(No Model.) 3 Sheets—Sheet 1.

A. E. ALDRICH.

APPARATUS FOR CARBURETING AIR.

No. 544,945. Patented Aug. 20, 1895.

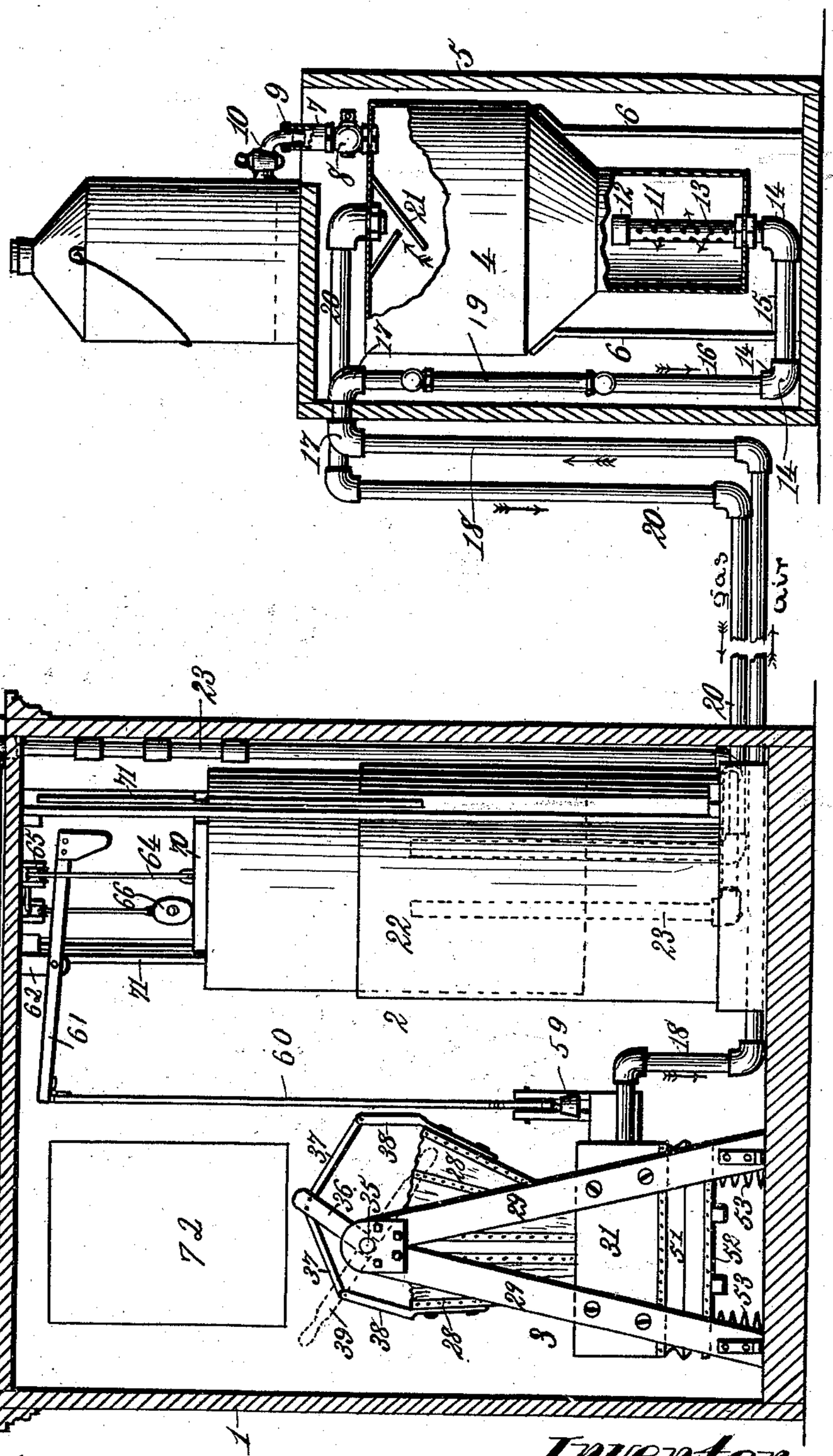

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

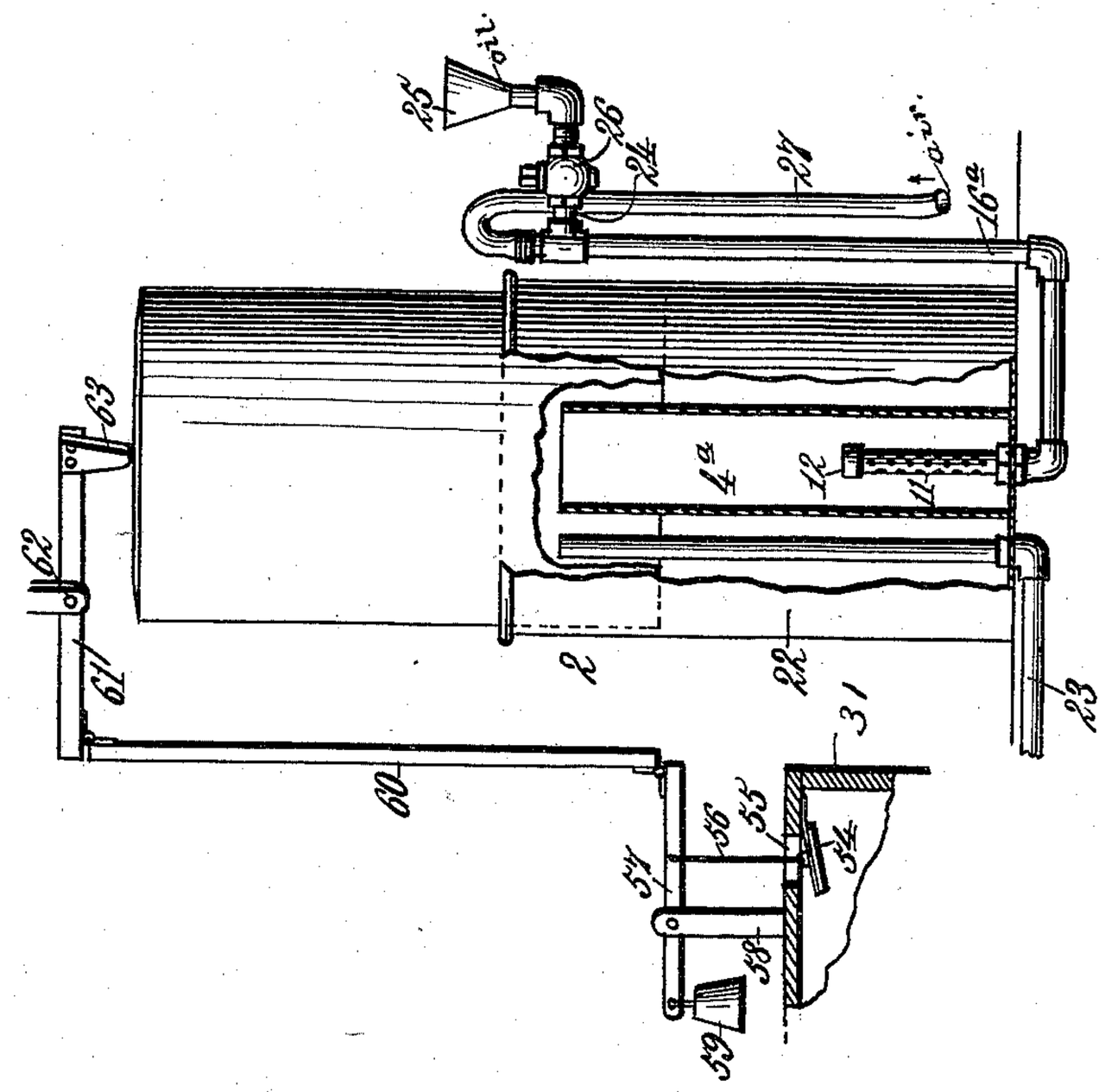

Fig. 4.

