No. 713,223. Patented Nov. 11, 1902.

F. L. IRISH.

ACETYLENE GAS GENERATOR.

(Application filed Oct. 23, 1901.)

(No Model.) 4 Sheets—Sheet 1.

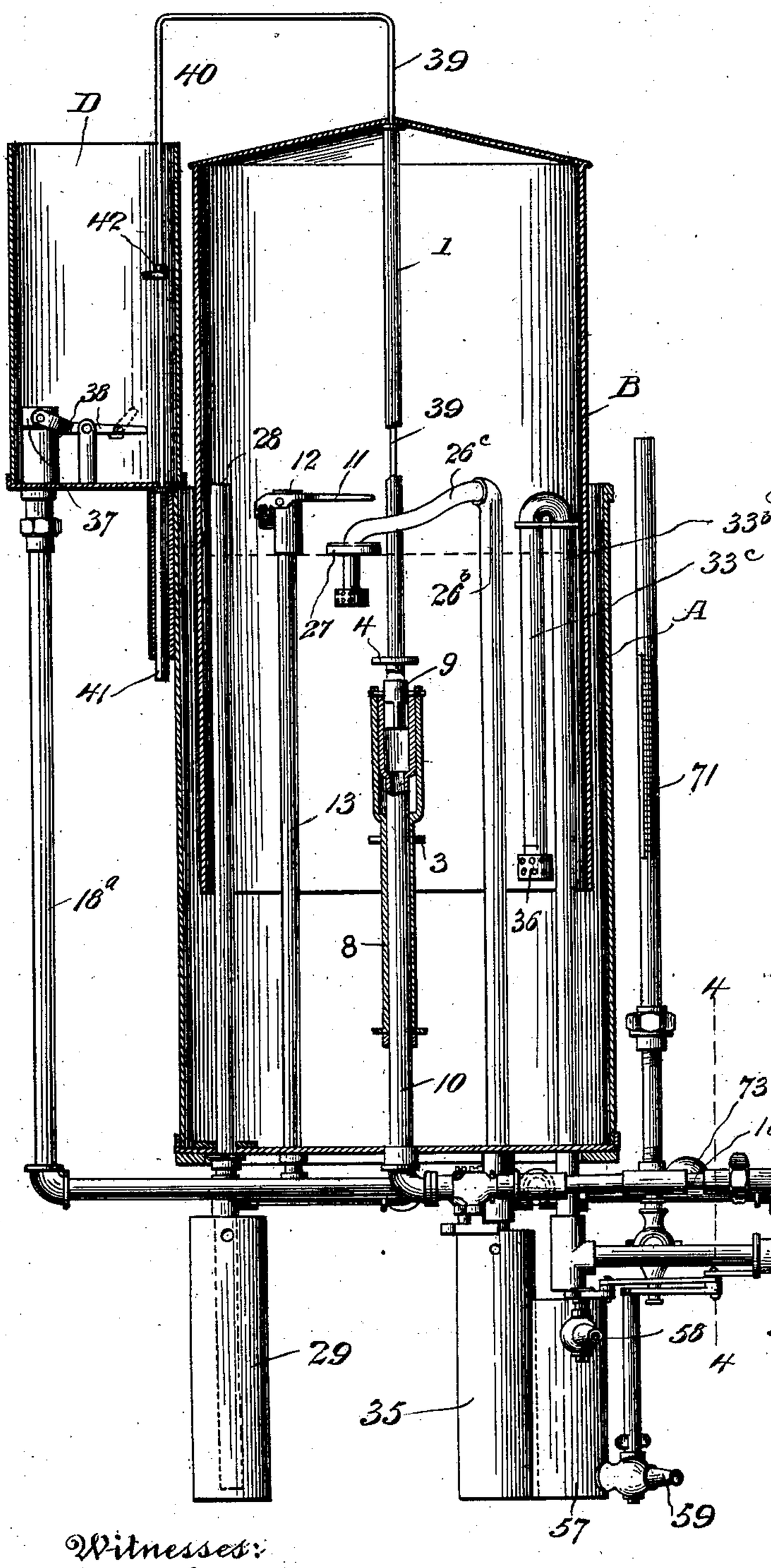
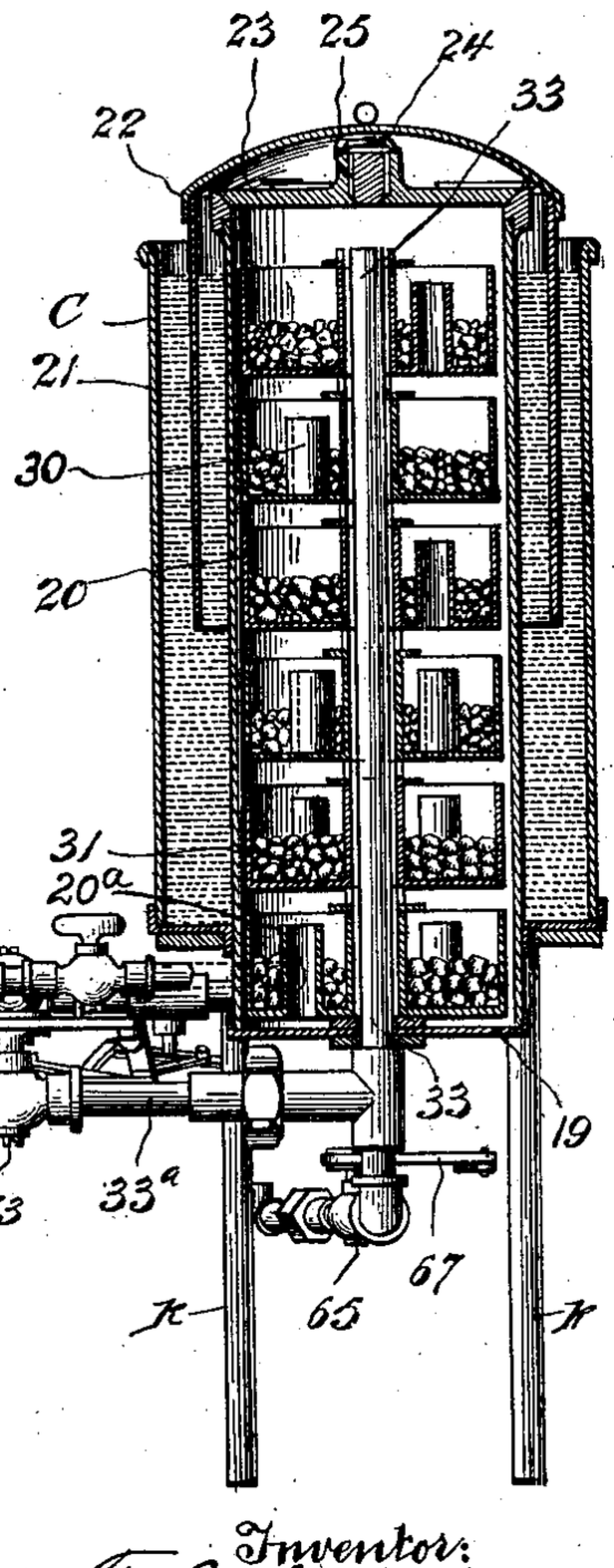


