No. 705,078. Patented July 22, 1902.

W. S. HAMM & J. A. MOSHER.

ACETYLENE GAS GENERATOR.

(Application filed Jan. 14, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig 1

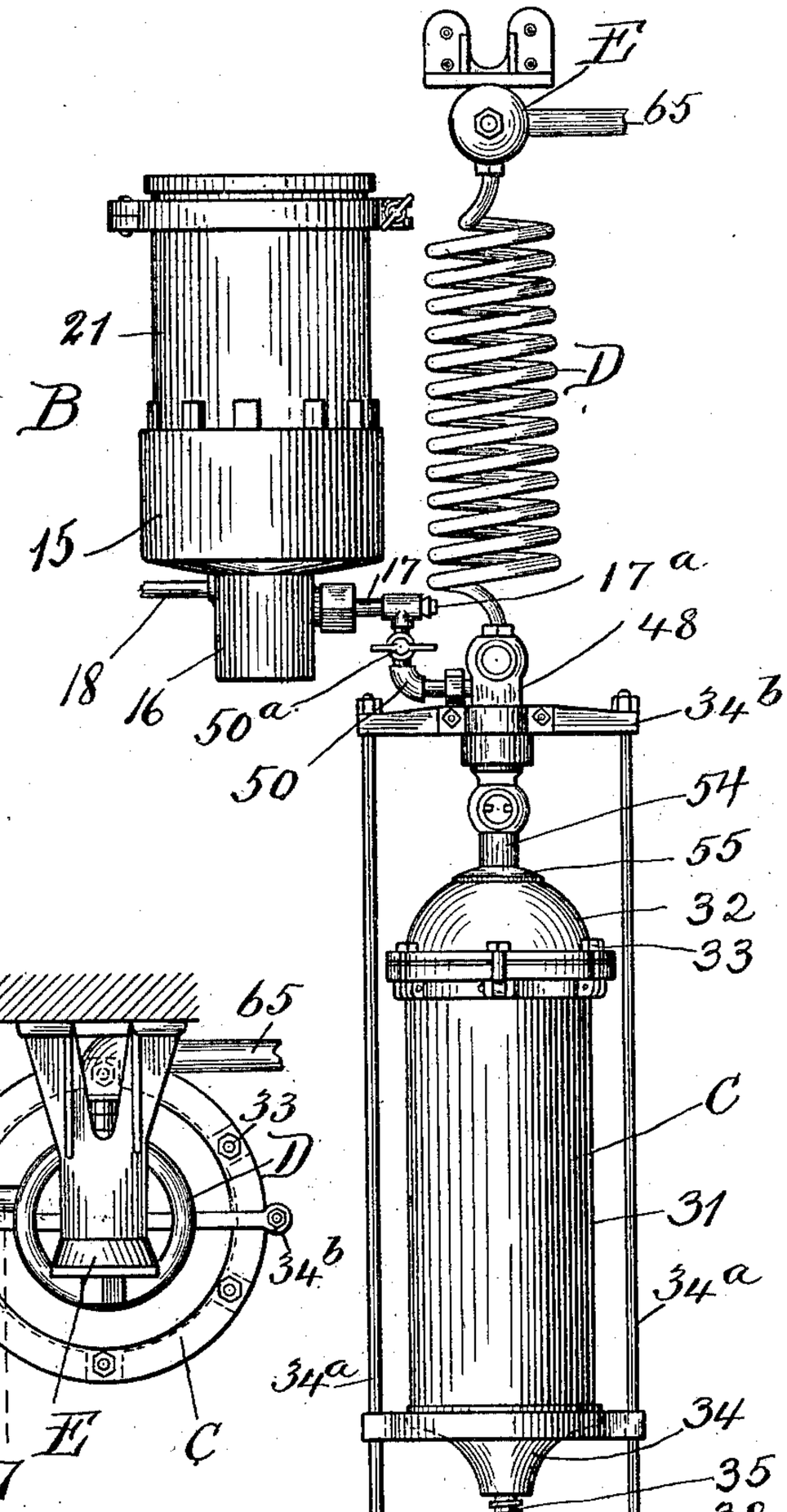

