No. 617,896. Patented Jan. 17, 1899.

L. S. BUFFINGTON.

APPARATUS FOR GENERATING ACETYLENE GAS.

(Application filed Sept. 10, 1896.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

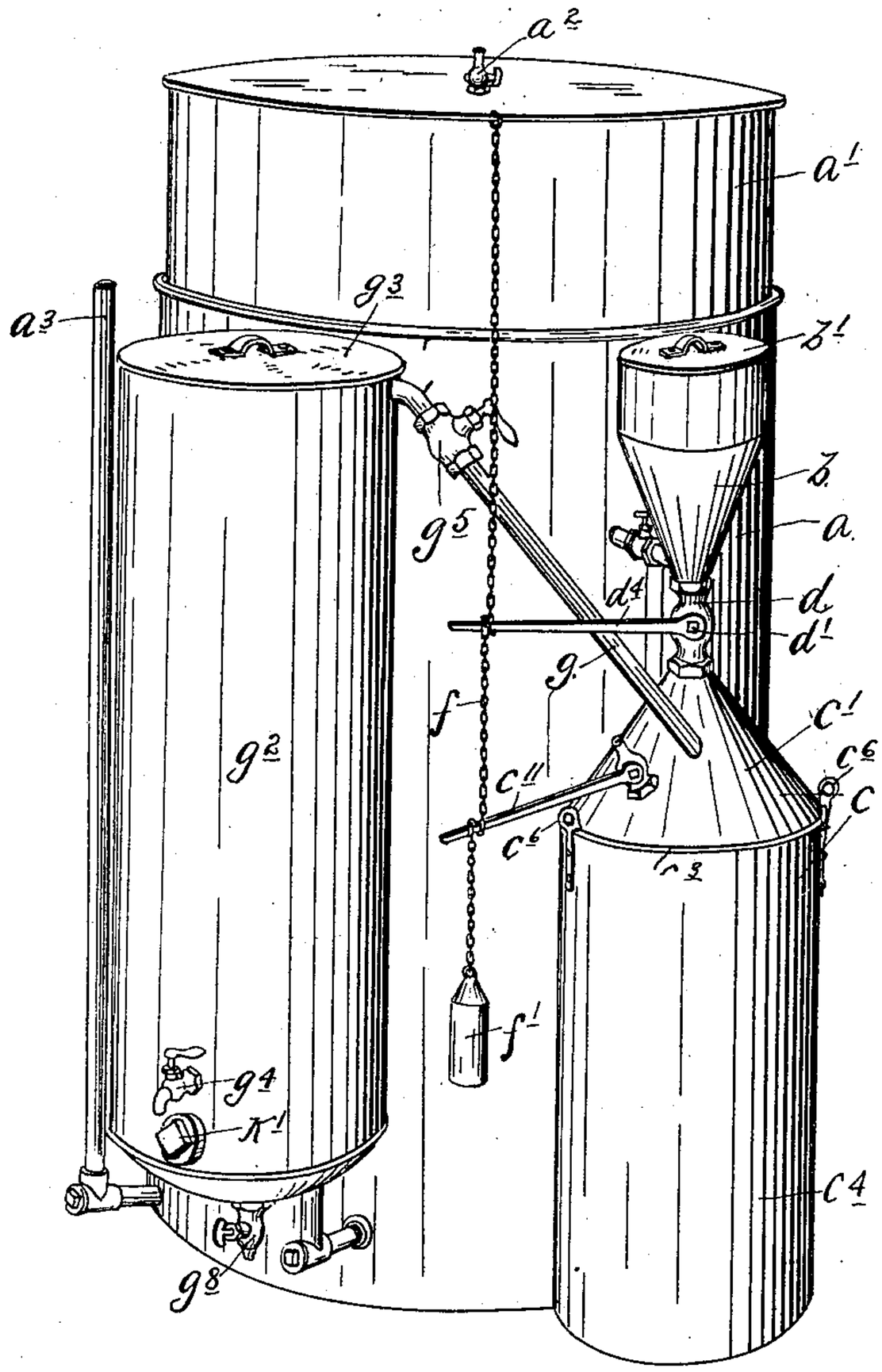

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Fig. 2.

