A. GRANDJEAN.

CARBURETING APPARATUS.

APPLICATION FILED JUNE 28, 1907.

953,606.

Patented Mar. 29, 1910.

4 SHEETS—SHEET 1.

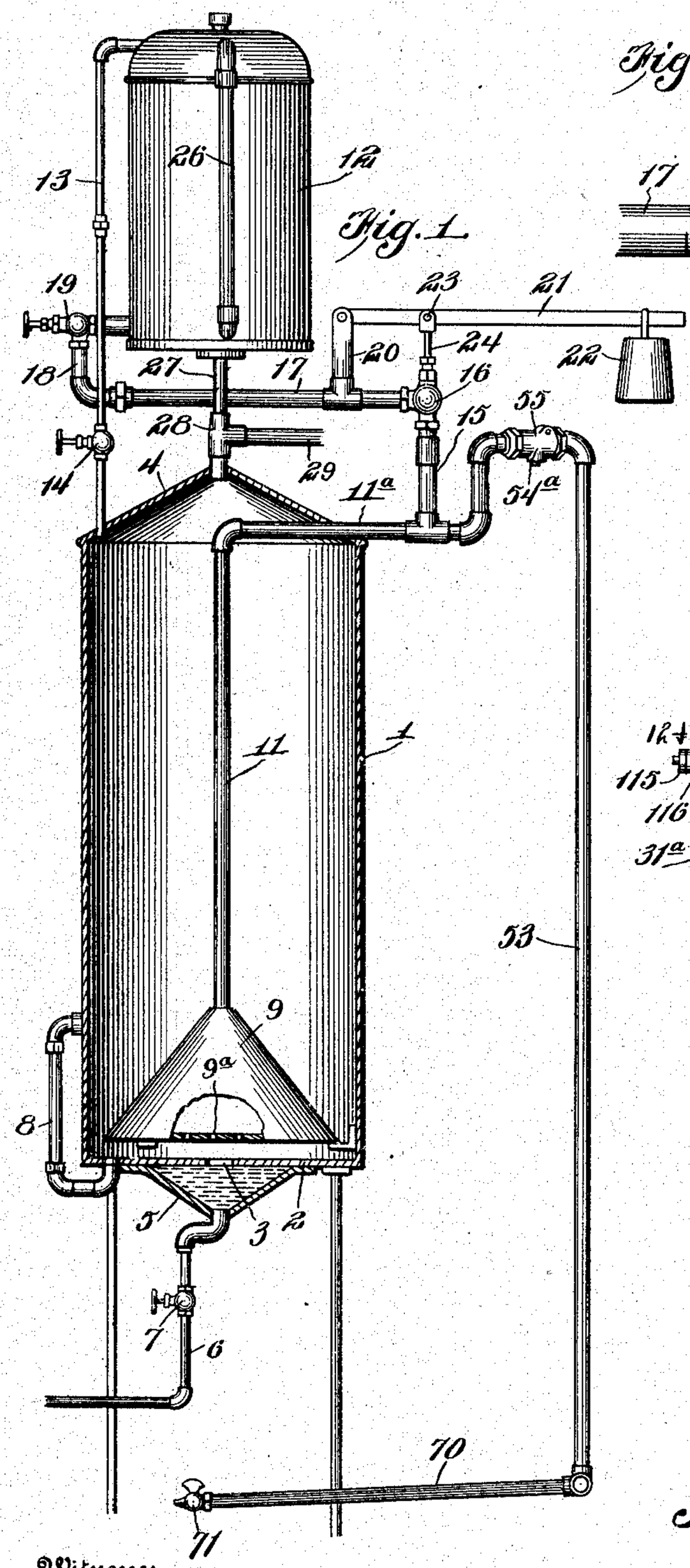

Fig. 1.

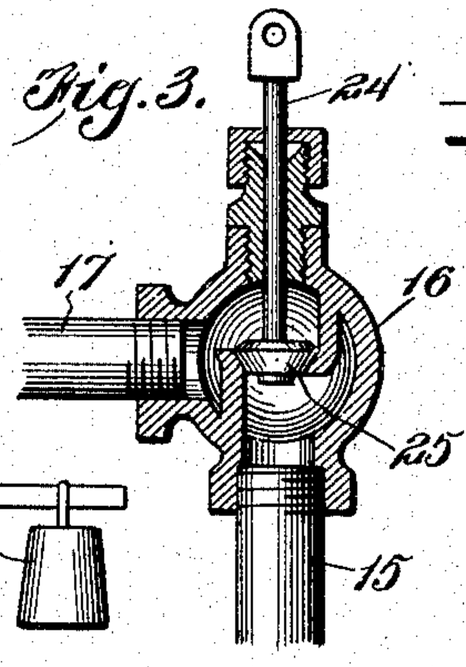

Fig. 3.

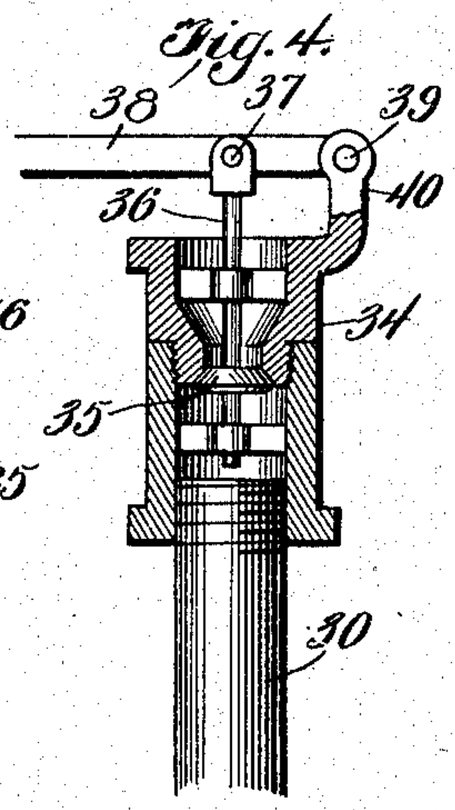

Fig. 4.