Fig 2

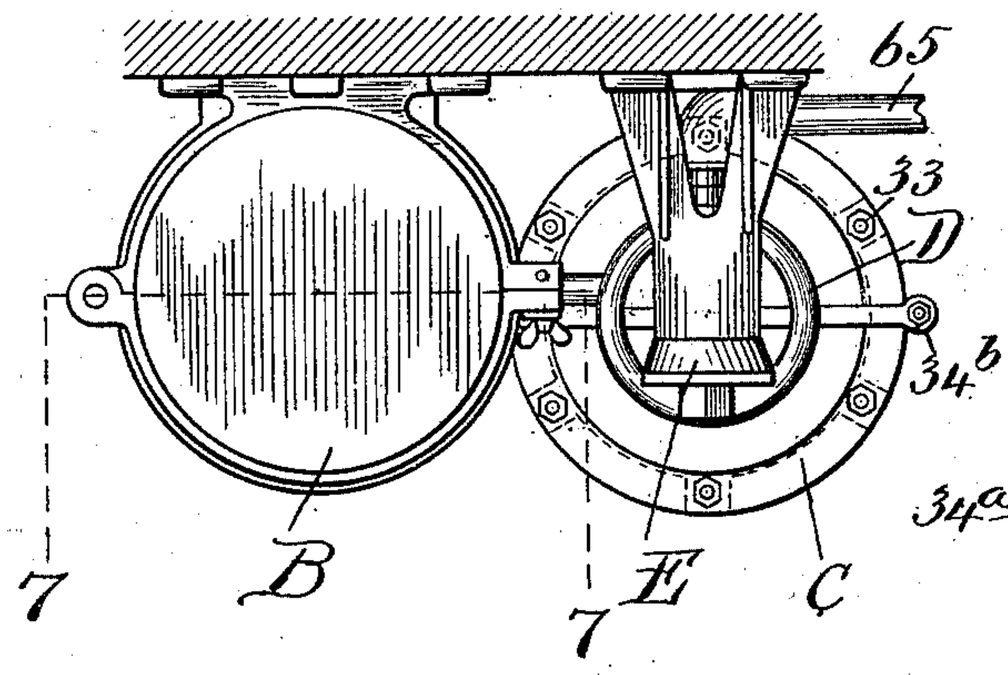

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Fig 4

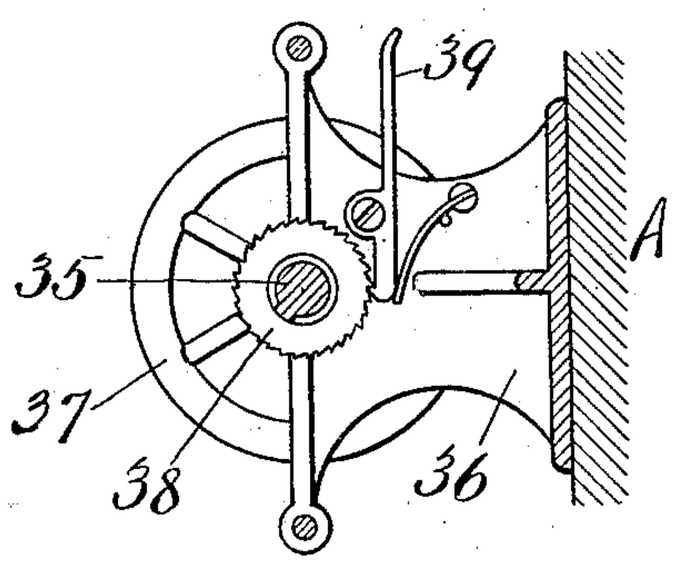


Fig 3

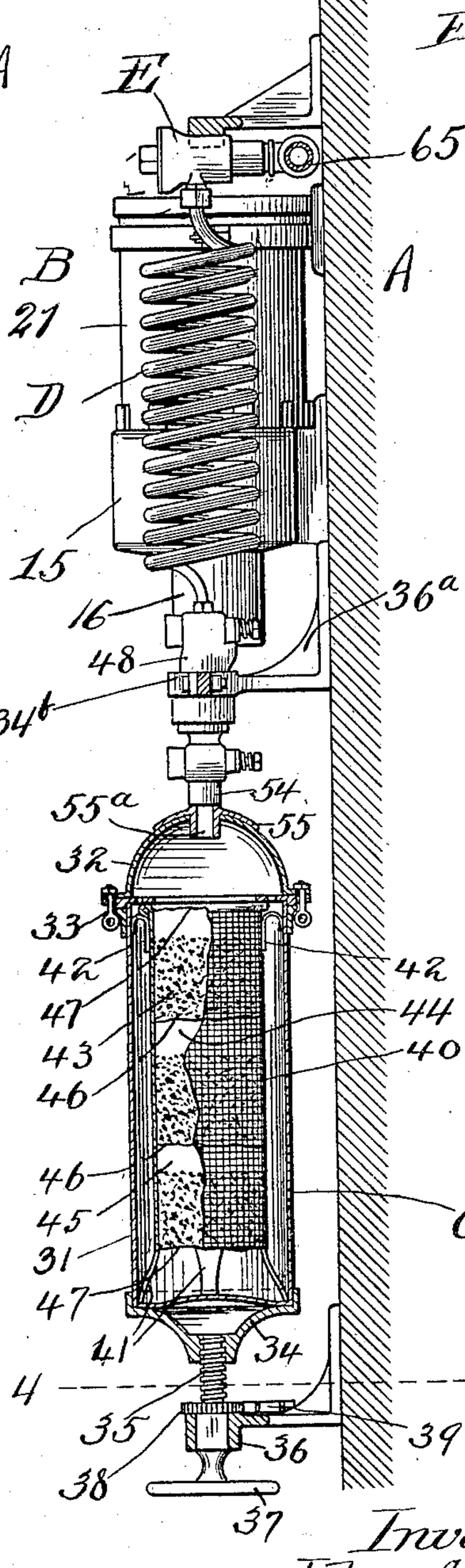