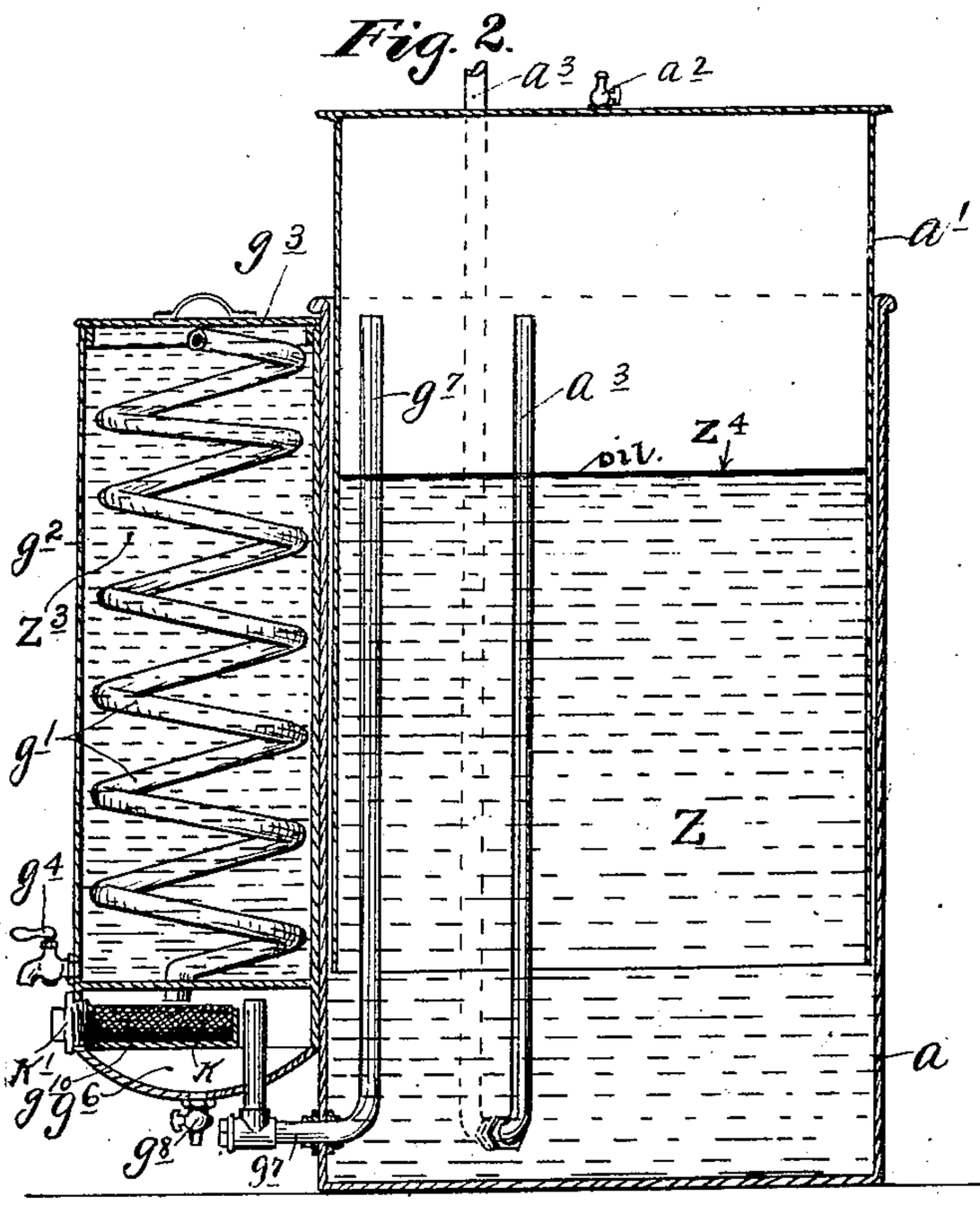


Fig. 3.

