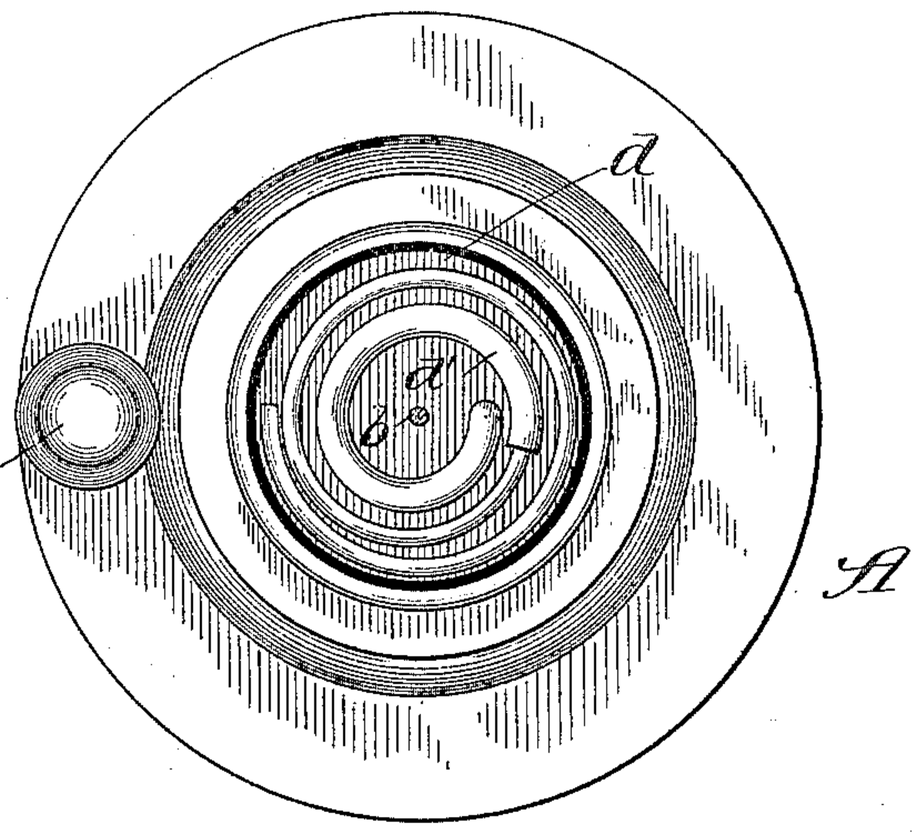


Fig. 3.

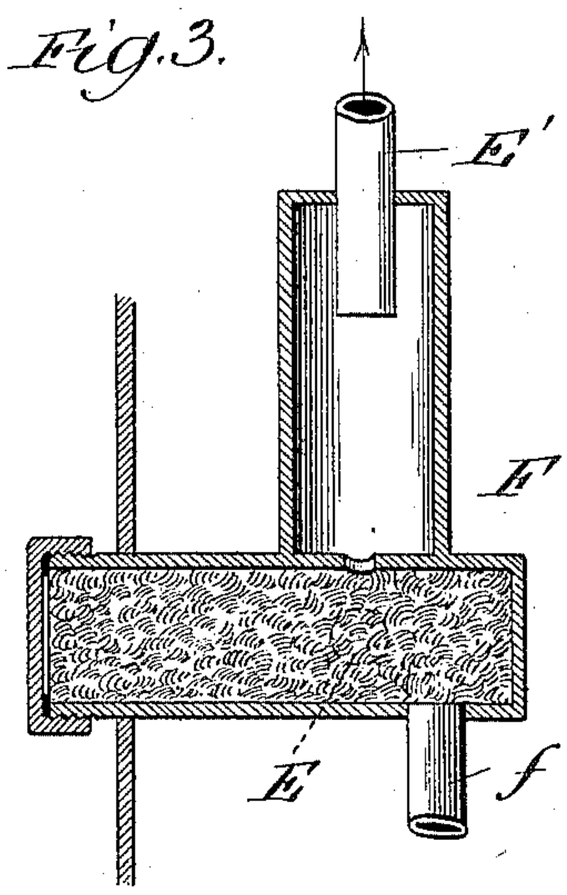


Fig. 4.