Fig 6

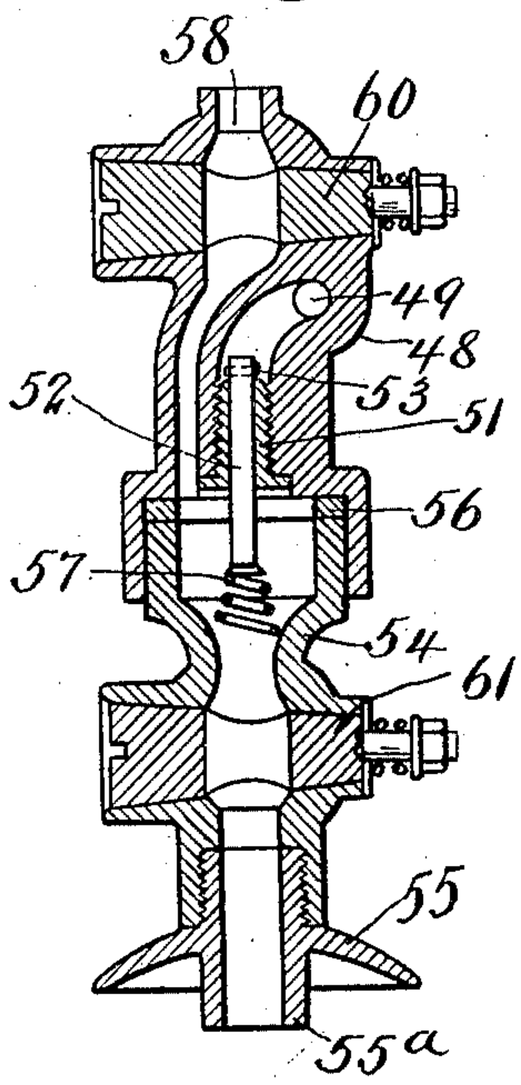
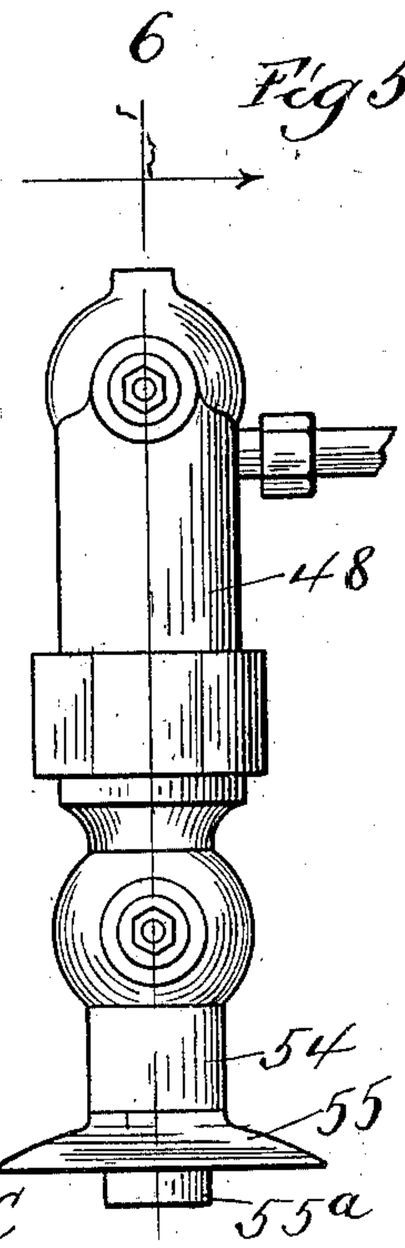


Fig 5



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(No Model.) 3 Sheets—Sheet 3.