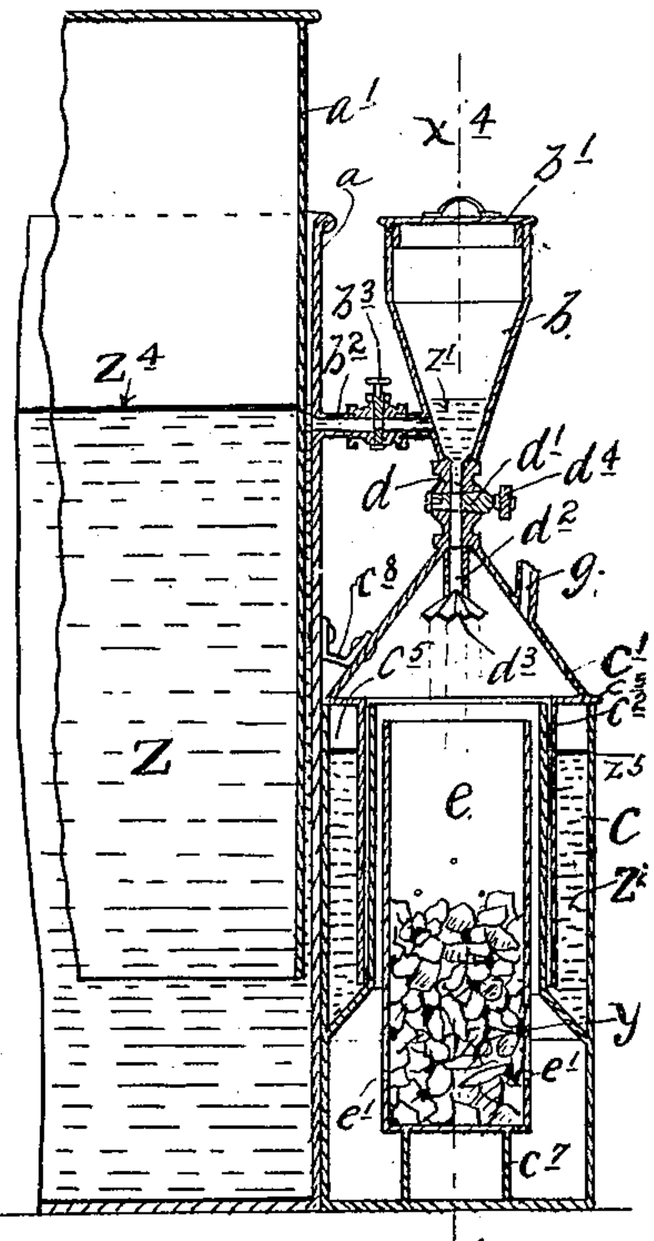


Fig. 4.