Fig. 1



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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

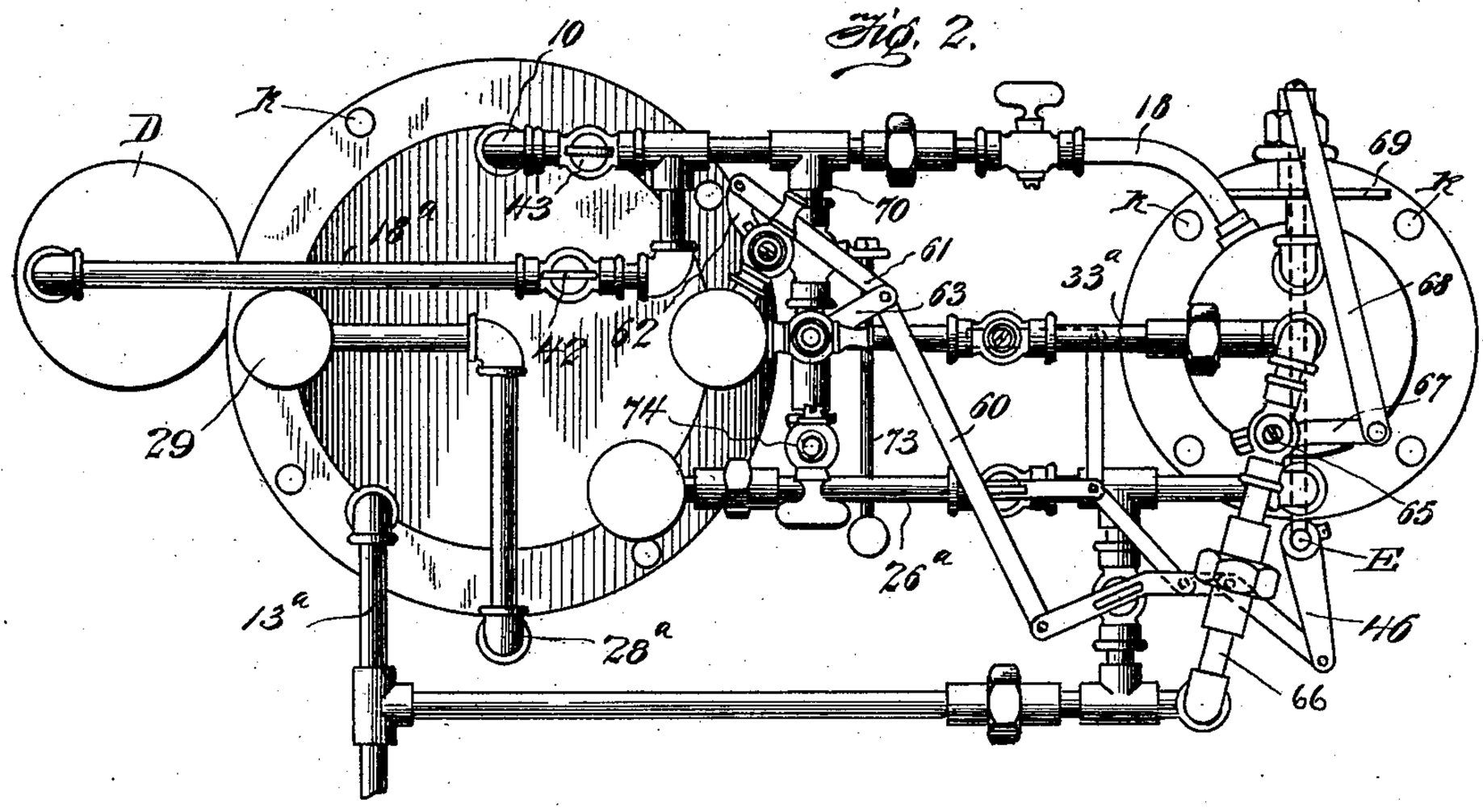
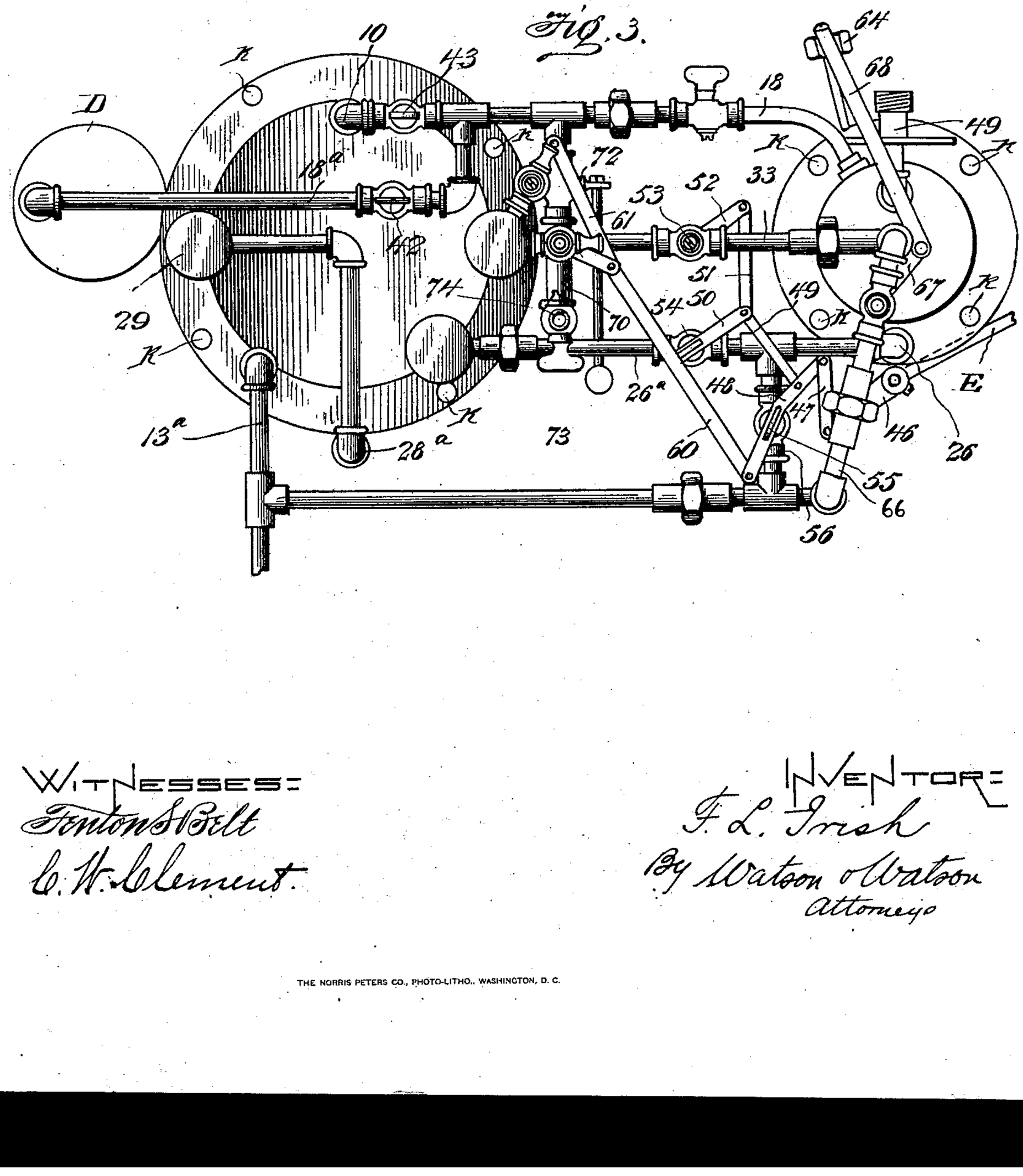