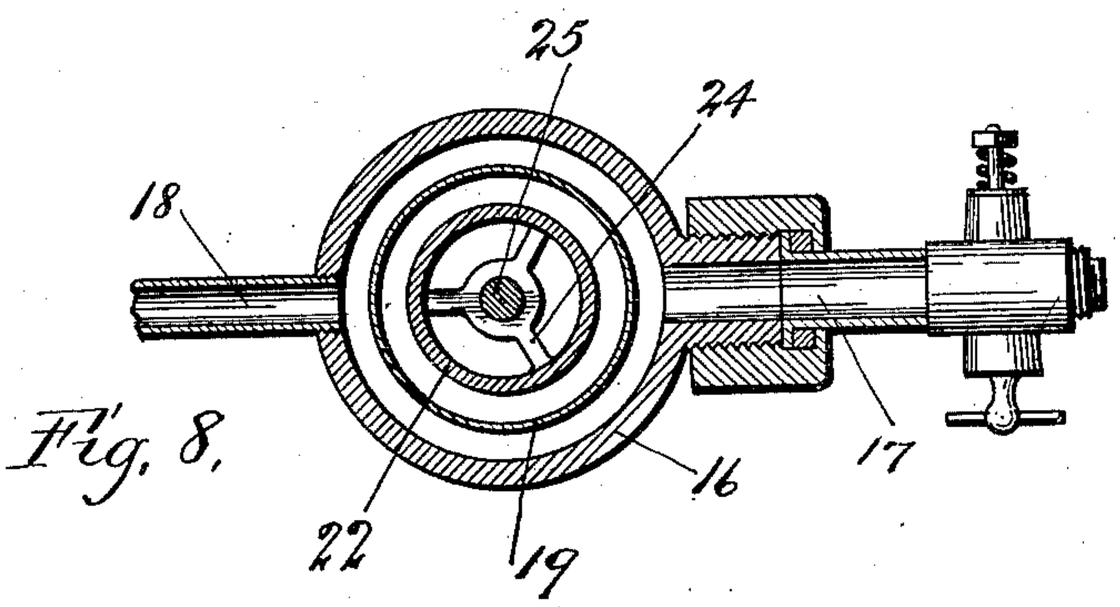

Fig. 8.