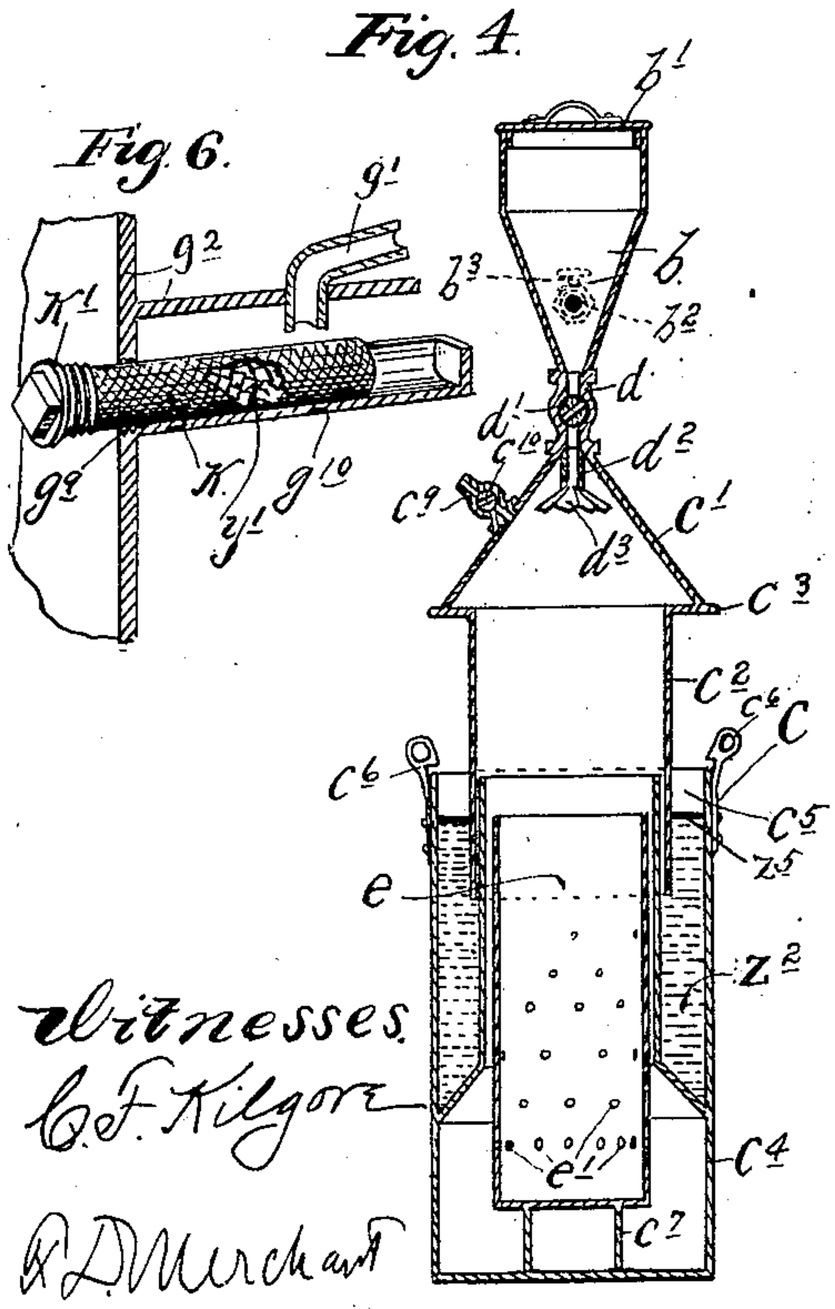
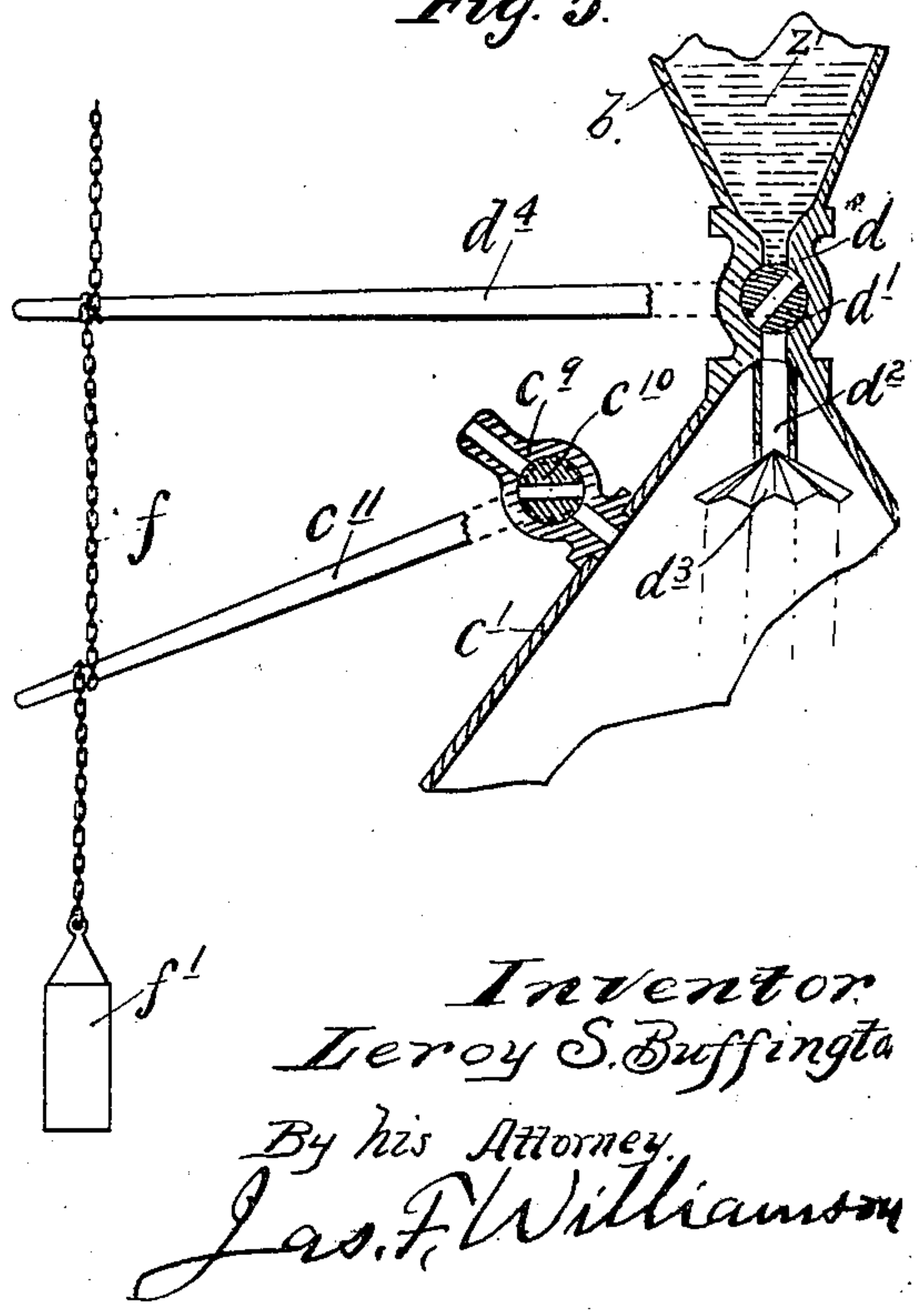