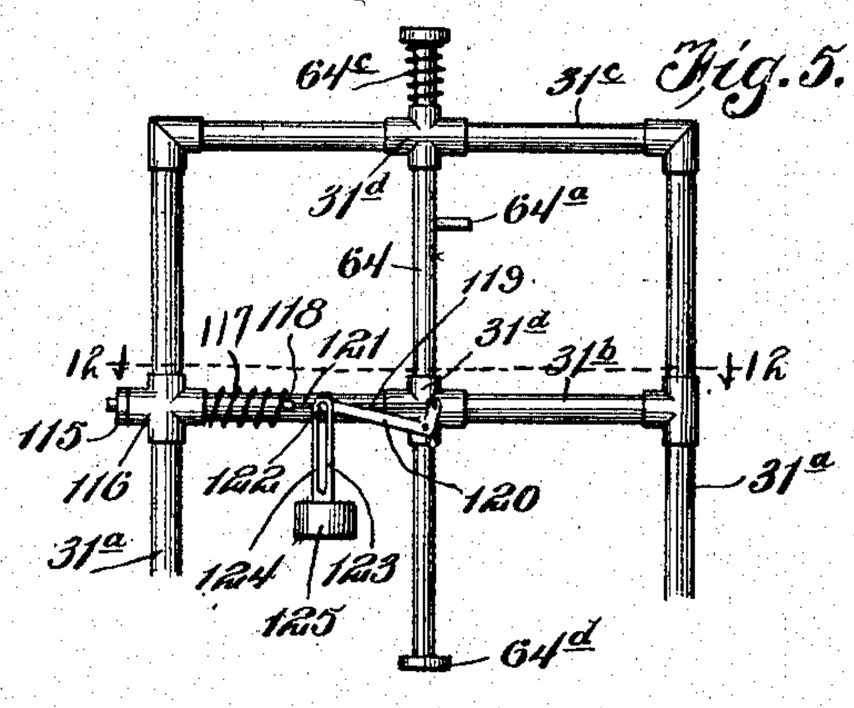

Fig. 5.

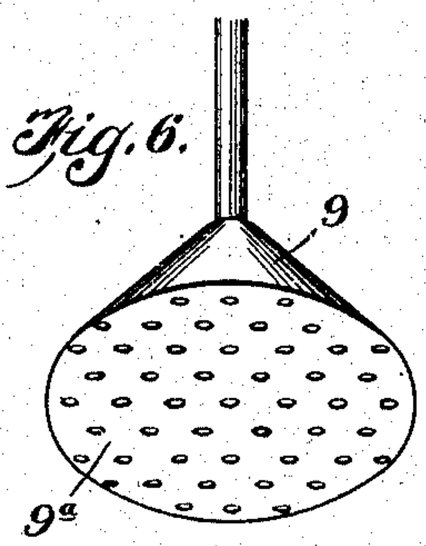

Fig. 6.

Witnesses

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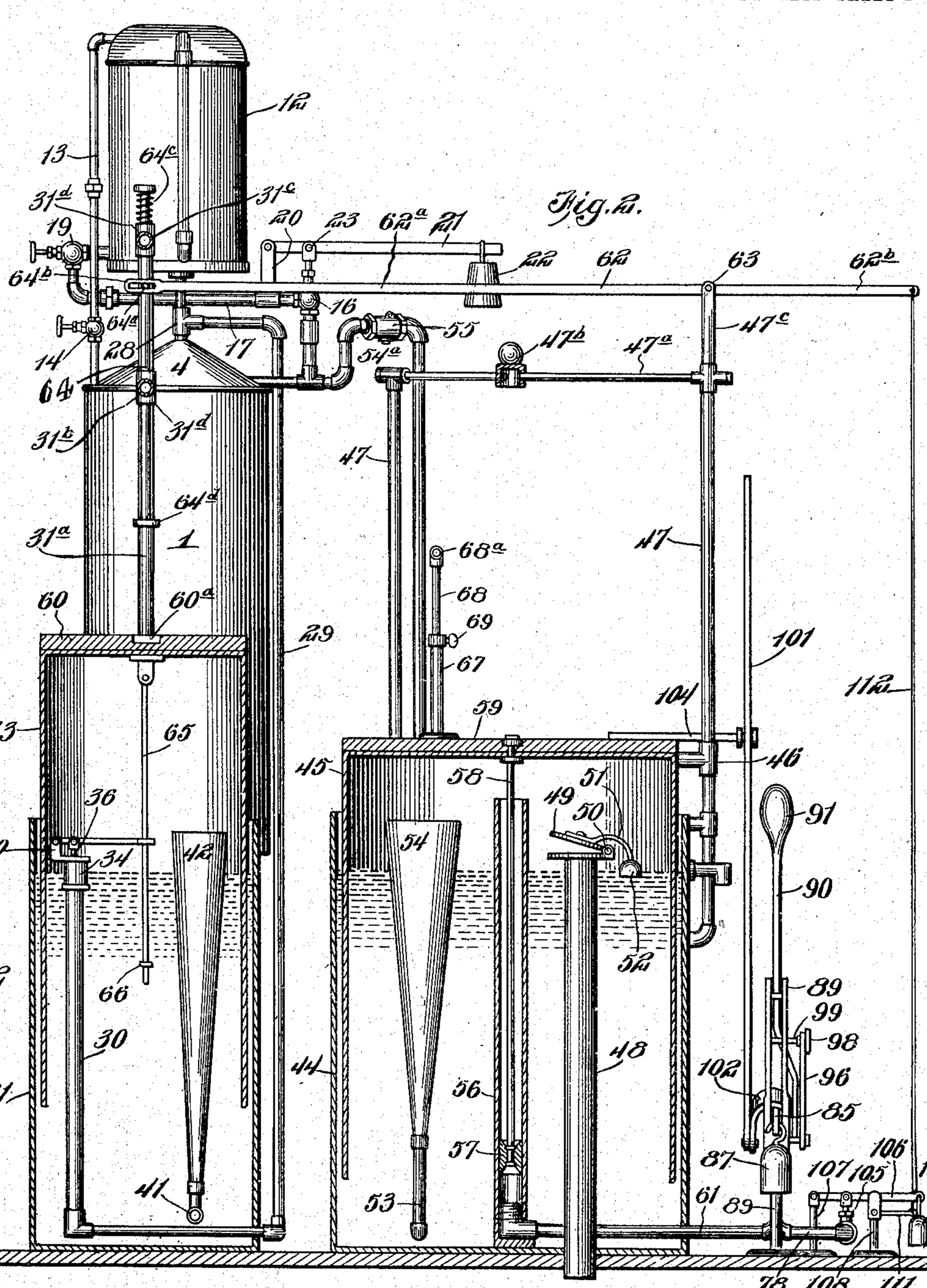
4 SHEETS—SHEET 2.

Fig. 2.