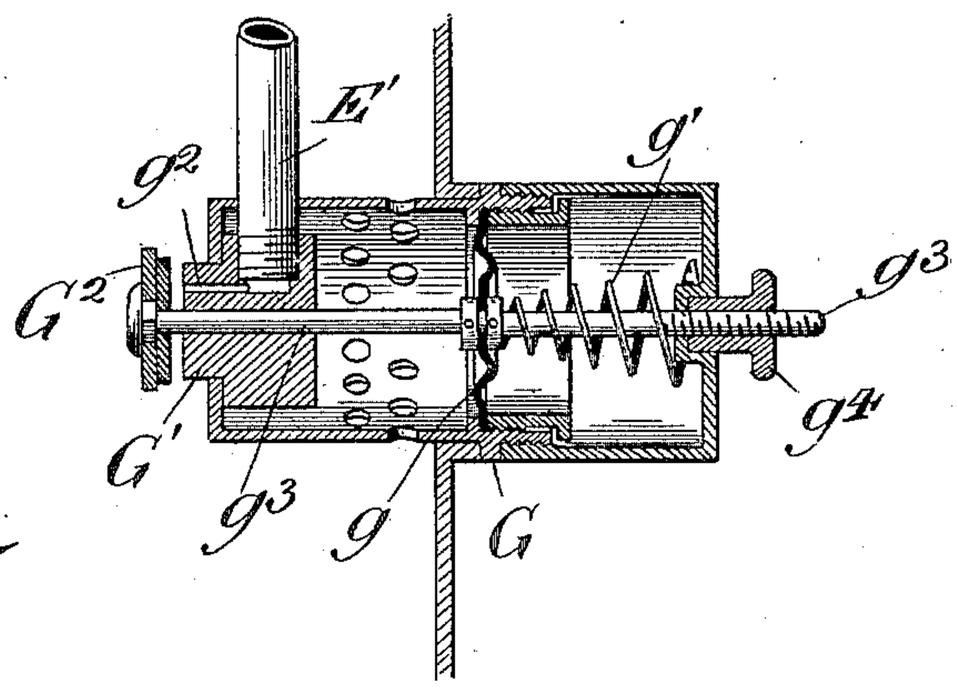
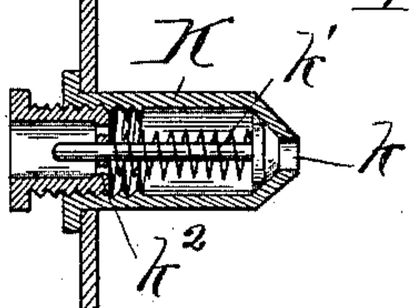


Fig. 5.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

AUGUST KARL STEIN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JOHN ZIMMERMAN, OF SAME PLACE.

APPARATUS FOR GENERATING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 599,270, dated February 15, 1898.

Application filed November 9, 1896. Serial No. 611,483. (No model.)

To all whom it may concern:

Be it known that I, AUGUST KARL STEIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Forming and Burning Acetylene and Similar Gases, of which the following is a specification.

The object of my invention is to provide a simple, economical, and efficient apparatus for forming and burning acetylene and similar gases; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical central sectional elevation of one form of apparatus embodying my improvements; Fig. 2, a plan view, partly in section, taken on the line 2 of Fig. 1; Fig. 3, an enlarged sectional detail of the drier or purifier; Fig. 4, an enlarged sectional detail of the pressure-regulator, and Fig. 5 an enlarged sectional detail of the escape or puppet valve.

In constructing an apparatus for carrying out my improvements I make a receptacle A, having three chambers A', A^2, and A^3. The chamber A' is adapted to contain and hold the carbid of calcium or other analogous gas-producing material, the chamber A^2 the liquid or water, and the chamber A^3 the gas that has been generated. The chamber for holding the gas-producing material is preferably located at the bottom of the receptacle, so that the water or liquid may be fed in by the action of gravity as it is desired to use the same.