Fig. 6.

Fig. 5.



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UNITED STATES PATENT OFFICE.

LEROY S. BUFFINGTON, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR GENERATING ACETYLENE GAS

SPECIFICATION forming part of Letters Patent No. 617,896, dated January 17, 1899.

Application filed September 10, 1898. Serial No. 605,383. (No model.)

To all whom it may concern:

Be it known that I, LEROY S. BUFFINGTON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Apparatus for Generating Acetylene Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates particularly to that class of gas-generating apparatus which is adapted for use in generating acetylene gas and is in the nature of an improvement on the apparatus shown and described in my pending application, Serial No. 580,182, filed February 21, 1896, entitled "Apparatus for Generating Acetylene Gas." To simplify the construction shown in my said prior application in certain respects to render the manipulation of other parts thereof more easy and in general to render the action of the apparatus as an entirety more efficient and complete, thereby adapting the same to produce a drier and better gas freed from water and gummy impurities, is the object of my present invention.

To these ends my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The preferred form of my apparatus is illustrated in the accompanying drawings, wherein like letters refer to like parts throughout the several views.

Figure 1 is a perspective view showing the complete apparatus. Fig. 2 is a vertical transverse section taken centrally through the storage-gasometer, the condenser, and drying-chamber. Fig. 3 is a vertical central section taken through the gas-generator and a portion of the gasometer. Fig. 4 is a vertical section taken on the line X^4 X^4 of Fig. 3, but showing the removable portion of the generating-chamber partially removed from the fixed portion. Fig. 5 is an enlarged view with some parts broken away and others shown in section, taken also on the line X^4 X^4 of Fig. 3 and illustrating principally the relations of the pair of valves which are controlled by the movement of the movable gasometer-section; and Fig. 6 is a detail view, partly in perspective and partly in section, showing a portion of the drying-chamber and the auxiliary carbid-holder.

a and *a'* represent, respectively, the fixed and the movable sections of an ordinary telescopically-expansible storage-gasometer which contains a body of water *z*, by means of which the said tank-sections are sealed together with a gas-tight joint. The movable gasometer-section *a'* in its upper end or head is provided with an air-escape cock a^2, and a service-pipe a^3 leads from the interior of the gasometer from a point above the level of the water *z* to the ordinary points of gas consumption.

The generator used to generate and supply the gas to the storage-gasometer involves a pair of receptacles *b* and *c*. Of these receptacles the member *b* is adapted to contain water *z'*, is located above the member *c*, and is in communication therewith through a hollow neck *d*, which is provided with a valve *d'*. As shown, the water-containing receptacle *b* is provided with a removable cover *b'*, and the lower portion of the same is in communication with the interior of the gasometer-section *a* through a short valved pipe connection b^2 b^3, through which when the valve b^3 is opened water may be supplied to the water-receptacle *b* from the annular compartment formed between the gasometer-sections *a* and *a'*. The generating-receptacle *c* comprises a fixed head-section *c'*, which is provided with a depending cylindrical portion c^2 and an outwardly-projecting annular flange or rim c^3, and a removable bottom section c^4 in the form of a cylinder having a closed lower end and an annular well c^5 at its upper end. Water or other sealing liquid z^2 is placed in the well c^5. When the sections of this generating-receptacle are placed in working position, as shown in Figs. 1 and 3 of the drawings, the lower open end of the fixed cylindrical portion c^2 will be submerged in the sealing liquid z^2 in the well c^5, and the body of the same will lie very close to the inner wall of said well. It will of course be understood that I do not limit myself to the annular form of the liquid-containing sealing-well. This annular sealing-well is very desirable in many cases and has a particular adaptation

for use in connection with the form of carbid-holder shown; but from a broad point of view it is only necessary that the sealing-well be adapted to receive the open end of the generator to form a seal between the connected parts. As shown, the removable bottom or cylindrical portion c^4 is provided with a pair of combined finger-pieces and spring-latches c^6, which are adapted to engage with the rim or flange c^3 of the head-section c' to hold said parts locked together. Obviously the bottom section is removed from the head-section simply by taking hold of the catches c^6 with the fingers and disengaging the same from said rim c^3 and then permitting said bottom section to lower, as shown in Fig. 4.

The carbid-holder e, which I prefer to use in connection with this generator, is in the form of a cylinder with closed lower end and having perforations e' through its side walls, which extend nearly, but not quite, to the bottom of the holder. This carbid-holder when loaded with carbid bodies y is placed in working position within the removable bottom section c^4 through the cylindrical passage formed by the annular well c^5, and, as shown, rests on an annular rim c^7, secured to its lower end. The neck portion d is continued downward a short distance into the generating-receptacle by means of a short pipe-section d^2, the lower end of which is serrated or notched and has secured thereto a dripper d^8. This dripper d^8 is formed from a small disk of thin metal stamped with a series of channels radiating from its center. The dripper d^8 stands immediately over the carbid bodies y in the carbid-holder e.

As shown, the head-section of the generating-receptacle is secured directly to the fixed gasometer-section a by means of a bracket c^8.

Opening to the atmosphere through the fixed head-section c' of the generating-receptacle is a discharge or safety nipple c^9, which is normally closed by a valve c^{10}. The stems of the valves d' and c^{10} are provided, respectively, with valve arms or levers d^4 and c^{11}, which extend to the same side of the generator.

To the movable gasometer-section a' over the free ends of the valve-arms d^4 and c^{11} is secured the upper end of a chain or flexible connection f, to the lower end of which is attached a weight f'. The intermediate portion of this connection f is loosely wound around the free ends of both of the valve-arms d^4 and c^{11}, and the tension of the weight f' will cause the connection to keep its hold on the said valve-arms wherever set. It will thus be seen that by moving the connection f on the valve-arms the active leverage of the same may be varied and that the valve-arms may be set at various relative adjustments with the greatest of ease.