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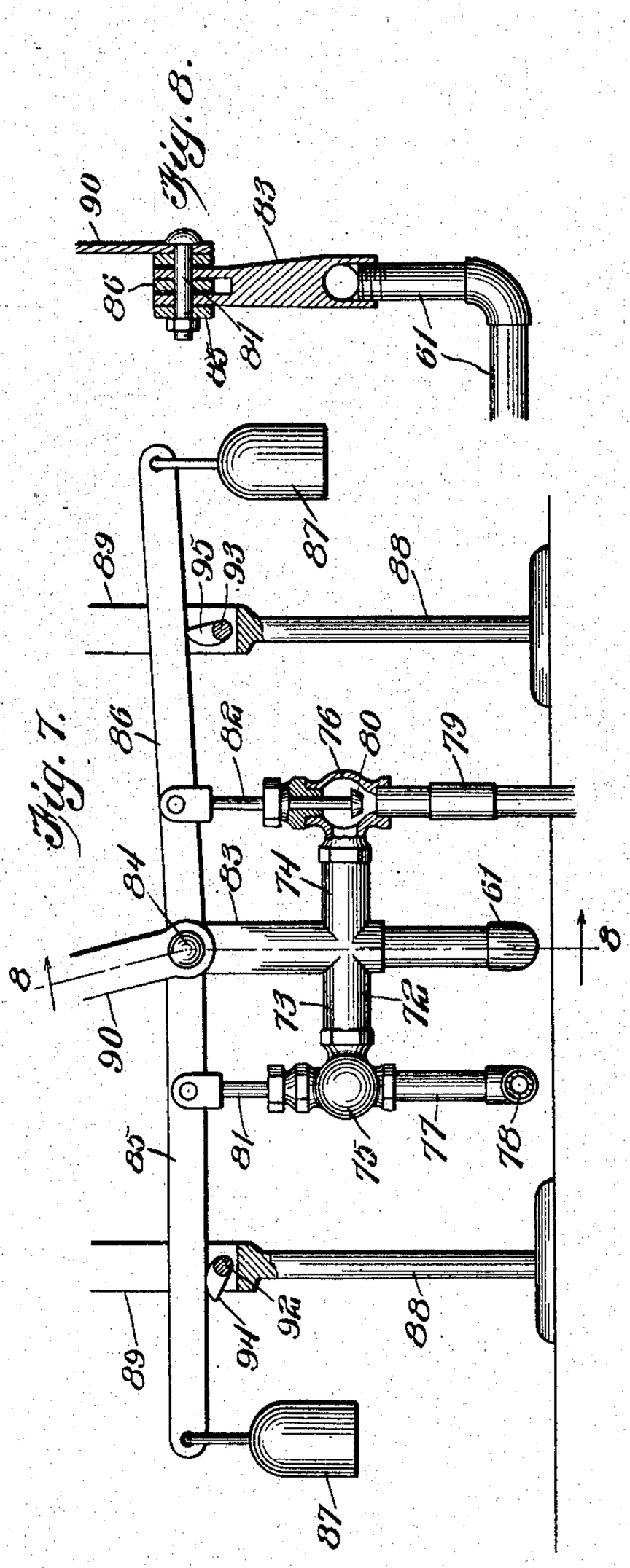

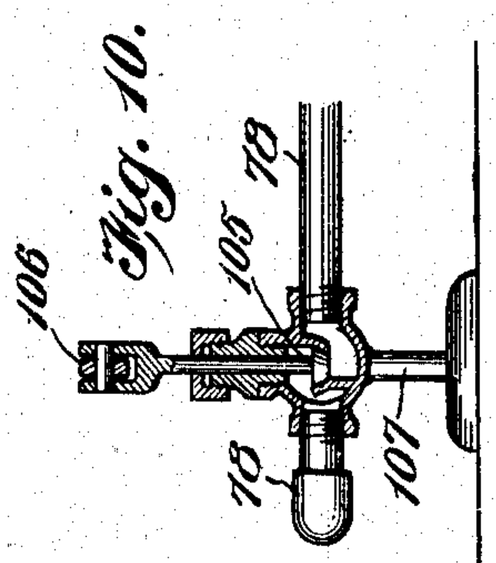

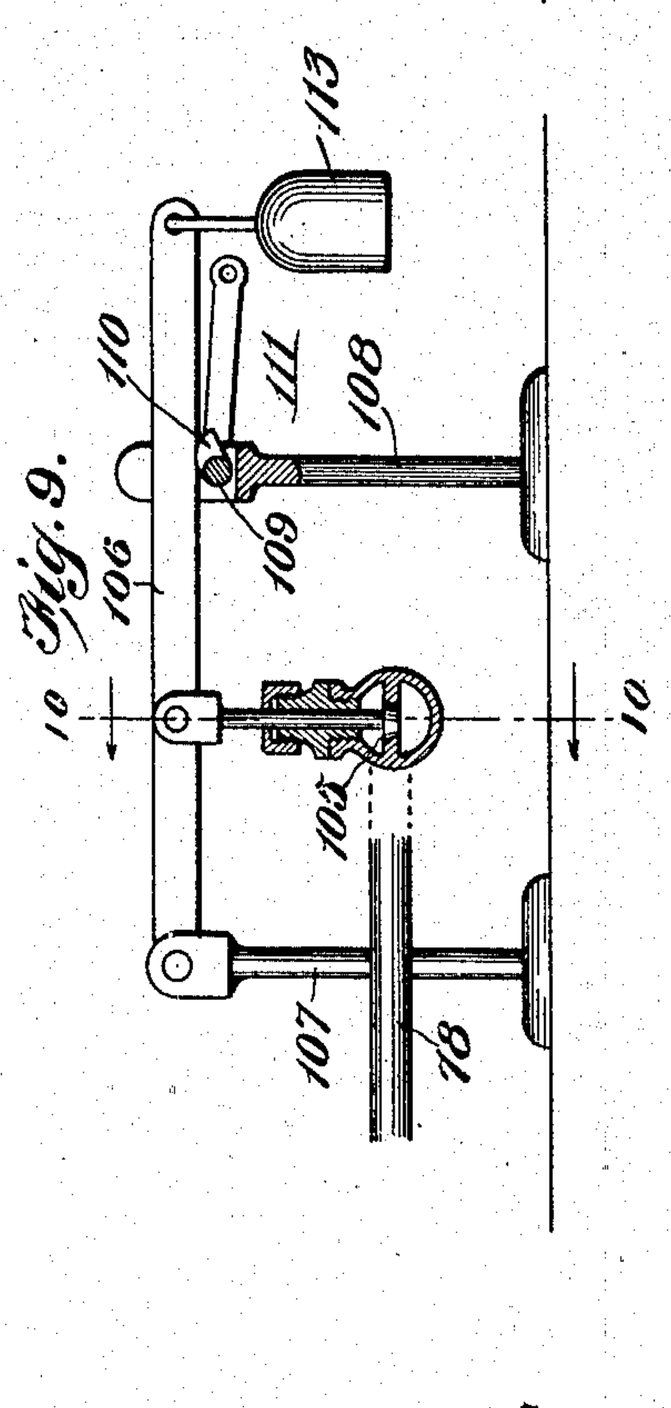

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4 SHEETS—SHEET 4.