Fig. 3.



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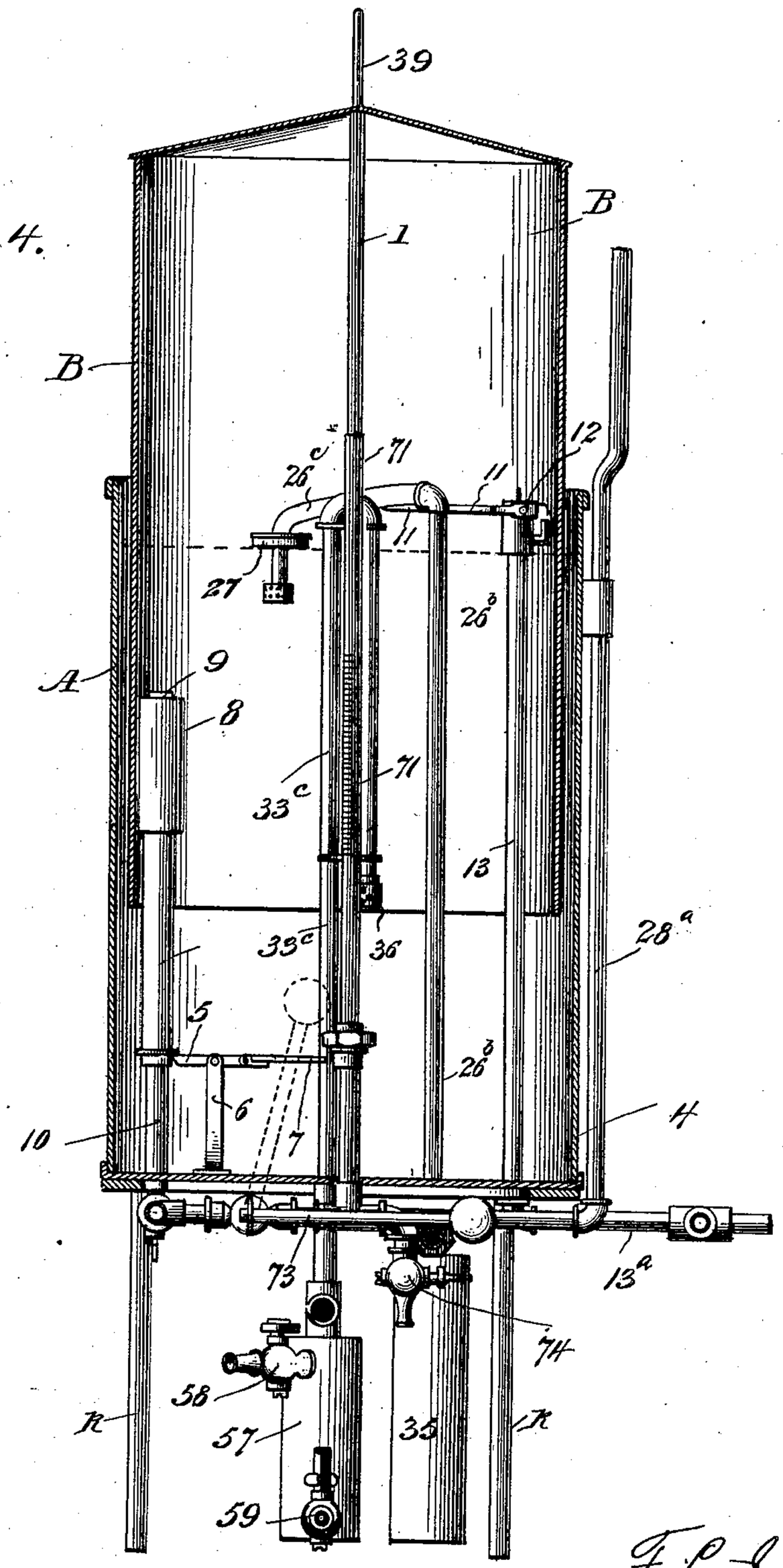
(No Model.) 4 Sheets—Sheet 3.

Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

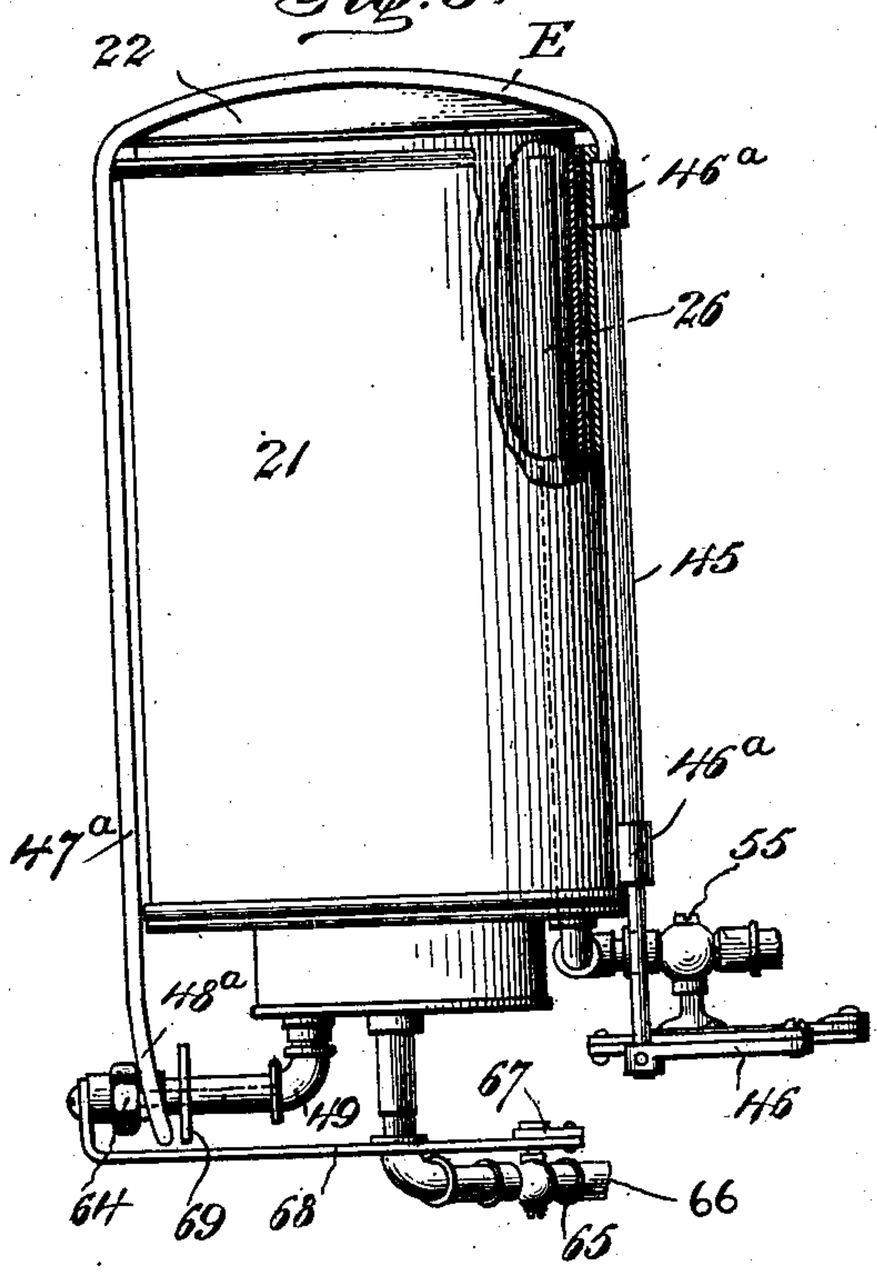

Fig. 6.

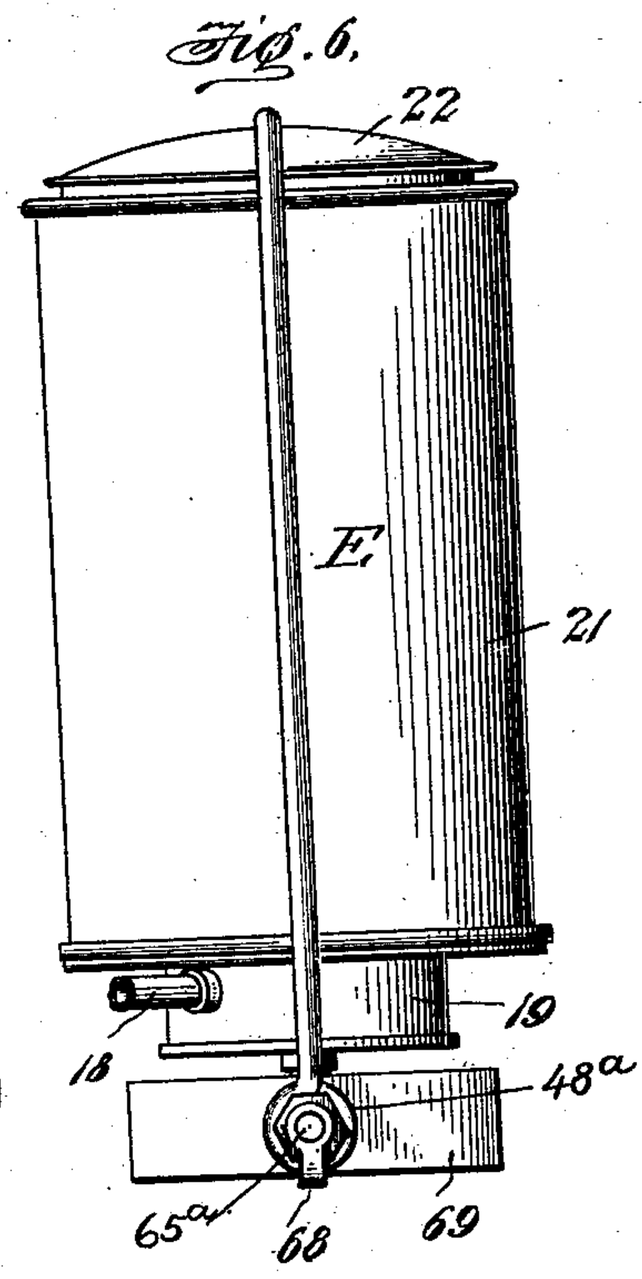

Fig. 7.