The generating-receptacle c is in communication with the storage-gasometer through gas-conveying connections involving as follows: g indicates an inclined pipe-section opening from the generating-receptacle through the head-section c' and terminating in a downwardly-turned condensing-coil g'. This condensing-coil g' is incased by a vertically-disposed drum or water-tank g^2, containing water z^3. As shown, the tank g^2 is provided with a removable cover g^3 and a draw-off cock g^4, and the pipe-section g is provided with a valve g^5. The lower end of the tank g^2 is extended downward to form a drip-pocket or drying-chamber g^6, into which the lower end of the coil g' opens.

g^7 indicates a pipe-section opening at one end within the drying-chamber g^6, near the top of the same, and opening at its other end within the storage-gasometer above the level of the water z. As shown, the drip-pocket or drying-chamber g^6 is provided in its bottom with a drip-cock g^8.

The drying action of the condensing-coil and drying-chamber is greatly facilitated and, in fact, rendered practically perfect by the introduction of an auxiliary carbid-holder containing carbid into the interior of said drip-pocket or drying-chamber. As shown, this carbid-holder is in the form of a reticulate cylinder k, adapted to be inserted through a suitable passage g^9 in the wall of said drip-pocket or drying-chamber and having a screw-threaded cap k' at its outer end, which engages suitable screw-threads cut in said passage g^9 to form a gas-tight joint therewith. As shown, the carbid-holder k is located in a trough g^{10}, secured to one of the walls of said drying-chamber g^6. The carbid-holder is shown as filled with carbid bodies y'. It is also important to note that in this preferred form of my apparatus the carbid-holder when placed in working position in the trough g^{10} stands immediately under the lower end of the condensing-coil g', so that the condensed water drippings from the coil will be discharged directly onto the carbid bodies y'.

Preferably a small amount of oil is inserted into the gasometer or storage-tank through the air-cock a^2. This oil will spread out and form a thin film or covering over the column of water contained in the movable gasometer-section a', as shown at z^4. This oil seal or oil covering serves to effectually prevent the evaporation of the water into the interior of the gasometer-section a', but does not, however, extend into the chamber formed between the gasometer-sections a and a'. The body of water z^2 contained in the well c^5 of the generating-chamber is also preferably covered with a film of oil z^5, while the section c^4 is removed from the head-section c'. Hence when the said parts are put together the oil seal z^5 will cover the sealing-water z^2 both inside and outside of the cylindrical section c^2. The important functions performed by both of the above-noted oil seals will be more particularly pointed out after the description of the operation of the apparatus.

The great importance of arranging the bottom section of the generating chamber or re-

ceptacle so that the carbid-holder or equivalent device may be removed therefrom through the bottom of the same by a downward movement should be noted. As is a well-known fact, acetylene gas is lighter—that is, has a specific gravity less than that of air—and hence, of course, will tend to rise to the top of the receptacle in which it is contained. If the said receptacle be opened at or near its upper portion, the gas will escape therefrom. It is, however, obvious that in my invention I obviate this objectionable feature by arranging the carbid-holder so that it may be removed from the generating chamber or receptacle by a downward movement through the bottom of said chamber. I have found in practice that my carbid-holder may be removed, cleaned, and recharged and replaced in working position without causing the escape of any perceptible amount of the gas with which the generating-chamber is filled.

It will be noted that in the construction above described the fixed section of the gasometer or storage-tank serves as a support for the fixed part or body-section of the generating chamber or receptacle. In other words, the generating-chamber has a support which is entirely independent of the removable bottom thereof. Hence it is not necessary to disturb or move the generating chamber or receptacle or its support in order to remove the bottom of said generating chamber or receptacle from working position.

The carbid-holders being charged with carbid, the tank-sections being provided with liquids and sealed, as above described, and the valve-arms and valves d^4 d' and c^{11} c^{10} being adjusted and connected to the valve-controller f, as indicated in Figs. 1 and 5, the operation of the apparatus as an entirety is substantially as follows: The generating action may be started by forcing the valve-arm d^4 downward by hand or otherwise, so as to permit the initial flow of the water z' from the water-receptacle b through the neck portion d, valve d', hollow stem d^2, over the dripper d^3, and onto the carbid bodies y in the holder e. When the water thus flowing strikes the dripper d^3, it will be split up and thrown off from the same in a series of fine radially-diverging streams and will thus be distributed in fine particles over substantially the entire surface of the exposed carbid bodies. The initial generation of gas is thus started, but will continue intermittently, as may be necessary, to keep up the desired supply of gas under the automatic control of the movable gasometer-section a', acting through the flexible controller connection f. The gas generated in the generating-chamber finds an escape and flows through the inclined pipe connection g, condensing-coil g', drying-chamber g^6, and pipe connection g^7 into the interior of the storage-gasometer a a'. From the storage-gasometer the gas is drawn off as it is used through the service-pipe a^3. As is obvious, as the gas-pressure in the gasometer is reduced by the use of the gas the movable section a' will lower, thus permitting the weight f' on the connection f to become active on the valve-arm d^4, and thus forcing said arm d^4 downward and opening the valve d', as just described, but in this case automatically. When the pressure in the gasometer has again been increased, so as to restore normal pressure, the gasometer-section a' will be raised, carrying with it the valve-arm d^4, until the valve d' is turned into its closed position, as indicated in Fig. 5. The generation of gas being thus stopped, the tank-section a' will almost immediately cease its vertical movement. By these successive operations the generation of gas is automatically controlled.