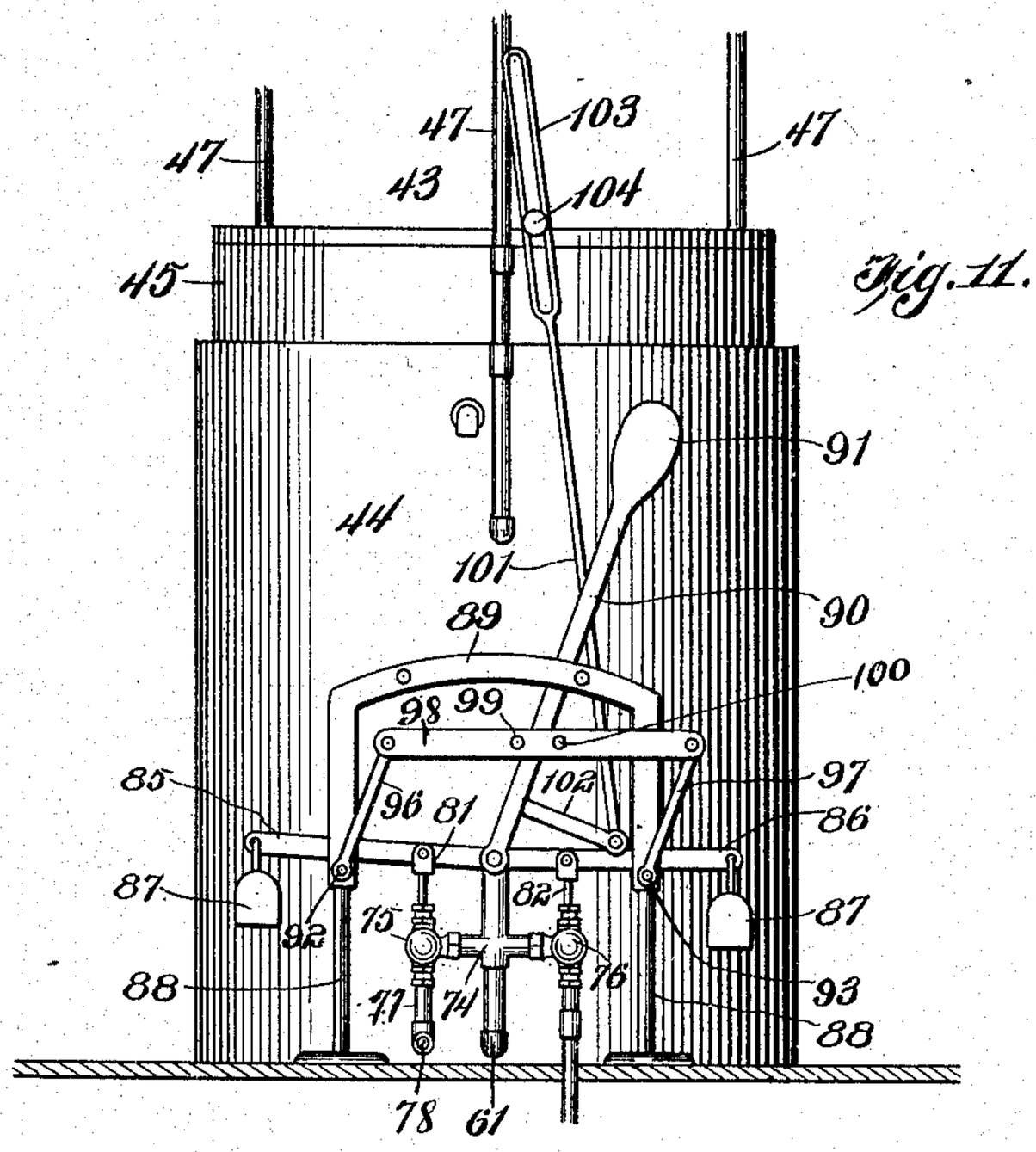

Fig. 11.

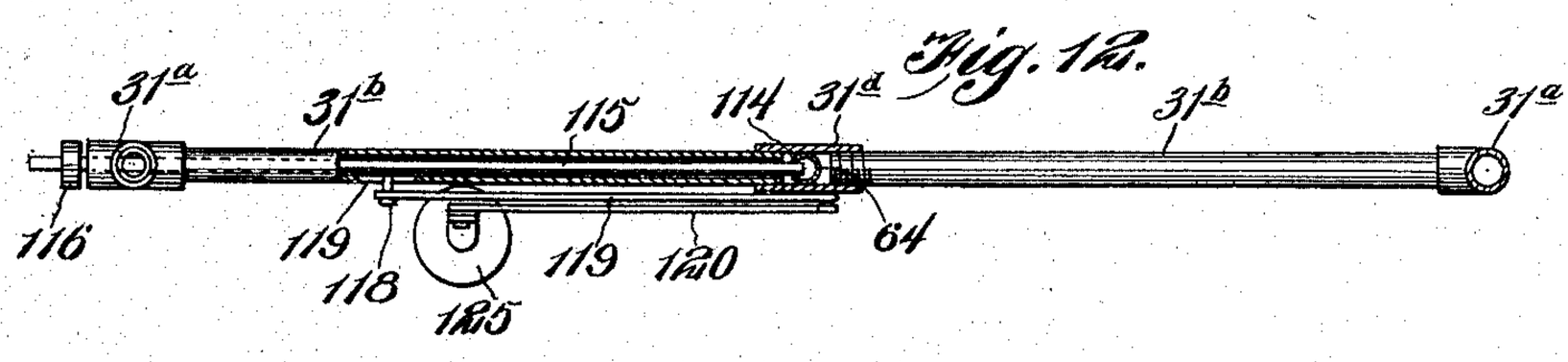

Fig. 12.

Witnesses

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UNITED STATES PATENT OFFICE.

ARTHUR GRANDJEAN, OF SAN DIEGO, CALIFORNIA.

CARBURETING APPARATUS.