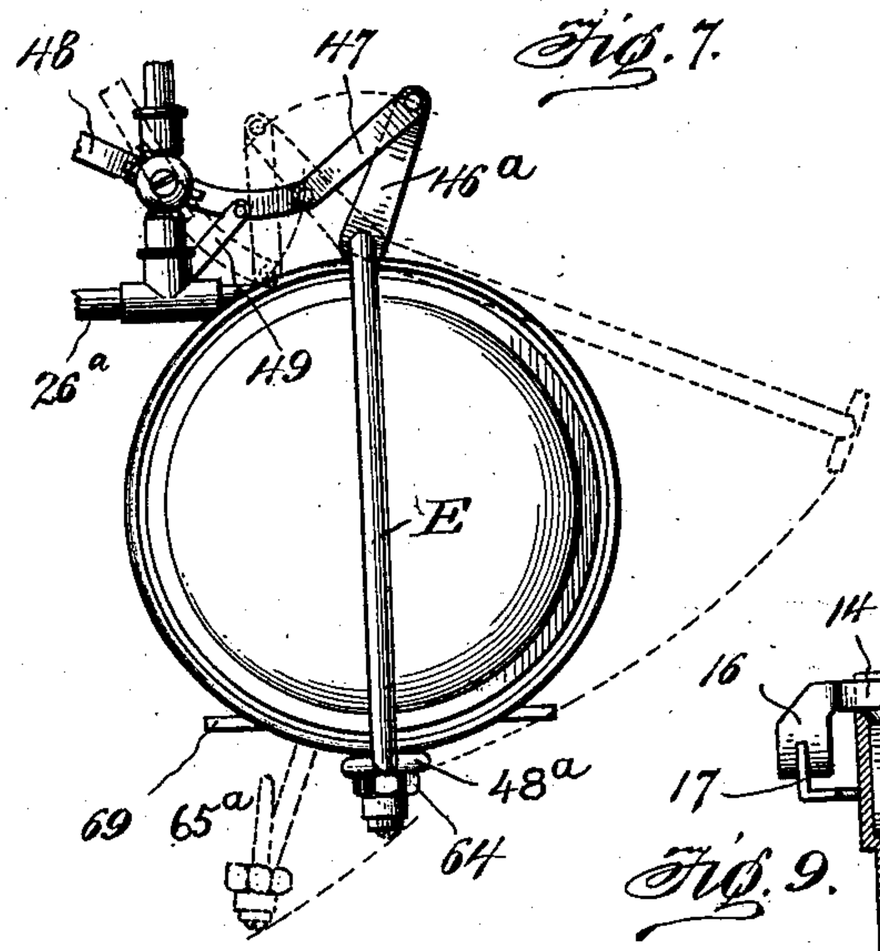

Fig. 8.

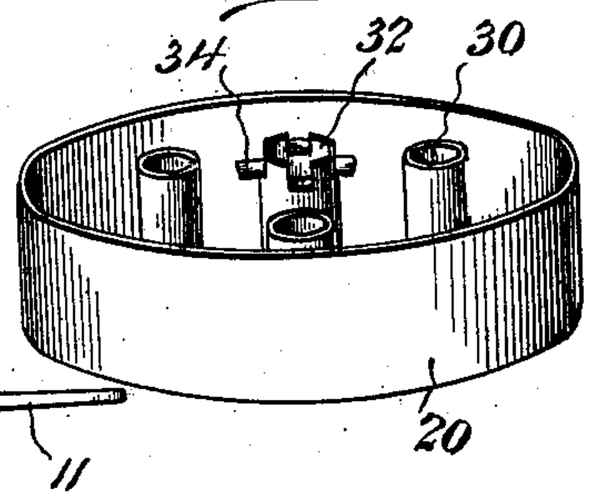

Fig. 9.

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UNITED STATES PATENT OFFICE.

FREMONT L. IRISH, OF AUBURN, MAINE, ASSIGNOR OF ONE-HALF TO ARTHUR D. HALL, LINWOOD B. JONES, AND EDWARD R. JONES, OF WINTHROP, MAINE.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 713,223, dated November 11, 1902.

Application filed October 23, 1901. Serial No. 79,638. (No model.)

To all whom it may concern:

Be it known that I, FREMONT L. IRISH, a citizen of the United States, residing at Auburn, in the county of Androscoggin, State of Maine, have invented certain new and useful Improvements in Acetylene-Gas Apparatus, of which the following is a specification.

This invention comprises certain improvements in acetylene-gas apparatus whereby accidents due to carelessness on the part of the operator are rendered impossible.

The invention also comprises improved means for causing the cool generation of gas and also for washing and further cooling the gas in its passage to the gasometer-bell and various other features which will be pointed out in the following specification.

In the accompanying drawings, Figure 1 shows the water-supply tank and generator in central vertical section and the gasometer bell and tank also in central section, the various pipes and connections to the gasometer being shown in side view. Fig. 2 is a bottom plan view of the apparatus with the parts in their normal operative positions. Fig. 3 is a similar view showing the position of the parts with the cover of the generator unlocked. Fig. 4 is a view on the line 4 4 of Fig. 1, the gasometer tank and bell being shown in central section. Fig. 5 is a side view of the generator with the cover locked. Fig. 6 is a front view of the same. Fig. 7 is a plan view of the same, the locking-bail being shown in its normal position in full lines and in its unlocked position in dotted lines. Fig. 8 is a perspective view of one of the carbid-receptacles, and Fig. 9 is a detail view of the escape-valve within the gasometer.