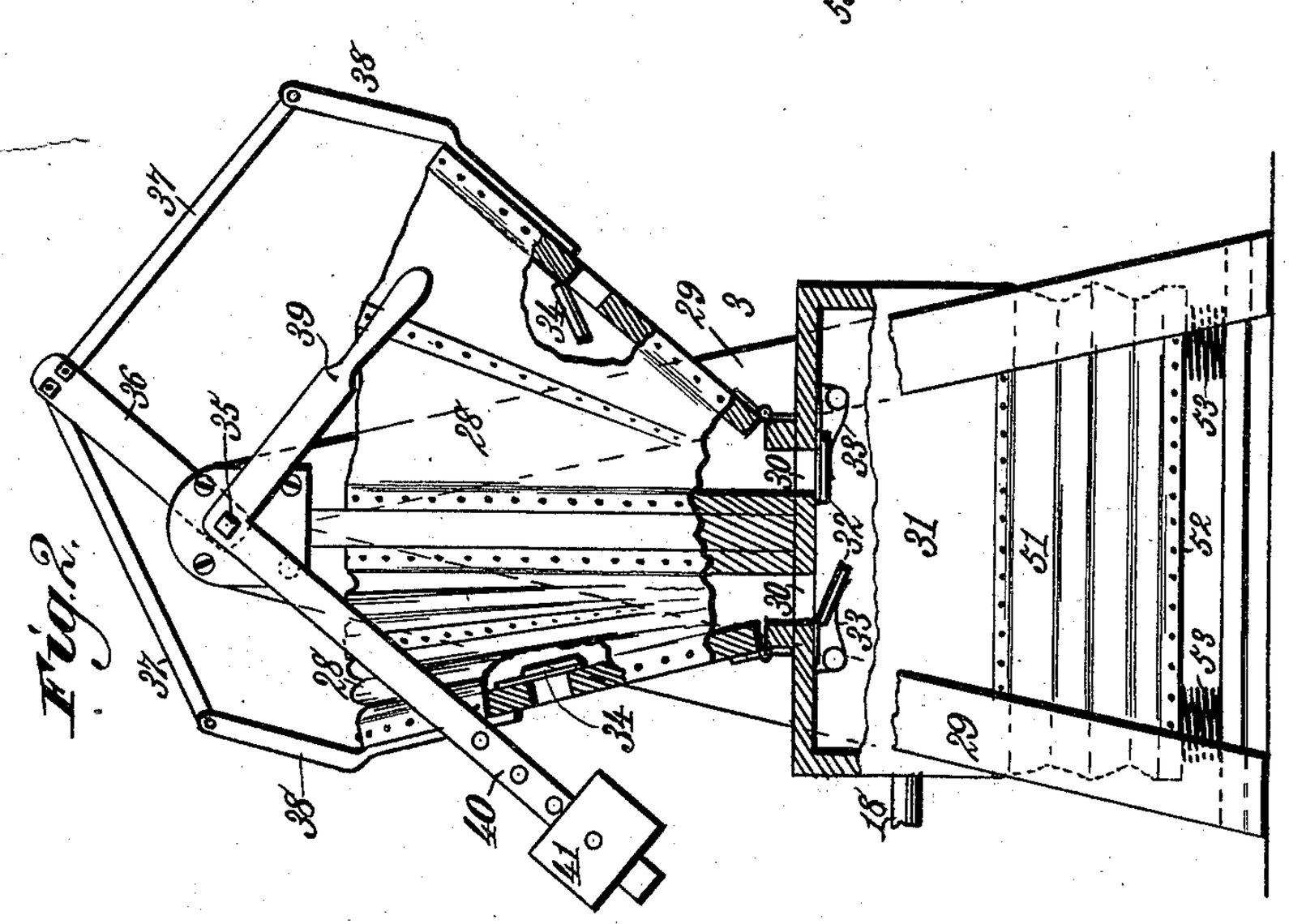

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Fig. 4.