953,606. Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed June 28, 1907. Serial No. 381,269.

To all whom it may concern:

Be it known that I, ARTHUR GRANDJEAN, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented new and useful Improvements in Carbureting Apparatus, of which the following is a specification.

This invention is an improved carbureting apparatus for carbureting air consisting of a mixture of atmospheric air and vapor of liquid hydro-carbon under pressure sufficient to cause such carbureted air to flow from the apparatus through the service pipe to the lights or point of consumption, one object of the present invention being to combine with a generator an air compressor to supply air and control the supply of liquid hydro-carbon thereto, a gasometer connected to the generator and having a pressure-actuated element, and means, including a controlling element actuated by the pressure actuated element of the gasometer to control the operation of the air compressor.

A further object is to combine in apparatus of this class, a generator, an air compressor to supply air thereto and a liquid hydro-carbon supply means for the generator controlled automatically by the air compressor so that the carbureted air is maintained at constant pressure in the service pipe.

A further object is to provide improved means for supplying air under pressure and liquid hydro-carbon to the generator.

A further object is to provide, in connection with the means for supplying under pressure a liquid hydro-carbon to the generator, means to prevent liquid hydro-carbon from being forced by back-pressure from the generator to the air compressor.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of devices hereinafter described and claimed.

In the accompanying drawing:—Figure 1 is a vertical sectional view of carbureting apparatus embodying my invention on a plane intersecting the air pump or compressor and the gasometer. Fig. 2 is a detailed sectional view of the same on a plane intersecting the casing of the generator. Fig. 3 is a detailed sectional view of the valve which controls the supply of the liquid hydro-carbon to the generator. Fig. 4 is a similar view of the valve which controls the passage of the gas or carbureted air from the generator to the gasometer. Fig. 5 is an elevational view of the upper portion of the guide frame for the gasometer bell and the means carried thereby for operating the lever controlling the supply of motive fluid to the compressor. Fig. 6 is a perspective view of the rose. Fig. 7 is a view in elevation, partly in section, illustrating the valves, levers and operating means for the motive fluid. Fig. 8 is a section on line 8—8 of Fig. 7. Fig. 9 is a view in elevation, partly in section, of the means controlled by the gasometer for controlling the supply of motive fluid to the compressor. Fig. 10 is a section on line 10—10 of Fig. 9. Fig. 11 is a side elevation of the air compressor, showing the motive fluid supplying and controlling means. Fig. 12 is an enlarged section on the line 12—12 of Fig. 5.

I first describe a generator or carbureter for use in my improved carbureting apparatus.

A casing 1 is here shown as of cylindrical form having a flat bottom 2 provided with a central opening, and having a conical upper portion 4. To the under side of the bottom of the casing is secured an inverted conical receptacle 5, which communicates with the interior of the casing through the opening 3 and serves to collect the sediment which settles from the liquid hydrocarbon in the casing. A drain pipe 6 leads from such receptacle and is provided with a valve 7, whereby it may be opened or closed at will. At one side of the casing is a gage 8 which may be of any suitable form and which serves to enable the level of the liquid hydro-carbon in the bottom of the casing to be noted. Spaced, a slight distance above the bottom of the casing, is an inverted funnel-shaped rose or sprinkler 9 which is here shown as a hollow conical vessel having a perforated bottom 9^a and supported by brackets 10. The perforated bottom of this rose is submerged in the layer of liquid hydrocarbon at the bottom of the generator casing and air is discharged through the perforations therein in the form of minute jets, which pass through and become impregnated with particles of hydrocarbon. A duct, which is here shown as a pipe 11 enters the casing at a point near the upper end thereof and extends downwardly through such casing and communicates with the rose 9.

Above the generator or carbureter is a tank or reservoir 12 to contain liquid hydro-carbon to be fed therefrom to the generator. A tube 13 connects the upper end of the generator casing with the upper end of the tank 12 and is provided with a valve 14, which, when open, serves to equalize the pressure in the generator and in the supply tank 12. The pipe 11 has a horizontal arm 11ª which is provided with an upwardly extending arm 15 at the upper end of which is the casing 16 of a valve to control the supply of liquid hydro-carbon from the tank to the generator. A supply pipe 17 which extends transversely below the tank 12 has one end connected thereto, as at 18, such connection including a valve 19, and the other end connected to the valve casing 16. On the said pipe is a standard 20 to which is pivoted the inner end of a lever arm 21 on which a weight 22 is slidably mounted. Said lever is pivotally connected as at 23 to the upper end of the valve stem or rod 24 of the valve 25 which operates in the casing 16 and which serves to permit or cut off the flow of liquid hydro-carbon from the tank to the generator. Such valve is normally closed by the action of the lever arm 21 and its weight 22. The tank 12 is here shown provided on one side with a gage 26 to indicate the condition of the liquid hydro-carbon in such tank. The tank is here shown as supported by a standard 27 which rises from the T-coupling 28 that serves to connect the carbureted air delivery pipe 29 to the upper end of the generator. Said pipe 29 extends downwardly and terminates in a vertical arm 30, which is located in the tank element 31 of a gasometer 32, which comprises, in addition to such tank element, a pressure actuated element, which is here shown as a bell 33. Water is placed in the tank element and serves to effect the seal between the same and the bell. The arm 30 of the carbureted air delivery pipe 29 extends upwardly a slight distance above the level of the water in the gasometer tank and is provided with a casing 34 having a valve 35 which closes upwardly against the valve seat and has an operating rod 36 the upper end of which is pivotally connected as at 37 to a lever 38, said lever being pivotally connected at one end as at 39 with a lug 40 which extends upwardly from one side of said valve casing. A service pipe 41 leads from the gasometer tank, its inner end being formed by a funnel-shaped arm 42, which extends upwardly in said gasometer tank and the upper end of which is above the level of the water in such tank.