Referring to the drawings, A indicates a gasometer-tank, and B a bell arranged therein, said tank and bell being of the ordinary construction. The bell is guided within the tank by means of a tube 1, attached to the top of the bell and which slides telescopically over a rod 39, secured centrally to the bottom of the tank. The guide-tube 1 carries at or near its lower end a tappet 3, and at a suitable distance above said tappet is arranged another tappet 4. A jointed valve-lever 5 is arranged in the path of the lower tappet 3 and is adapted to be moved thereby when the gasometer-bell falls, on account of the withdrawal of gas, to a position near the bottom of the tank. This valve-lever 5, as shown, is fulcrumed upon a suitable support 6, and its outer end 7 is hinged to the inner end in such manner that when the tappet 3 in its downward course comes in contact with said arm the lever will be tilted upon its fulcrum and will raise the tube 8, which carries at its upper end a valve 9, fitting over the end of a water-pipe 10. This valve is arranged below the normal level of the water in the gasometer-tank, and when the valve is opened water may pass to the gas-generator, as will hereinafter be explained.

The valve-lever is made in two connected parts in order that the tappet 3 in its upward course after having passed below the end of the lever may rise with the bell without obstruction. The upper tappet 4 is adapted to engage a lever 11, to which is connected a valve 12, fitting over and normally closing a gas-escape pipe 13, which extends above the normal water-level in the gasometer. The arrangement is such that should an excessive amount of gas be generated and carried into the bell the upward movement of the latter will cause the tappet 4 to open the valve 12 and permit a part of the gas to escape. The lever 11, as shown in Figs. 1 and 9, has a yoke portion 14 fitting around the head of the valve, and the latter is pivotally attached to said yoke by a pin 15. The rear end 16 of the lever rests within a slotted bracket 17 above the pipe 13. It will be seen that when the tappet 4 in its upward movement engages the lever 11 the latter will fulcrum upon the bracket 17 and the valve will be raised. When the bell is being inserted in the gasometer-tank, however, the tappets 3 and 4 must necessarily pass downward past the lever 11, and the said lever will then fulcrum upon the pivot-pin 15 and will tilt without disturbing the valve.

The water-pipe 10 extends through the bottom of the gasometer-tank and is connected with a pipe 18, leading into the lower part of

a generating-chamber 19, within which is arranged a vertical series of carbid receptacles or holders 20, and the escape-pipe 13 leads through the bottom of the gasometer-tank to the atmosphere through a branch 13ª. Surrounding the generating-chamber 19 is a water-jacket 21, within which is arranged a bell or cover 22, said cover extending over the top of the chamber and into the water-jacket, thereby forming a seal. The chamber 19 is provided with a removable cap or cover 23, which fits gas-tight over the top of the chamber and may be suitably secured thereto, and said cover is provided with an escape-valve 24, fitting within an opening 25 in the cover. A gas-pipe 26 is vertically arranged between the chamber 19 and the bell 22, its upper end extending above the water-level and the bell and its lower end extending through the bottom of the water-jacket and thence by way of the horizontal section 26ª to the section 26ᵇ, which extends upwardly through the gasometer-tank into the bell B above the water-level, where it is connected to a flexible tube 26ᶜ, the free end of which is carried by a float 27 upon the water in the tank. The end of the flexible tube, as shown, projects a short distance beneath the surface of the water and is provided with a perforated nozzle or rose through which the gas enters the water in small bubbles. The float 27 is adjustable on said tube, so that the end of the latter may be arranged at any desired depth. The range of adjustment for practical working will, however, be limited by the gas-pressure in the pipe 26 and the depth of the water seal in the condensation vessel 35. This water-sealed receptacle 35 is connected to the lower end of the section 26ᵇ to receive the water of condensation from said pipe. The service-pipe 28 leads from the interior of the bell above the water-level through the bottom of the gasometer-tank and thence outward through the pipe 28ª to the burners or gas-mains, and a suitable water-sealed drip vessel 29 is connected to the pipe at a low point in order to remove the water of condensation from the pipe.

The carbid-holders, as shown in Figs. 1 and 8, consist of circular pans, having one or more tubes 30 extending upwardly through the bottom and through which the water may flow onto the carbid, which is indicated by the reference-numeral 31. The tops of these tubes are below the upper edges of the pans, so that the water will not flow over the edges of the pans. A central tube or holder 32 is also arranged in each pan, through which a gas-pipe 33, hereinafter referred to, extends. The carbid-holders, as shown in Fig. 1, are arranged in a vertical series, and in order to remove the several holders for the purpose of cleaning and charging the sleeve 32 is slotted at its upper end, and tongues 34 are turned outwardly in order that the pans may be lifted by inserting a hook or fork beneath said tongues. It will be seen that water admitted to the lower part of the generating-chamber will pass successively through the several holders to the upper holder. The tubes 30 while admitting the water to the holders also afford efficient cooling-surfaces for the carbid with which they are surrounded, the heat being conducted to the water within the tubes. The provision of these cooling-tubes is an important feature, as the cool generation of gas is necessary for the best results at the burners. This cooling during generation is further effected by the water-jacket, and the subsequent washing of the gas still further cools it.

The operation of the apparatus so far as described is as follows: When the gasometer-bell falls by reason of the consumption of gas until the tappet 3 strikes the lever 7 and elevates the valve 9, water will pass through the pipes 10 and 18 into the bottom of the generating-chamber 19, from whence it will flow through the tubes into the lowermost receptacle 20ª onto the carbid within said receptacle. Assuming the cap 23 or its valve 24 to be removed, the bell or cover 22 being retained, the gas generated will pass upwardly through the tubes in the succeeding holders and thence into the cover 22 above the level of the water. From the interior of the bell or cover 22 the gas will pass through the pipe 26 to the flexible tube 26ᶜ and thence into the gasometer-bell B, thereby causing the latter to rise. A further consumption of gas will cause a repetition of this operation, more water being admitted to the generating-chamber and the gas passing into the gasometer-bell. Should an excessive amount of gas be generated, the rising of the bell will bring the tappet 4 into contact with the valve-lever 11, thereby opening the valve 12 and permitting the excess of gas to escape through the escape-pipe 13. The apparatus thus far described, therefore, will be found to comprise an operative machine when the top 23 or valve 24 is removed, so as to permit the gas to pass from the generating-chamber to the pipe 26. The gas generated, however, may not be as perfectly washed and cooled as desired, owing to the fact that it is introduced into the water in the gasometer-tank near the top of the same.