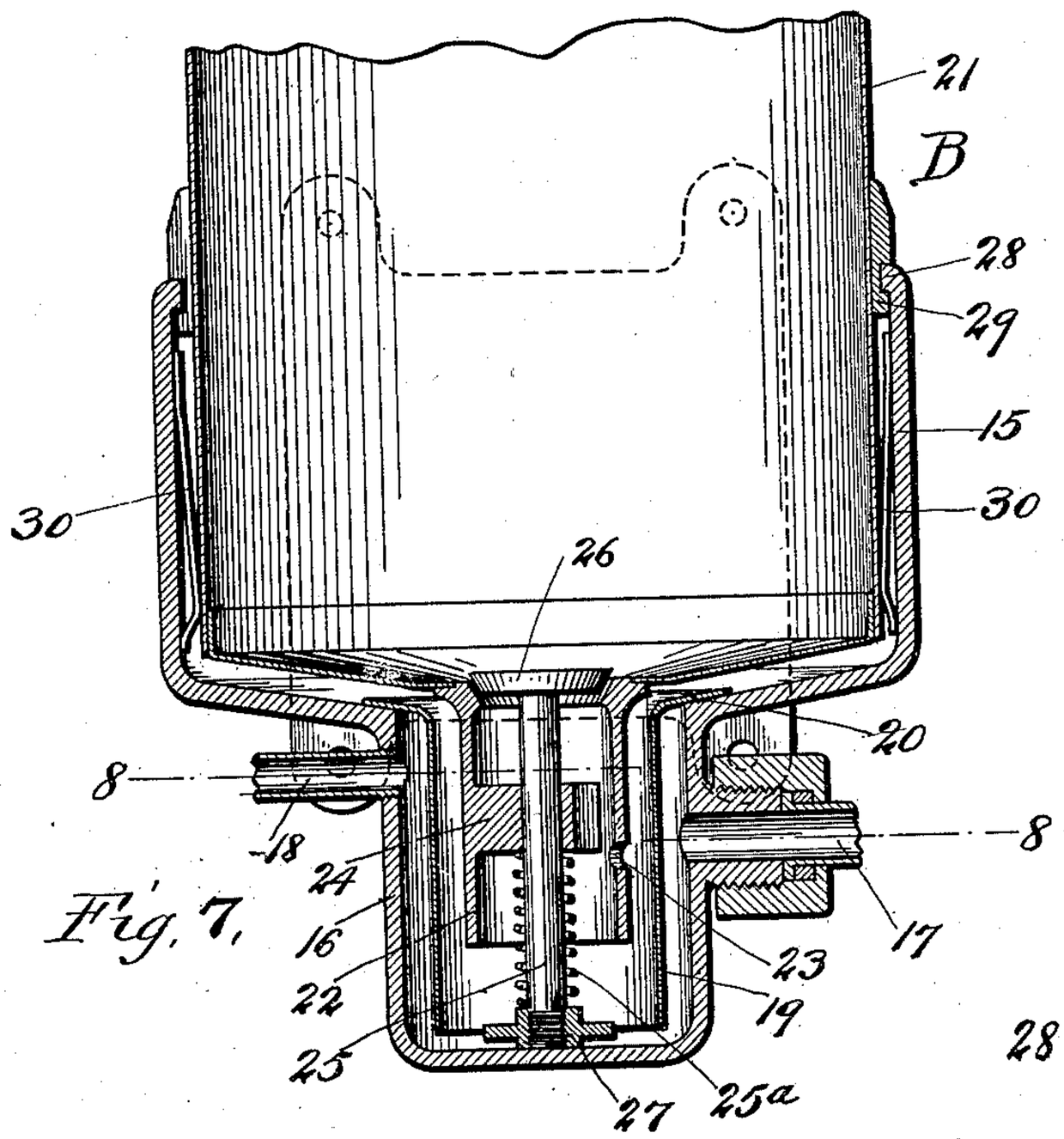

Fig. 7.

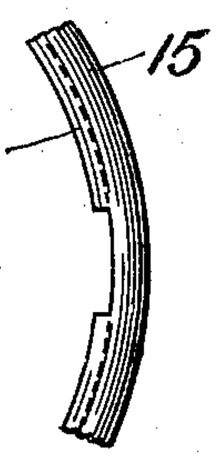

Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM S. HAMM AND JOHN A. MOSHER, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE ADAMS & WESTLAKE COMPANY, A CORPORATION OF ILLINOIS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 705,078, dated July 22, 1902.

Application filed January 14, 1901. Serial No. 43,172. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM S. HAMM and JOHN A. MOSHER, citizens of the United States of America, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Acetylene-Gas Generators, of which the following is a specification and which are illustrated in the accompanying drawings, forming a part thereof.

This invention relates to that class of generators which are intended to supply a distributing system provided with a plurality of burners; and the present invention is particularly applicable for the lighting of railway-cars, houses, &c.

The objects of the invention are to provide for the generation of the gas without unduly heating the carbid from which it is made by the chemical action; to provide and regulate a constant supply of water; to provide for the proper delivery of the water to the carbid; to provide for the cooling of the gas and the condensation of the vapor carried out of the generator, and generally to provide a practical, simple, easily-controlled, and easily-adjusted generator for the uses named. These various objects are attained in the construction hereinafter fully described, and which is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the device. Fig. 2 is a plan view of the same. Fig. 3 is a side view, partly in elevation, partly in section, and some of the parts being shown as broken away. Fig. 4 is a detail plan section on the line 4 4 of Fig. 3. Fig. 5 is a detail side elevation. Fig. 6 is a longitudinal central section of the water-feed and gas-delivery attached to the generator proper, taken on the line 6 6 of Fig. 5. Fig. 7 is a central vertical detail section of the water-chamber. Fig. 8 is a plan section on the line 8 8 of Fig. 7, and Fig. 9 is a detail plan of one of the parts.