In connection with the generator, I employ suitable means for feeding air under pressure thereto for carbureting therein. Such air compressing and feeding means is here shown as an air pump 43, which is specifically described in my co-pending application for Letters Patent of the United States for carbureters, Serial No. 289,465, filed November 28, 1905, patented July 21, 1908, Serial Number 894,136. Such air pump comprises a tank 44 to contain water and a vertically movable bell element 45 sealed therein. Guide arms for such bell element, one of which is shown at 46, slide on vertically disposed equidistantly spaced guide rods 47, which are connected by braces 47ª united by a coupling 47ᵇ, which latter also acts as a stop to limit the upward movement of the bell to which is fixed a horizontally extending stop arm 147 which limits the upward movement of the bell 45. An air inlet pipe 48, which is open at its lower and upper ends, extends upwardly in the tank 44 of the air pump and is provided at its upper end with a valve 49, hinged, as at 50, and provided with an operating arm 51 which extends from the hinged side thereof and has at its outer end a weight 52 which counterbalances said valve and enables the same to be readily operated. An air pipe 53 leads from the air pump to the pipe 11. The inner end of such pipe 53 is formed by an arm 54 which extends upwardly through the water in the tank 44 and is funnel-shaped. The connection between the pipe 53 and the pipe 11 forms an elevated portion or goose-neck 54ª, which serves to prevent the flow of liquid hydro-carbon from the tank 12 through the pipe 17 and arm 15 of the pipe 11 to the air pump and said elevated connection or the goose-neck includes a check valve, indicated at 55, which closes against the back-pressure from the generator casing to the air pump.

It will be noted by reference to the drawings, that the arm 15 which forms a part of the conduit leading from the tank 12 to the pipe 11 is between the check valve 55 and the generator. It will also be noted that the pipe 11 which leads to the generator forms a common conduit both for the liquid hydro-carbon and the air under pressure supplied to the generator.

The bell or movable element of the air pump or air compressor is operated by fluid pressure mechanism including a cylinder 56. In the tank 44 and piston or plunger 57 in such cylinder is a rod 58 which connects such piston or plunger to the upper end of the bell element 45. A weight 59 is on such element to normally depress the same and to force the same downwardly when the pressure of the air under such bell element diminishes. A similar weight 60 operates in a similar manner on the bell 33 of the gasometer. A water supply pipe 61 communicates with the lower end of the cylinder 56. In practice suitable means are employed to admit water under pressure through such pipe 61 to such cylinder to cause the bell 45

to be forced upwardly and to permit the escape of the water from such cylinder, to enable the weight 59 to move the bell downwardly. A specific form of means for supplying motive fluid in such cylinder is described and shown in my co-pending application for Letters Patent hereinbefore referred to and hereinafter described. Such motive fluid supply means is in accordance with my present invention connected to a controlling element, here shown as a lever 62 fulcrumed as at 63 on the extended upper end 47^c of one of the guide rods 47. The tank 31 of the gasometer carries guide rods 31^a for the bell 33, which rods are coupled by cross rods 31^b and 31^c, and slidably mounted in guides 31^d on said cross rods is an operating rod 64 provided with a pin 64^a engaging a slot 64^b in the end of the long arm 62^a of lever 62, whereby said lever is slidably and pivotally connected with said operating rod. As shown, the rod 64 is limited in its downward movement by a cushioning spring 64^c and is adapted to drop by gravity from an elevated position to its lowered position shown in Figs. 2 and 5. At its lower end the operating rod carries a head or contact piece 64^d arranged to be engaged by the weight 60 on the upward movement of the gasometer bell, which weight is preferably cut out to provide a receiving recess 60^a for said head whereby to guide the operating rod in its vertical movement and prevent undue lateral strain. A rod 65 extends downwardly from the upper end of the gasometer bell 33, passes through and is slidable in an opening near the free end of the lever 38 of the valve 35 and is provided at a suitable distance from its lower end with a stop or tappet 66 which serves when the gasometer bell has been raised by the pressure of the carbureted air to the desired maximum extent, to engage and lift such lever 38 and cause the same to close the valve 35 and thereby cut off a further supply of carbureted air to the gasometer.

The bell of the air pump is provided on its upper side with a standard 67 in which a tappet rod 68 is telescopically disposed, a set screw 69 being provided to adjustably secure such tappet rod in the standard. When the bell of the air pump rises to the desired maximum extent by the pressure of the water thereunder, a contact 68^a on such tappet rod 68 engages the lever arm 21 of the valve 25 and lifts such valve so as to cause the liquid hydro-carbon to be fed from the tank 12 to the pipe 11.

To enable such moisture as may accumulate in the pipe 53 to be discharged therefrom from time to time, I provide such pipe at its lower end with a drain pipe 70, as shown in Fig. 2, which drain pipe has a valve 71.

The motive fluid supply and exhaust pipe 61 leading from the cylinder 56 is connected exteriorly of the tank with a cross coupling 72, the branches 73 and 74 of which communicate with valve casings 75 and 76 respectively located on opposite sides of the pipe 61. The casing 73 communicates with a pipe 77 which in turn is in open communication with any supply pipe carrying water under pressure, as a city service main 78 or the like; while the casing 74 is in communication with a waste or discharge pipe 79. Each of the casings 75 and 76 contains a valve 80, the stems 81 and 82 of which valves project vertically above the casing. The coupling 72 is provided with a vertically projecting post 83 bifurcated at its upper end and revolubly supporting transverse the bifurcation a pivot pin 84. Levers 85 and 86 are pivotally supported at their inner ends on said pin 84, extend in opposite directions from the post 83 and are respectively connected to the valve stems 81 and 82, the free end of each of the levers being provided with an adjustable weight 87. Standards 88 are arranged adjacent the respective levers and support or are extended to provide an inverted U-shaped guide frame 89, preferably formed of spaced strips terminally connected to the standards, and so arranged as to permit the passage therebetween of the levers 85 and 86. A balance arm 90 is also pivotally secured upon the pin 84, projecting upwardly therefrom and guided between the strips of the frame 89, the upper end of the arm being weighted at 91. Pins 92 and 93 are revolubly mounted transversely of the strips forming the frame 89 directly beneath the levers 85 and 86 respectively, which pins carry cams 94 and 95 arranged to contact with and elevate the levers in the proper operation of the pins to a sufficient extent to open the respective valves connected thereto. Arms 96 and 97 are fixed to the pins 92 and 93 and extend upwardly therefrom and are pivotally connected at their upper ends by a bar 98. This bar is disposed in proximity to the balance arm 90 and is provided with pins 99 and 100 projecting laterally therefrom and arranged on opposite sides of the balance arm, whereby said arm in movement will impart a reciprocating movement to the bar 98 and thereby rock the arms 96 and 97 and the pins 92 and 93 and operate their cams. The cams 94 and 95 are arranged so that when one is in operative position the other will be in inoperative position, as shown in Fig. 7. A bar 101 is connected at its lower end to an arm 102 rigidly secured to and projecting at right angles from the balance arm 90, the upper end of said bar being longitudinally slotted, as at 103. The bar 101 is disposed adjacent to the tank 44 and is engaged by a trip 104 secured to the top of the bell 45, the outer end of said trip extending

through the slot 103 so as to play between the stops formed by the upper and lower end walls of said slot.