In order to more thoroughly wash and cool the gas, it is necessary to introduce it at a greater depth in the water of the gasometer-tank, so that in its passage upward through the water the impurities will be removed. This introduction of the gas at a greater depth in the water requires a higher gas-pressure in the generator, and this in turn requires a corresponding increase in the pressure of the water supplied to the carbid, which of course must be sufficient to overcome the back pressure of the gas. In order to provide for the introduction of the gas at a desirable distance below the water-level in the gasometer for the purpose of washing the gas, the pipe 33, hereinbefore referred to, is provided, said pipe leading from the upper

part of the generating-chamber downwardly through the central tubes or sleeves of the holders and through the bottom of the tank and thence continuing by way of the sections 33^a and 33^b upwardly through the gasometer-tank to a short distance above the level of the water and terminating in a downwardly-turned portion 33^c, which extends to the desired distance below the level of the water in the gasometer-tank and is provided at its extremity with a perforated rose or nozzle 36, and the top 23 and weighted valve 24, hereinafter mentioned, are provided in order that the top of the generating-chamber may be closed gas-tight. The gas then generated instead of passing into the pipe 26 upon the outside of the generating-chamber will be forced to pass through the pipe 33 and from thence by way of the nozzle 36 into the water in the gasometer-tank and in its upward movement through the water into the bell will be thoroughly washed. Any leakage past the valve 24 or cap 23 will not accumulate in the head 22, but will pass through the pipe 26 into the gasometer-bell. Should the pipe 33 in any manner become closed, so as to interfere with a free passage of gas therethrough, the valve 24 will lift and the gas will pass into the pipe 26. In order to supply water to the generator-chamber at a pressure sufficiently high to overcome the gas-pressure in said chamber, I provide a high-pressure water-supply tank D, which is conveniently supported at the top of the gasometer-tank, as shown in Fig. 1. This tank is connected with the water-pipe 18, leading to the bottom of the generating-chamber, by means of a branch 18^a, and a valve 37 normally closes the end of the pipe within the supply-tank. This valve is operated by a jointed lever 38, similar to the lever 5 in Fig. 4. Connected to the top of the gasometer-bell is a rod 39, which, as shown, extends over the side of the water-supply tank and is provided with a downwardly-extending arm 40, the lower end of which extends into and is guided by a closed guide-tube 41, projecting downwardly from the bottom of the supply-tank. Upon this rod is arranged a tappet 42, which when the gasometer falls engages the lever 38, thereby raising the valve 37 and permitting water to pass from the supply-tank into the generating-chamber. The gas generated by the admission of the water to the carbid passing into the gasometer-bell raises the tappet 42, and the valve 37 falls to its seat and cuts off the further supply of water until the gasometer-bell again falls. The tappet 42 is of course arranged to open the valve 37 before the valve 9 is raised by the tappet 3 in cases where the machine is arranged for operating at high or low pressure, as illustrated in the drawings.

When operating at low pressure in a combined machine, pipe 18^a may be closed by a valve 42, and when operating at high pressure the pipe 10 may be closed by a valve 43, and the top 23 or valve 24 should be removed when operating at low pressure and said cap and cover should be in place when operating at high pressure.

It will be seen that the machine is operative without the high-pressure attachments for washing and cooling the gas, and it may thus be placed upon the market as an inexpensive machine. Where better results are desired, however, the high-pressure attachments may be coupled to the machine, as shown in the drawings, and either worked independently of the low-pressure apparatus or coöperatively therewith.

In order to provide against explosions which might occur through carelessness in cleaning and charging the generator, means are provided whereby the generating-chamber cannot be opened until the branch outlet leading therefrom is opened and the gas connection between the generator and the gasometer are closed. Means are also provided for connecting the generating-chamber with the escape-pipe at the same time that the drainage-pipe is opened in order to permit air to enter the chamber, so that the water may drain off freely from the carbid-chamber and water will be prevented from being siphoned over through the pipe 33 into the generating-chamber. To this end I provide a locking-bail E, one arm 45 of which is hinged vertically in eyes 46^a upon the rear of the water-jacket 21, said bail being adapted to extend over the bell or cover 22, its opposite arm 47^a terminating in a loop or eye 48^a, which is adapted to fit over the end of a drainage-outlet pipe 49, leading from the bottom of the generating-chamber. To the lower end of the arm 45 of the bail is connected a horizontal arm 46, and to said arm a system of levers 47, 48, 49, 50, 51, and 52 is connected in such manner that when the bail is swung to one side, as shown in full lines in Fig. 3 and in dotted lines in Fig. 7, valves 53 and 54 in the high and low pressure gas connections 33^a and 26^a, respectively, will be closed, whereas when the bail is swung so as to extend over the top of the bell or cover 22 said valves will be opened. The lever 48 also opens and closes the valve 55, arranged in a pipe-section 56, leading from the escape-pipe to the pipe 26^a between the valve 54 and the generator. This valve 55 is opened by the levers when the valves 53 and 54 are closed and is closed when said valves are opened. This valve 55 is for the purpose of permitting gas which may be within the cover 22 to escape. This latter valve may, however, be dispensed with. A drip-receptacle 57 is connected with the high-pressure gas-pipe 33, and this receptacle is provided with a valve-controlled air-inlet 58 and a valve-controlled drainage-outlet 59, the valves of which are operatively connected to the bail, so that the receptacle will be drained whenever the bail is moved, and a trap can not be formed in the pipe by neglect of the operator. As the pres-