In this particular apparatus it is desirable that the water or vapor arising from the same should be kept as far as possible from contacting the carbid of calcium. Hence the necessity arises for locating the carbid of calcium at the bottom of the receptacle, the water or fluid at the top of the receptacle, and the gas at a point intermediate or away from both. In order to accomplish this result, a partition *a* is used to separate the two chambers from each other. This partition is provided with a perforation or valve-seat a', in which operates a movable valve B. This movable valve is secured by a valve-rod *b* to a diaphragm B' at the upper portion of the receptacle, so that the movements of the diaphragm are communicated to the valve to operate the same and act to close or open the opening of the dividing-partition. A helically-coiled spring C is used intermediate with the vibrating diaphragm and the upper portion a^2 of the casing, while the continuation of the valve-stem b' is provided with an adjustable nut B^2, that regulates the tension of the helically-coiled spring. I prefer to inclose the diaphragm in a separate operating-chamber *d*.

To automatically operate the feed-valve at desired times and generate the gas, a pipe D is provided that leads from the gas-forming chamber to a chamber *d* below the operating-diaphragm. This pipe at its upper end is provided with a coil d', which opens into the chamber *d*, so that the pressure from the gas-generating chamber is furnished to this upper chamber and actuates the diaphragm to close the valve after it reaches a predetermined pressure. When the pressure falls below the predetermined point, the tension of the coil-spring and diaphragm forces the feed-valve open and permits water to enter and contact the carbid of calcium and form a fresh supply of gas. By keeping the outlet of this pipe in a separate chamber away from the water and providing it with a coil at the upper end all danger of water entering the material-chamber by its pipe is minimized.

To convey the gas from the generating-chamber to the retaining-chamber, I provide a pipe E and connect it with a purifier or drier F, so that it enters at one side thereof. This purifier may be provided, if desired, with a drip-pipe *f*, which connects with the producing-chamber and permits any excess of moisture to flow back into the same. This purifier or drier is provided with an absorbent material, preferring fibrous cotton or charcoal for such material. As the gas passes through this material all surplus moisture is dried or absorbed from the same, so that when it passes through the outlet-pipe E' it enters the retaining-chamber A^3 in a comparative dry state.

To regulate the pressure of the gas in the retaining-chamber, I provide a pressure-regulator, consisting of a perforated casing G,

having located therein a diaphragm g, communicating directly with the retaining-chamber on one side, while its opposite side is engaged by the coil-spring g'. The inner side of the casing G is provided with a valve-seat G′, having a perforation g^2 connecting with the pipe E′. The diaphragm is provided with a valve-stem g^3, having a valve G^2 at its inner end. The outer end of this valve is provided with an adjustable nut g^4 to regulate the tension of the coil-spring and diaphragm. When the pressure in the retaining-chamber reaches a predetermined point, it acts on the diaphragm g against its tension and the tension of the helical spring, so as to force the same outwardly and close the valve against the valve-seat and thus shut off a further supply of gas from entering such chamber. When the pressure in the retaining-chamber is reduced to or below the predetermined point, the pressure on the diaphragm is diminished, and its tension, together with the tension of the helical spring, forces the valve inwardly and permits a fresh supply of gas to enter the retaining-chamber—that is, providing gas is being generated. By this means it will be seen that a practically uniform pressure of gas is kept up in the retaining-chamber and can be led therefrom by means of a pipe H to a burner h or place of storage, as desired.

In the apparatus shown in Fig. 1 I show the burner-pipe as entering a case I, in and by which the burner is inclosed and which is provided with a reflector i and lens i', so as to concentrate and focus the light in the desired manner.

The apparatus shown in the drawings and which has been described above is particularly applicable to portable lamps of all descriptions; but it will be understood, of course, that it may be applied on either a larger or smaller scale, as desired, or for any commercial, industrial, or experimental purpose.

In order to allow the gas to escape from the retaining-chamber when it reaches an unsafe or dangerous pressure, I provide a safety or puppet valve K, formed of a thimble having a perforation k, and a spring-actuated valve k'. When the pressure reaches a dangerous point, the valve k' is forced back and the gas escapes through the perforations $k\,k^2$ out into the open air. The pipe E′ is led through the liquid-chamber, so that the gas may be cooled and contracted thereby.