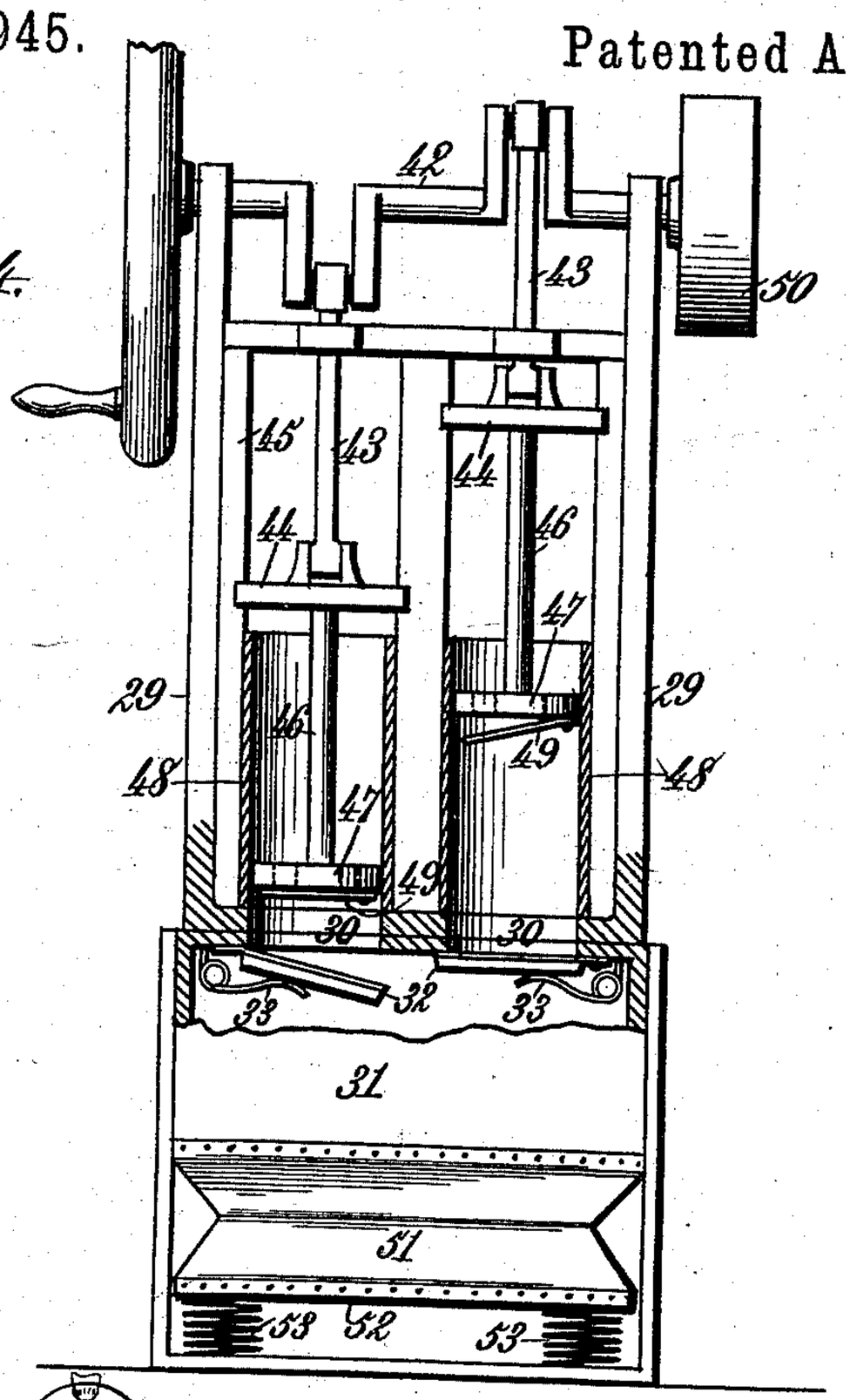


Fig. 5.