sure in the pipe 33 is usually high enough to prevent the use of an ordinary water-sealed drainage-receptacle, such as the receptacles 35 and 29, the valve-controlled air-vent and drainage outlets are provided, and the valves which control said vent and outlet are connected by lever 60 and lever-arms 61 and 62 to the system of levers, so that each time the bail is swung to one side in order to remove the cover of the generator the vent and drain-outlet of the receptacle 57 will be opened, and when said bail is returned to its normal position the vent and outlet will be closed. The receptacle will therefore be drained at each movement of the bail. In order to prevent the removal of the bell or cover 22 before the drainage-tube of the generating-chamber is opened, a threaded cap 64 is removably fitted onto the end of the drainage-tube 49. To obtain access to the generating-chamber, therefore, it is necessary first to open the drainage-tube, thus permitting the water to escape and then to swing the locking-bail to one side, thus closing the gas connection between the generator and gasometer and also opening the drainage-receptacle 57. When this drainage-tube 49 is open, it is necessary to admit air to the generating-chamber in order to permit the water to pass out freely and to prevent the formation of a partial vacuum therein, which would draw water through the pipe 33 from the gasometer-tank into said chamber and start a siphonic action through said gas-pipe if the bail were not promptly moved aside, so as to cause the valve 53 in said pipe to close. For the purpose of preventing this siphon action a valve 65 is arranged in a branch pipe 66, leading from the pipe 33 to the escape-pipe, and this valve is connected by a lever-arm 67 and rod 68 to the head or cap 64, which closes the drainage-outlet. A pin 65^a is secured to the center of the cap 64 and extends into the drain-pipe. In order to entirely remove the cap, so that the bail can be turned to one side, the cap must be moved outward, as shown in full lines in Fig. 3 and in dotted lines in Fig. 7, until the inner end of the pin clears the end of the drainage-tube. This movement insures the opening of the vent-valve 65 immediately after the drainage-tube is opened. A guard 69, secured to the drain-pipe, extends laterally on each side thereof and prevents the operator from carelessly pushing the cap inward into a position where the valve 65 would be closed while the water is draining from the generation-chamber.

In a branch pipe 70, connected with the water-pipe 18, I arrange a water-gage 71, open at the top. Communication between this gage and pipe 18 is normally cut off by a valve 72, to which is attached a weighted lever 73. By raising the lever into the position shown in dotted lines in Fig. 4 water may be admitted to the gage. The water thus admitted will rise in the gage to a height above the level of the water in the generator which will depend upon the gas-pressure in the generator, as when the apparatus is in operation the gas-pressure is a known and nearly constant quantity, depending upon the depth to which the gas is introduced in the gasometer-tank, and the weight of the gasometer-bell by making the proper deduction for the gas-pressure the height of the water in the generating-chamber may be determined from the gage and the number of carbid-holders and the amount of carbid still unused may be approximately determined. In practice the gage 71 is graduated, so as to indicate in inches and fractions thereof the water-level in the generating-chamber by placing the lowermost mark upon the gage at the height to which water would be forced therein by the normal gas-pressure. After determining the height of water in the generator the valve is closed and the water may be withdrawn from the gage through a valve-outlet 74. In first starting the machine, no gas having been generated, the gasometer-bell will be at the bottom of the tank, with its tappet 3 below the lever 5 and the tappet 42 below the lever 38, so that no water can pass by way of the mechanically-operated valves 9 or 37 to start the machine. By simply raising the weighted lever 73, however, a charge of water may be admitted to the generating-chamber from the gage and sufficient gas will then be generated to raise the gasometer-bell into operative position.

It will be seen from the above description that the apparatus is not only automatic in its action and proof against accidents, but that it may be arranged as a cheap machine where washing and cooling of the gas are dispensed with, or with a slight additional expense the attachments described may be added for the purpose of washing and cooling the gas.

The apparatus may be supported in any suitable way, as by means of the legs *k*.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an acetylene-gas apparatus, the combination with a gasometer, a generating-chamber, an outlet-pipe for said chamber, and gas connections between said gasometer and chamber of a cover for said chamber, a pivoted bail extending over said cover and having an eye at one end adapted to fit over the outlet-pipe, a cap fitting the end of said pipe and adapted to prevent the removal of the bail, and means connected with said bail for opening and closing the gas connections between the gasometer and chamber.

2. In an acetylene-gas apparatus, the combination with a gasometer, of a generator comprising a chamber adapted to contain carbid, a valved top removably secured to said chamber, a water-jacket surrounding said chamber, and a bell or cover extending over said top and into the water-jacket, separate gas connections leading from the interior of

the generating-chamber and the interior of the cover to the interior of the gasometer, and means for feeding water into the generating-chamber.

3. In an acetylene-gas apparatus, the combination with a gasometer, of a generator comprising a chamber adapted to contain carbid, a top removably secured to said chamber, a water-jacket surrounding said chamber, a bell or cover extending over said top, separate gas connections leading from the interior of the generating-chamber and the interior of the cover to the interior of the gasometer, a source of high-pressure water-supply, and means operated by the gasometer-bell for admitting water from said high-pressure supply or from the gasometer-tank to said generating-chamber.

4. In an acetylene-gas apparatus, the combination with a gasometer, a normally closed generating-chamber, and a gas-pipe leading from said chamber into the gasometer and terminating below the water-level in said gasometer, of a normally open valve in said pipe, a drip-receptacle attached to said pipe, said receptacle having separate air-inlet and water-outlet openings and valves normally closing said openings, a locking device for preventing the opening of the generating-chamber and a system of levers connected to said device, said levers being arranged to operate the pipe-valve and the drip-receptacle valves so as to close the former and open the latter when the locking device is removed from the cover.

5. In an acetylene-gas apparatus, the combination with a gasometer, a normally closed generating-chamber, a gas-pipe leading from said chamber into the gasometer and terminating below the water-level in said gasometer, of a drip-receptacle connected to said pipe, said receptacle having an air-inlet opening and a drainage-opening and normally closed valves in said openings, devices for closing and locking said generating-chamber, and means connected with said devices for operating said valves.

6. In an acetylene-gas apparatus, the combination with a gasometer, a normally closed generating-chamber, having a valve-controlled air-vent, a drain-pipe for said chamber, a cap adapted to close the end of said drain-pipe, a lever connecting said cap with the valve in the air-vent, a pin connected centrally to said cap and adapted to fit into the drain-pipe, and a guard adjacent to said drain-pipe and adapted to prevent the movement of the cap in a direction to close the vent while the cap is removed from the drain-pipe.

7. In an acetylene-gas apparatus, the combination with a gasometer and a source of water-supply, of a generating-chamber, a vertical series of carbid-holders in said chamber, gas connections between said chamber and gasometer, a pipe leading to said chamber from the source of water-supply, a normally closed valve in said pipe adapted to be automatically opened by the gasometer-bell, a gage connected to said pipe between said automatically-operated valve and the generating-chamber, and a valve adapted to normally close communication between said gage and pipe.

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

FREMONT L. IRISH.

Witnesses:

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GEORGE W. BATES.