Operation: The material is furnished the chamber A′ either by unscrewing or having a hand-hole through which the material may be inserted. Water is then poured in through the opening a^7 into the liquid-chamber. The tension on the valve-diaphragm is regulated by means of the nut B^2, so that water enters the chamber, and gas is formed. Immediately on the formation of gas, it enters the diaphragm-chamber through the pipe D, and at the same time passes through the pipe E′, in which it is cooled and contracted, to the retaining-chamber until the pressure in such chamber is sufficient to actuate the pressure-regulator therein and close the pipe. When this pressure-regulator in the retaining-chamber is closed, the pressure continues to pass through the pipe D to the diaphragm-chamber until it rises above a predetermined point and closes the valve to prevent a further supply of water entering the gas-producing chamber. As soon as gas is drawn off through the service-pipe H to a burner or reservoir the pressure in the retaining-chamber is reduced, and the pressure-regulator in such chamber acts to open the passage between the gas-producing chamber and the retaining-chamber. This action reduces the pressure in the producing-chamber and permits the gas to flow back from the diaphragm-chamber, thus reducing the pressure in such chamber and permitting the valve to open and to allow a fresh supply of water to be furnished the material-chamber and generate a fresh supply of gas. It will thus be seen that the pressure-regulator in the retaining-chamber governs and controls the forming of the gas and the operation of the other parts, conferring in this peculiar arrangement and combination a great advantage on the apparatus.

While I have described my invention with more or less minuteness as regards details and as being embodied in certain precise forms, I do not desire to be limited thereto unduly any more than is pointed out in the claims. On the contrary, I contemplate all proper changes in form, construction, and arrangement, the omission of immaterial elements and substitution of equivalents as circumstances may suggest or render expedient.

I claim—

1. In an apparatus of the class described, the combination of a receptacle having a liquid-chamber at the upper portion thereof, a gas-producing chamber at the lower portion thereof adapted to hold gas-producing material, a partition separating such chambers provided with a perforation or valve-seat, a longitudinally-movable valve on such seat, a diaphragm connecting with such valve and operating in a separate chamber, a pipe for furnishing gas under pressure to the diaphragm-chamber and provided with a coil at the upper end thereof so that gas under pressure may be furnished such chamber to actuate the diaphragm and thereby the valve and minimize the danger of water or liquid flowing back through such pipe, substantially as described.

2. In an apparatus of the class described, the combination of a receptacle having a liquid-holding chamber at the upper portion thereof, a gas-producing chamber at the lower portion thereof adapted to hold the gas-producing material, a gas-retaining chamber intermediate the other two chambers, a diaphragm separating the liquid and material chambers and provided with a perforation or valve-seat, a valve in such perforation or

valve-seat provided with an actuating-diaphragm at the upper end thereof arranged to be actuated by gas under pressure, means for connecting the valve and diaphragm together so that they operate and move simultaneously, a purifier or drier in the gas-retaining chamber connected with the producing-chamber, a pipe leading from the purifier through the liquid-holding chamber to cool and contract the gas entering the retaining-chamber, substantially as described.

3. In an apparatus of the class described, the combination of a receptacle provided with a liquid-holding chamber and gas-producing chamber and a gas-retaining chamber, means for automatically admitting the liquid into the gas-producing chamber, a pipe connected with the gas-producing chamber and the gas-retaining chamber, an automatic pressure-regulator on such pipe and located in the retaining-chamber comprising a perforated casing, a diaphragm to be actuated by the pressure in the retaining-chamber, a valve-seat connected with the pipe that leads from the gas-producing chamber, a valve connected with the diaphragm to be operated thereby and close the perforation of the valve-seat when the pressure reaches a predetermined point and open the same when it falls below such point, and mechanism for regulating the tension of the diaphragm to the desired point, substantially as described.

4. In an apparatus of the class described, the combination of a receptacle provided with a liquid-holding chamber in one portion thereof, a gas-producing or material chamber in another portion thereof, a gas-retaining chamber, a valve intermediate the gas-producing and liquid chambers provided with an actuating-diaphragm in a separate chamber, means for communicating the pressure of the gas-producing chamber to the diaphragm-actuating chamber, and an automatic pressure-regulator in the gas-retaining chamber to regulate the pressure in such chamber and connected with the gas-producing chamber so as to control the actions of all of the parts, substantially as described.

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Witnesses:
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