The motive service pipe 78 is, adjacent its connection with the pipe 77, provided with a valve 105, the stem of which is connected to a lever 106 fulcrumed upon a standard 107 projecting from the floor or base of the apparatus. Beyond the valve 105 relative to the standard 107 is arranged a second standard 108 bifurcated at its upper end to receive and guide the free end of said lever. Journaled in the walls of the bifurcation of the standard 108 is a transverse pivot pin 109 carrying a cam 110 designed to elevate the lever 106. An arm 111 is fixed upon the pin 109 beyond the standard, its free end being connected with the short arm 62^b of the lever 62 by a connection 112. The parts are so positioned that when the cam 110 is in inoperative position a weight 113 on the free end of the lever 106 operates to close the valve 105 and thereby shut off the motive fluid supply to the apparatus, while, on a reverse movement of the cam, the free end of the lever 106 is elevated, opening the valve 105 and restoring communication between the main and supply pipe 61.

It has been found desirable to secure a quick action of the valve 105, and for this reason means must be provided for securing an open movement of the lever 106 at greater speed than incident to the slow descent of the gasometer bell. The construction with this object in view is illustrated particularly in Figs. 5 and 12, wherein it will be noted that the rod 64 is hollow and at that point registering with the guide or coupling 31^b when the bell is fully elevated is formed with an opening 114. The cross bar 31^b joining the guide rods 31^a is hollow and adapted to slidably support a rod 115, the outer end of which projects beyond the rod 31^b and is provided with a stop 116, limiting its movement toward the rod 64. The inner end of said rod 115 is adapted to engage the opening 114 in the rod 64 when the parts are in registering position and prevent descent of said rod 64, the engagement being automatically maintained through the medium of a coiled spring 117 encircling the pipe 31^b and bearing against a pin 118 projecting from the rod 115 and through an elongated slot 119 in the pipe 31^b, as clearly shown in Fig. 12. An angle lever 120 is pivotally supported on the guide 31^b, the short arm of said lever being connected by a rod 121 with the pin 118, while the long arm of the lever is provided with a headed pin 122 engaging an elongated slot 123 in a bar 124 which projects toward the gasometer bell and carries at its lower end a weight 125.

In operation, assuming the parts constructed and arranged as described and the hydraulic controlling mechanism in the position illustrated in Fig. 11, in which it will be noted that the valve in the casing 75 hereinafter termed the inlet valve, is open and the valve in the casing 76, hereinafter termed the outlet valve, closed, the motive fluid from the main 78 is freely admitted through the pipes 77, 73 and 61 to the cylinder 56, the pressure of the water on the piston 57 serving to elevate the bell 45. This movement of the bell tends to create a partial vacuum above the surface of the sealing liquid in the pump, whereby air is caused to rush in through the supply pipe 48. The upward movement of the bell and consequently the indrawing of air is continued until the trip 104 engages the upper end wall of the slot 103 in the arm 101. A slightly further movement of the bell after this contact operates to move the balance arm 90 to the reverse position from that shown in Fig. 11, which arm in its movement contacts with the pin 99 projecting from the arm 98 and moves said arm 98 with the effect to reverse the normal or operative positions of the cams 94 and 95, moving the former to an inoperative position and the latter to an operative position, as shown in Fig. 7. The weight on the free end of the lever 85 will consequently at once operate to close the inlet valve, while at the same time the elevation of the lever 86 effects the opening of the outlet valve. The flow of the motive fluid to the cylinder is thereby arrested and the upward movement of the bell 45 stopped, the fluid within the cylinder exhausting into the escape pipe 79 through the pipes 61 and 74 and valve 76, leaving the bell free for downward movement so far as the pressure of the motive fluid is concerned. The weight 59 now operates to depress the bell and thereby force the contained air through the pipe 53 into the generator, the air passing through the body of hydrocarbon in the generator, whereby it is saturated and enriched to form the carbureted air. When the bell 45 has moved downward a sufficient distance to cause the trip 104 to contact with the lower wall of the slot 103, a reverse movement of the parts of the valve mechanism is effected, the outlet valve being closed and the inlet valve opened, whereby the bell is again elevated and the pump recharged with air, the check valve 55 in the pipe 53 preventing any return flow of the air delivered to the generator through said pipe. On the upward movement of the bell 45 as described and just prior to the reversal of the valve mechanism as set forth, the contact 68^a engages and elevates the lever arm 21, thereby opening the valve 16 for the feed of a charge of hydrocarbon from the reservoir 12 to the rose within the generator through the pipes 17, 15 and 11, the hydrocarbon feeding action in practice being such as to maintain a

shallow layer or level of the hydrocarbon within the bottom of the generator tank to a point above the perforated bottom of the rose.

When the bell 45 descends and the action of the valves is reversed to permit descent of the bell, the lever 21 is drawn down by the weight 22, thus closing the feed valve 16 after the bell has progressed slightly on its downward movement. On such downward movement of the bell the air contained within the pump above the sealing liquid is forced out through the pipe 53 and check valve in the goose neck 54[a] into the pipe 11, the current of air discharging through the rose and the body of hydrocarbon in the generator whereby it is enriched, such action securing a saturation of the air to the desired extent with the hydrocarbon in an effective manner. This operation is repeated upon each ascent and descent of the pump bell, making the feed of hydrocarbon and air to the generator automatic in every respect to supply a continuous amount of carbureted air to the gasometer until the latter is fully charged. The feed of carbureted air from the generator to the gasometer continues until the bell 33 thereof is elevated to a maximum extent, when the bell contacts with and elevates the rod 64, thereby raising the long arm 62[a] and lowering the short arm 62[b] of the lever 62, allowing the arm 111 through the relaxation of the connection 112 to drop and retract the cam 110, whereupon the weight 113 acts upon the lever 106 to close the valve 105, shutting off the flow of motive fluid from the main to the pump independent of the pump valve mechanism hereinbefore described. The feed of gasolene and air to the generator will thus be automatically cut off until the pressure in the bell 33 decreases and said bell falls and allows the rod 64 to return by gravity and the action of the spring 64[c] to normal position, whereupon the lever 62 and the valve 105 will be reset for further action to again restore communication between the main and the pipe 61. In the downward movement of the bell of the gasometer, when said bell has descended to a prescribed extent, the weight 125 which has been previously elevated to operate the lever 120 and lock the rod 64 against movement by the rod 115, is released, thus allowing said rod 64 to drop quickly and suddenly into contact with the gasometer bell, which movement causes a quick action of the valve 105 for admitting an initial flow of motive fluid of sufficient power to properly control the subsequent operation of the apparatus.