Throughout the zone of operation of the movable gasometer-section a' in its ordinary automatic action, above described, the valve c^{10} in the safety discharge-nipple c^9 will be oscillated to and fro, but throughout this movement will be in its closed positions. When, however, by an over generation of gas or otherwise the gasometer-section a' is raised above this normal zone of operation, the valve c^{10} will be thrown into an open position, thus permitting the escape of gas from the generating-compartment into the open air. As soon as the normal pressure of gas is restored by the escape through the valve c^{10} and nipple c^9 the valves d' and c^{10} will both be moved into their normal closed positions. (Shown in Fig. 5.)

The important action of the condenser and drier in the connections between the generating-receptacle and the storage-gasometer will be next considered.

Acetylene gas generated by gas-generators of the ordinary construction is found to be more or less laden with water and with gummy impurities. The water in the gas causes the same to burn with a smoky flame and the gummy impurities in a short time clog and fill the burners. In my apparatus above described all water and gummy impurities are removed by the action of the condenser and drip-pocket or drying-chamber above noted. As the warm and unpurified gas passes through the inclined pipe-section g it will be slightly cooled and a portion of the watery vapors will be precipitated and run back onto the carbid in the generating-chamber. As the gas passes onward through the condensing-coil g' it will be entirely cooled and the remaining watery vapors and other liquid impurities will be precipitated and will flow into the drying-chamber g^6.

In the construction shown, wherein the auxiliary carbid-holder k is located immediately under the lower open end of the condensing-coil g', the water which is precipitated in the coil will be discharged onto the carbid y', contained in said holder, and will be entirely taken up by the chemical action between the same and said carbid, which chemical action of course results in a further generation of

acetylene gas. This generation of gas will of course be extremely slow, as it depends entirely upon the liquid condensation of the foreign substances contained in the passing gas. Obviously this action of the carbid within the drying-chamber renders the drying action almost absolutely complete and perfect. The gummy precipitates even though they do not enter into the gas-forming reaction with the carbid will nevertheless be absorbed thereby or by the lime products, and thus be held from again mixing, by absorption or otherwise, with the gas. While the action of the drying device is greatly facilitated by the action of the carbid, yet the device described will serve the purpose fairly well, even if this carbid device is dispensed with.

Returning to the carbid-holder, it will be noted that the sides of the same, commencing a short distance above its imperforate bottom, are provided with several series of perforations e', each of which series is formed in a different horizontal plane located each some little distance above the other. In virtue of this construction any surplus of water which is not immediately taken up by the chemical action between the same and the carbid on which it is dropped will find its way to the bottom of the carbid-holder and will commence action on the particles of carbid which lie closest to the bottom. This chemical action at the bottom of the carbid-holder will continue until the carbid which lies below the lowest series of perforations e' have been entirely decomposed or turned into lime, and if after this the lime products remain soaked with water the heat in the generating-chamber will soon turn the water into steam, which, rising through the carbid in the holder, will continue the generating action from the bottom of the same. It will thus be seen that the carbid in the holder will be attacked by the water both from the bottom and from the top. As is evident, any very great surplus usage of water in the carbid-holder may find its escape through the upper series of perforations e'. Of course when the generating action is commenced on a freshly-loaded holder of carbid the water dripped thereonto will be almost instantly taken up; but in a short time the upper surface of the carbid will become covered with the lime products, and hence after the apparatus has been running a short time the action of the water on the carbid becomes substantially as above described. It will also be understood from the foregoing description that as the bottom of the holder becomes filled with dried lime the series of perforations, which lie at different horizontal planes, will be closed, one series after the other, thus giving the effect of a bottom which is raised step by step from one series of perforations to the other.

As already noted, the depending cylindrical portion c^2 of the generating-receptacle fits very closely to the inner wall or cylindrical flange of the well c^5. In virtue of this construction the cross-section of the annular space formed between said parts is very small as compared with the cross-section of the annular space between said cylindrical portion c^2 and the outer wall or flange of said well c^5, and hence a considerable rise and fall of the inner annular column of the sealing liquid in the well c^5 will cause but a very slight rise or fall of the outer annular column of water in said well. Again, by making the joint between the end of the removable bottom section c^4 and the outwardly-projecting flanged portion c^3 air-tight, or nearly so, the air contained in the well above the column of water and outward of the depending cylinder c^2 will serve as a cushion to prevent a sudden rise or fall in said column.