The device illustrated is shown as being capable of support by means of brackets secured to a wall-plate A; and it consists generally of a water font or reservoir B, a generator C, a gas-cooling and vapor-condensing coil D, and a gas-strainer E.

The water-reservoir comprises a cup-shaped receptacle 15, having depending centrally from its bottom a well 16, from the side wall of which lead a tube 17 and at a still higher elevation a vent 18. A cylinder 19, having imperforate walls and being of slightly less depth and of less diameter than the well, is located therein and is supported by a radial flange 20 at its upper end, which rests upon the bottom of the receptacle 15 and is soldered or otherwise secured thereto, so as to form a tight joint.

The reservoir proper, 21, is substantially in the form of a bottle having a neck 22, across the interior of which there is a bridge or spider 24, the hub of which is longitudinally apertured to provide a sliding bearing for a stem 25, upon the inner end of which is fixed an inwardly-opening valve 26, adapted to close the neck 22. Upon the outer end of the stem 25 there is removably placed a nut 27, and interposed between this nut and the bridge 24 there is placed an expansion-spring 25^a, coiled about the spindle 25 and normally holding the valve 26 to its seat. The reservoir 21 is adapted to enter the receptacle 15, its neck 22 entering the well 16 and being of less diameter and shorter than the cylinder 19. The stem 25 is of such length that when the reservoir is introduced into the receptacle 15 its end strikes the bottom of the well 16, thereby compressing the spring 25^a and opening the valve 26.

The upper end of the wall of the receptacle 15 has an instanding flange 28 with vertical slots, and upon the sides of the reservoir 21 there are placed blocks 29 in hook form, which will pass through the vertical slots in the flange, and the reservoir being partially turned will prevent its withdrawal. The reservoir is centered within the receptacle and prevented from jarring by means of longitudinal springs 30, secured to the inner walls of the receptacle and which are compressed by the reservoir as it is placed within the latter. The neck 22 of the reservoir is provided with a lateral aperture 23, so placed that when the reservoir is within the receptacle 15 this aperture will be on a level with the discharge-pipe 17.

The generating-chamber comprises a cylin-

drical receptacle 31, closed at the bottom and having a removable top or dome 32, which is secured to the cylindrical body by means of eyebolts 33, pivoted to the body portion and adapted to be turned into suitable slots in a radial flange at the base of the dome 32, these bolts being provided with screw-nuts, whereby the cap may be drawn down securely to form a gas-tight joint. The cylinder 31 rests upon a chair or plate 34, which has a central vertical screw-threaded aperture to receive a threaded stem 35, which is adapted to turn freely in the bracket 36, secured to the wall A, this stem being provided at its lower end with a hand-wheel 37. A ratchet-wheel 38 is fixed upon the stem 35 and coöperates with a spring-pawl 39. The chair-plate 34 is provided with suitable recesses or ways to receive and run upon vertical guide-rods 34^a, which rise from the bracket 36 and are united at the top by means of a cross-bar 34^b, forming a part of a bracket 36^a, secured to the wall A. By means of the threaded stem 35 the cylinder may be raised and lowered for the purpose hereinafter described.

Within the cylinder 31 there is placed a basket formed of woven wire and cylindrical in form, but of less length and diameter than the cylinder within which it is located. This basket is supported upon legs 41 and stayed at the top by arms 42, adapted to bear against the side walls of the cylinder 31. The basket is further fixed in position by any suitable means, as shown by direct pressure upon its top of the dome or cap 32 or an appurtenance thereof. The basket has woven-wire ends 47 and a plurality of horizontal partitions 46 of the same material, so that it is divided into compartments, as 43, 44, and 45, which may be of any desired number, these compartments being adapted to receive the carbid and which in charging are filled to about two-thirds of their capacity.

The connection between the water-reservoir and the generating-chamber is by means of a casting 48, adapted to be attached both to the pipe 17 or an extension 50 thereof and to a nipple 54, attached to the upper end of the generating-cylinder. The casting 48 is cored to form a duct 49, arranged to receive the water from the water-pipe and deliver it to the nipple 54, this duct being shown as opening laterally through the casting at its upper end and at its lower end having a vertical direction. Within the lower end of the duct 49 there is placed a plug 51, which is preferably threaded and which is centrally and longitudinally apertured to receive a rod 52, which fits loosely within the aperture, so as to permit the passage of water therethrough. This rod is of greater length than the plug and is provided at its upper end with a cross bar or head 53 to prevent its accidental withdrawal and is supported by a light spring 57, which is preferably housed within the aperture of the nipple 54 and has a tapering helical coil. The length of this spring is such that it normally raises the cross-pin 53 above the end of the plug 51.