By the construction and mode of operation of the parts described, by which the supply of the motive fluid is controlled by both the bell of the pump and the bell of the gasometer, and by which the feed of gasolene or other hydrocarbon to the generator is controlled by the bell of the pump, a regular supply of hydrocarbon to the generator and of the resulting gas to the gasometer is automatically secured in a simple and effective manner to supply sufficient gas for consumption and no more. As a result, an apparatus is provided which is self governing and is adapted for private or isolated plants, as it requires no manual control beyond the initial adjustment of the parts and the necessary renewal of the hydrocarbon within the reservoir as occasion requires.

Having thus described my invention, what I claim, is:—

1. In a carbureter, the combination with a hydrocarbon reservoir, a generator, and a gasometer in communication with the generator and having a movable bell, of a feed pipe leading from the reservoir to the generator and provided with a controlling valve, an air pump having a delivery pipe leading to the generator and provided with a movable bell adapted to descend by gravity and to be elevated by fluid pressure, said bell carrying a contact device adapted in its upward movement to open said valve, means for supplying a motive fluid under pressure for elevating the bell, and means operated by the respective bells through the pressures in the gasometer and pump for independently controlling the motive fluid supply.

2. In a carbureter, the combination of a generator, a gasometer in communication therewith and having a movable bell, a hydrocarbon supply tank, an air compressor in communication with the generator, said compressor also having a movable bell adapted to descend by gravity and discharge air therefrom to the generator, means actuated by the movable bell of the compressor for feeding charges of hydrocarbon from the supply tank to the generator, means for supplying a motive fluid for elevating said compressor bell, and means operated by the bell of the gasometer for controlling the supply of the motive fluid.

3. In a carbureter, the combination of a hydrocarbon reservoir, a generator, a gasometer in communication with the generator and having a movable bell, a hydrocarbon feed pipe leading from the reservoir to the generator, an automatically closing valve in said pipe, an air pump having a movable bell adapted to descend by gravity and to be elevated by fluid pressure, an air feed pipe leading from the pump and leading to the generator, a contact device on the bell of the pump adapted on its upward movement to open said valve, means for supplying a motive fluid under pressure for elevating the pump bell, valve mechanism controlling the inlet and exhaust of the motive fluid, and means controlled by the bell of the gasometer for operating said valve mechanism to let on or off the supply of motive fluid to the pump.

4. In a carbureter, the combination of a generator, a gasometer in communication therewith, a hydrocarbon reservoir arranged above the generator, a hydrocarbon feed pipe leading therefrom, said pipe having an automatically closing controlling valve therein, a combined air and hydrocarbon feed duct leading into the generator and connected with the feed pipe, a fluid pressure operated pump for supplying air to the generator, said pump having a movable member provided with means to open said valve, means actuated by the bell of the gasometer for controlling the supply of motive fluid, to the pump, an air feed pipe leading from the pump to said duct and connected therewith at an angle to the oil feed pipe, and a check valve in said air feed pipe adjacent its point of connection with said duct.

5. In a carbureter, the combination with a hydrocarbon reservoir, a generator, a gasometer in communication with the generator and having a movable bell, of a hydrocarbon feed pipe leading from the reservoir to the generator, a valve in said pipe, a weighted arm for automatically closing the valve, an air pump having a movable bell adapted to descend by gravity and to be elevated by fluid pressure, an air feed pipe leading from the pump and connected with the hydrocarbon feed pipe leading to the generator, said air feed pipe being provided adjacent to said hydrocarbon feed pipe with a goose neck having a check valve therein, a contact device on the bell of the pump adapted on its upward movement to engage and operate said weighted arm to open the valve, means for supplying a motive fluid under pressure for elevating the pump bell, valve mechanism controlling the inlet and exhaust of the motive fluid, and means controlled by the pressure in the gasometer and pump for operating said valve mechanism to let on or cut off the supply of motive fluid to the pump.

6. In a carbureting apparatus, the combination of a generator, a gasometer in communication therewith, a hydrocarbon supply tank arranged above the generator, a hydrocarbon feed pipe leading therefrom, said pipe having a controlling valve therein, a lever arm adapted to be actuated to open the valve and to automatically return the valve to closed position, a combined air and hydrocarbon feed duct leading into the generator and connected with the feed pipe, a fluid pressure operated pump for supplying air to the generator, said pump having a movable member provided with means to engage and operate said lever arm, means controlled by the bell of the gasometer for controlling the supply of motive fluid to the pump and stopping the movement of said movable member of the pump when the pressure in said gasometer reaches a determined degree, an air feed pipe leading from the pump to said duct and connected therewith at an angle to the hydrocarbon feed pipe, and a check valve in said air feed pipe adjacent its point of connection with said duct.

7. In a carbureting apparatus, the combination of a generator, a gasometer in communication therewith, a hydrocarbon supply tank arranged above the generator, a hydrocarbon feed pipe leading therefrom, said pipe having a controlling valve therein, a lever arm adapted to be actuated to open the valve and to automatically return the valve to closed position, a combined air and hydrocarbon feed duct leading into the generator and connected with the feed pipe, a fluid pressure operated pump for supplying air to the generator, said pump having a movable member provided with means to engage and operate said lever arm, means controlled by the bell of the gasometer for controlling the supply of motive fluid to the pump and stopping the movement of said movable member of the pump when the pressure in said gasometer reaches a determined degree, an air feed pipe leading from the pump to said duct and connected therewith at an angle to the hydrocarbon feed pipe, said pipe being provided with an elevated or goose neck portion adjacent its point of connection with the duct, and a check valve in said goose neck portion.

8. In a carbureting apparatus, the combination of a generator, a gasometer, a hydrocarbon feed tank arranged above the generator, a delivery pipe leading from the generator to the gasometer, a support for the tank, a T-coupling communicating with the generator and connecting said delivery pipe and support therewith, a hydrocarbon feed pipe leading from the tank to the generator, a pressure equalizing pipe connecting the generator with the tank, a feed valve in said feed pipe, an air compressor having a movable element adapted to open said valve, a check valved air supply pipe leading from the compressor to the generator, means for supplying a motive fluid to operate the compressor, and means operated by the bell of the gasometer to control the supply of motive fluid to the compressor and to regulate the action of the said movable element thereof.

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

ARTHUR GRANDJEAN.

Witnesses:
C. K. HUDSON,
W. D. FRENCH.