As also before noted, the gas contained in the storage-gasometer is sealed from the water z by the oil covering or film z^4 and the gas in the generating-receptacle is sealed from the water z^2 in the well c^5 by means of the oil film or covering z^5. By these oil-seals all evaporation or absorption of the bodies of water used in the various devices is absolutely prevented, and hence the only moisture or water which may become commingled with the gas is that which becomes vaporized in the generating action; but, as already fully described, all of this vaporized water and other impurities are removed or separated from the gas before it reaches the storage-gasometer.

It will be noted that the carbid is contained in a holder which is directly supported by the removable bottom section of the generating-receptacle, and hence that the carbid is supported, although indirectly, by said removable bottom section. As is perfectly obvious, the carbid might be supported directly by the bottom or lower portion of said removable bottom section. However, I prefer to use the carbid-holder illustrated.

It will be understood, of course, that instead of filling the well c^5, for instance, with water and covering the same with a film of oil the oil seal might be made by filling the said well entirely with oil. Furthermore, as the oil seals z^4 and z^5 prevent the evaporation of water the generating-chamber will be kept dry, and hence all generation of gas from the carbid in the generating-chamber will be effectually prevented, except when water is dropped onto the carbid y from the dripping device.

Attention is recalled to the fact that the pipe b^2, which supplies water to the water-receptacle b, is in communication with the column of water z in the gasometer exterior of the movable tank-section a', and hence it is impossible for the oil z^4 to get into the water-receptacle b or commingle with the water which is used for generating purposes.

It is thought to be obvious from the foregoing description that the construction and operation of the apparatus are extremely simple, considering the completeness and ex-

treme efficiency of the functions of the apparatus as an entirety.

It will be understood, of course, that various alterations in the details of construction of the preferred form of my apparatus may be made without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a generating-receptacle, provided with an open lower end, of a cup-like telescopically-removable bottom section, provided with a sealing liquid into which the open end of said generating-receptacle is submerged, and means for securing said parts against telescopic movement, under normal variations of gas-pressure, substantially as described.

2. The combination with a generating-receptacle, open at its lower end, of a telescopically-removable bottom section, provided with a marginal liquid-containing sealing-well, into the liquid of which the lower end of said generating-receptacle is immersed, when said bottom section is in working position, substantially as described.

3. The combination with a generating-receptacle, open at its lower end, of a telescopically-removable bottom section, provided with a marginal liquid-containing sealing-well, into the liquid of which the lower end of said generating-receptacle is immersed, when said bottom section is in working position, and a carbid-holder directly supported by said bottom section and insertible and removable, to and from position, through the central passage of said sealing-well, substantially as described.

4. In a gas generator and holder, the combination with a pair of receptacles located one above the other, a communicating passage between said receptacles, and an escape-passage opening to the atmosphere from the generating member of said pair of receptacles, of valves in said passages adapted to be opened by movements in reverse directions, valve-arms extending from said valves, an expansible gasometer in communication with said generating-receptacle, means for connecting said valve-arms to the movable gasometer-section, and means for varying the relative adjustments of said valves, with respect to each other, substantially as and for the purposes set forth.

5. In a gas generator and holder, the combination with a pair of receptacles located one above the other, a communicating passage between said receptacles, an escape-passage opening to the atmosphere from the generating member of said pair of receptacles, valves in said passages, adapted to be opened by movements in reverse directions, and valve-arms extending from both of said valves, of an expansible gasometer in communication with said generating-receptacle, and a common connection from the movable gasometer-section, connected to both of said valve-arms, with freedom for adjustments so as to vary the relative positions of said valve-arms with respect to each other and to the movable gasometer-section, substantially as described.

6. In a gas generator and holder, the combination with a pair of receptacles located one above the other, a communicating passage between said receptacles, an escape-passage opening to the atmosphere from the generating member of said pair of receptacles, valves in said passages, adapted to be opened by movement in reverse directions, and valve-arms extending from said valves, of an expansible gasometer in communication with said generating-receptacle, and a flexible connection secured at its upper end, to the movable gasometer-section, operating on the ends of both of said valve-arms and provided, at its lower end, with a weight, substantially as described.

7. A generating-receptacle, involving a fixed head-section having the depending cylindrical portion, an annular projecting flange or rim, a removable cylindrical section with closed bottom and annular upper end well adapted to contain liquid and to receive the cylindrical portion of said head-section, and means for securing said parts together, consisting of finger-operated spring-catches on said removable cylindrical section, engageable with the flange of said head, substantially as described.

8. The combination with a gas-generator, of gas-conveying connections leading therefrom, involving as elements thereof, a condensing-coil, a drip-pocket or chamber, located below said condensing-coil, and an auxiliary carbid-holder located within said drying-chamber, immediately under the lower end of said condensing-coil and in position to receive the condensed drippings therefrom, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LEROY S. BUFFINGTON.

Witnesses:
JAS. F. WILLIAMSON,
F. D. MERCHANT.