A second duct 58 leads longitudinally through the casting 48 and is open at its lower end to the aperture of the nipple 54 and in communication at its upper end with the cooling and condensing coil D.

The aperture of the nipple 54 is enlarged at its upper end, so as to include both of the ducts in the casting 48, this casting being counterbored to receive the nipple end. The connection between the casting and the nipple is preferably by a sliding joint, made tight by the use of a suitable gasket 56 and secured by the action of the threaded spindle 35, so that in assembling the parts this spindle is lowered to allow the end of the nipple to pass below the end of the casting as the generator is placed upon its seat 34, and then as the screw is turned up the nipple is forced into the socket of the casting. The nipple 54 is secured to the dome 32 of the generator by means of a flange-cap 55, adapted to be soldered or otherwise secured to the dome and having a threaded nipple for entering the counterbored nipple 54. The latter nipple is provided with a stop-cock 61, so that when the generator is disconnected the escape of gas therefrom may be prevented. A similar cock 60 is seated within the casting 48, so as to control the gas-duct 58, and another one, 50^a, is located in the extension 50 of the water-pipe 17. This latter pipe is shown as having its end closed by means of a plug 17^a, so that, if desired, connection may be made with a plurality of generators.

The cooling and condensing coil D is an ordinary helical coil leading upwardly from the duct 58, so that any moisture condensed out of the ascending gas will run directly back to the duct 58 and the nipple 54 into the generator. The upper end of the coil D leads into a strainer E and passes thence into the distributing system 65.

By the construction shown and described herein the various obstacles to the satisfactory generation and delivery of acetylene gas are successfully overcome. It is of course essential that a uniform pressure of gas be maintained in order that the most satisfactory results in illumination may be secured. When, as in the present case, the generator is designed to automatically govern the pressure, it is essential that the head of water be uniform. The difficulty in securing this uniformity of head is overcome by the use of the form of water-tank shown, in which the discharge is controlled by air-pressure. The connection between the reservoir 21 and its receptacle 15 is sufficiently loose to allow air to enter freely between the two; but the air is prevented from access to the interior of the reservoir, and hence the discharge of water is prevented therefrom when the level of the water within the well 16 is above the vent or spigot 23, and this aperture is so located that the water-level falls below its upper side

before it falls entirely below the discharge-pipe 17.

By introducing into the water-passage a removable rod or spindle 52 provision is made for the automatic regulation of the water-supply by the gas. While this spindle fits loosely within the aperture of the plug 51, it is nevertheless sufficiently large so that the annular space surrounding it is so contracted that gas will not bubble up through it when filled with water, and hence if the pressure of gas is sufficient to retard the water-flow the latter is entirely cut off thereby, and if the pressure rises still higher the water is actually raised bodily above the plug, when the gas-pressure is relieved by the gas bubbling up through the water in the passage 49 and escaping through the pipe 17 and to the chamber surrounding the cylinder or curtain 19 in the well 16 and therefrom through the vent-pipe 18. The employment of the spindle 52 furthermore guards against the stoppage of the water-flow by an accumulation of sediment in a passage which is sufficiently restricted to admit of the automatic regulation by the gas-pressure, though it provides for a passage of very considerable area, notwithstanding the fact that it is sufficiently restricted in one of its dimensions to serve the desired end in regulation.

In car-service the spindle performs the additional function of automatically dislodging any sediment which may accumulate in the passage around it, as the jarring of the car causes its reciprocation, and this action is greatly facilitated by the employment of the spring 57.

Great difficulty has been experienced in generating gas by delivering to a mass of carbid a regulated supply of water, and for this reason large generators have usually been constructed, so as to employ a large volume of water into which the carbid is dropped or lowered, so that the water will take up much of the heat due to the chemical action. It is known that sufficient heat is developed by this action to materially damage both the carbid and the gas, the former being roasted and rendered less efficient for the production of gas and the latter being brought into a condition in which its molecular arrangement is changed so that it readily condenses in the pipe and at the burners.

While it is of course impossible to utilize the chemical action in the generation of gas without having present the resultant high temperature, we have found that the high temperature which results in the injury to the carbid and the gas is due to a retention of the heat, so that the temperature becomes much greater than the initial temperature due to the chemical action. By the construction herein shown and described we provide means for the rapid distribution of the heat, and thus prevent a development of the disadvantageous temperature. This is secured by the peculiar form of generator employed, and particularly by reason of the subdivision of the basket or carbid-container into a plurality of isolated compartments, each holding a comparatively small quantity of the material and being open upon all sides, so that the gas and heat may escape in all directions. The heat distribution is further facilitated by the large size of the generating-cylinder as compared with the contracted area within which gas is generated. The water drops, of course, upon the upper end of the basket, and the chemical action commencing at the extreme top extends gradually downward, but is not set up to any material extent in any of the lower compartments of the basket until the carbid above it is substantially all spent, so that the seat of any rapid generation of gas and consequent development of heat is localized. The gas nevertheless, of course, entirely fills the cylinder 31, and hence the entire body of the latter is available for radiating purposes, and we have found in actual practice that this cylinder continues so cool that the hand may be placed upon it without discomfort. The gas is still further cooled by the peculiar arrangement of the eduction-passage as the water is dropped down through the ascending gas and vaporized to a sufficient extent to extract much of the heat therefrom.

A still further and very material advantage in the construction herein shown and described is found in the provision for renewing the supply of carbid. In railway or domestic service much annoyance results from recharging a stationary generator. Even though the charging may be by means of a specially-prepared cartridge, a spent cartridge cannot be removed without giving rise to disagreeable odors and the scattering of the slaked lime. Neither is it practicable to prepare large cartridges for storage and shipment so that they shall be complete in themselves.

The removable generator of the present invention is a complete storage and shipping case for the carbid. It is easily attached to the water-service and gas-distributing portions of the system and having been attached is at once brought into service as a complete generator by merely opening its valve. The carbid having been spent the valve is closed and the generator is easily removed, to be replaced by a newly-filled one without loss of time, the discharge of any gas whatever, or the scattering of any of the lime. The refilling can be done entirely away from the premises, and a sufficient number of generators may be intrusted to the charge of one person to enable him to become proficient in their care. In railway-service the supervision of the lighting system of each car may be attended to at certain designated stations, wholly relieving the trainmen of responsibility save that of lighting and extinguish-

ing. The generators proper may be made as a separate article of manufacture to be supplied to users of the system described herein.

For railway-service the system herein described has the added advantage of extreme safety. The gas is generated only as needed. No material quantity is stored in generator or pipes. The high efficiency of the gas admits of the use of much smaller pipes than when gases are used which must be burned in relatively large volume to secure the same illumination.

The generator may be considerably removed from any water-tank, even that of the lighting system, so that in case of accident the risk of bringing the water and carbid together, and thus generating gas to support combustion, is very small. The generators may be made very strong, so that even in very severe accidents they are not likely to be fractured, and hence their contents will not be exposed. Indeed, an accident is far more likely to entirely stop generation of gas by cutting off the water-supply.

While we have called the coil D a "cooling" and "condensing" coil, it is in practice found to serve the purpose principally of the condenser, as the gas is sufficiently cool before entering it.

To insure the dropping of the water directly upon the carbid and prevent it from running down the sides of the generating-chamber, the cap 55 is provided with a nipple 55ª, which extends through and below the inner face of the dome 32.

We claim as our invention—

1. The combination with an acetylene-generating chamber, of a water-passage leading thereto, and a spring-supported longitudinally-movable rod or spindle located within such passage, and of such size as to so restrict the passage that an excess of gas-pressure will stop the flow of water.

2. In a combined acetylene-generator and shipping-case, a tank having an attaching-nipple, means for hermetically sealing the tank when not in service, a carbid-container fixedly held within the tank and comprising a plurality of compartments each having a foraminous cover whereby water dripping from one compartment is distributed over the entire surface of the contents of the one next below.

3. In a combined acetylene-generator and shipping-case, a tank having a valve-controlled attaching-nipple, a carbid-container fixedly held within the tank and comprising a plurality of compartments each having a foraminous cover whereby water dripping from one compartment is distributed over the entire surface of the contents of the one next below.

4. In a combined acetylene-generator and shipping-case, a tank, a carbid-container comprising a plurality of compartments each having a foraminous cover whereby water dripping from one compartment is distributed over the surface of the contents of the one next below, a removable cover for the tank such cover having a valve-closed nipple and being adapted to engage the top of the carbid-container and fixedly secure the same.

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