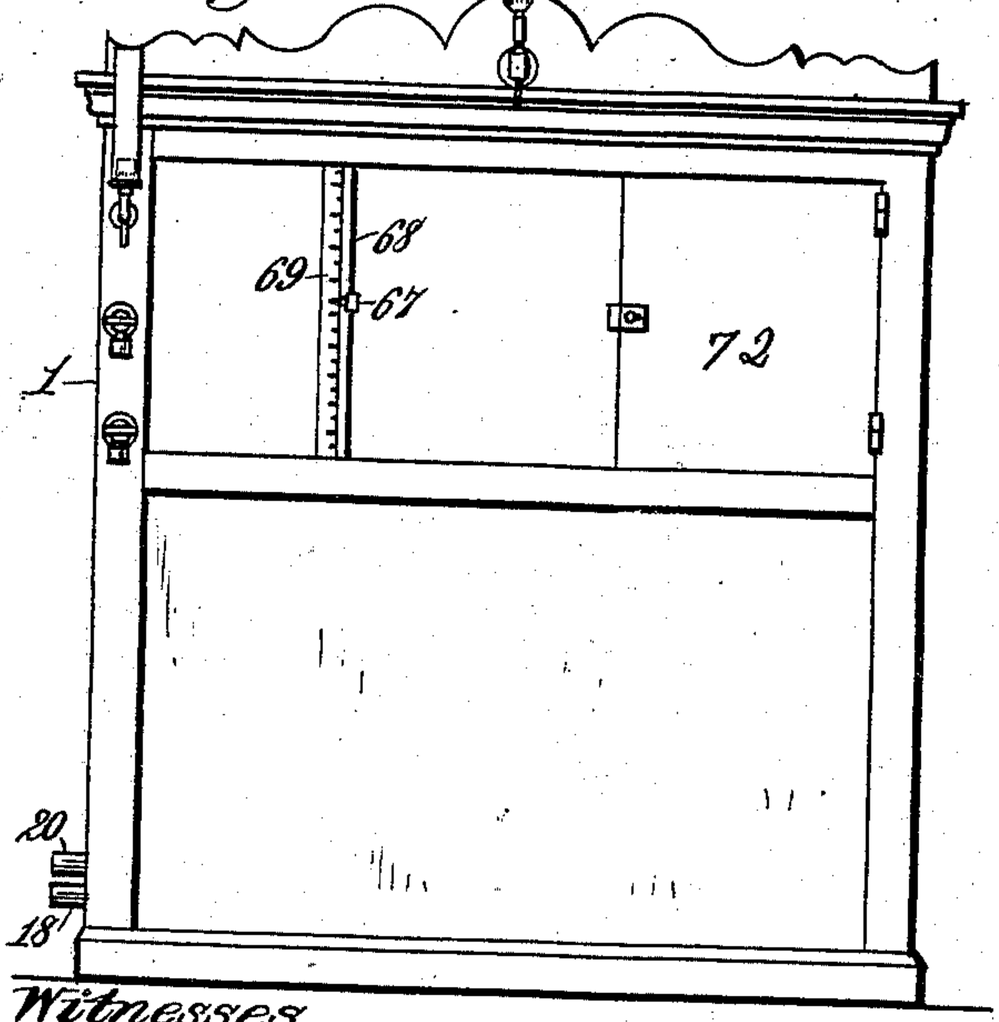
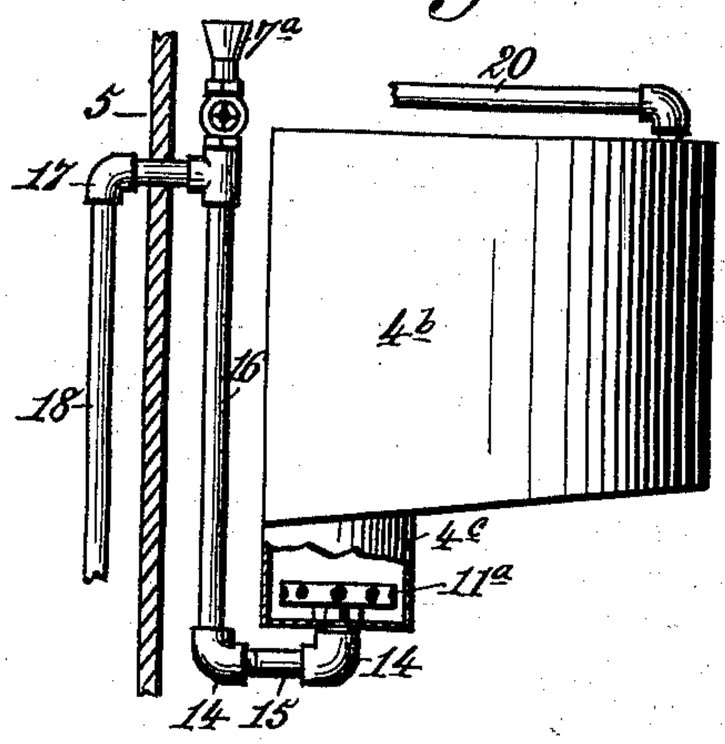


Fig. 6.



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Atty.

UNITED STATES PATENT OFFICE.

ALBERT E. ALDRICH, OF LEXINGTON, KENTUCKY.

APPARATUS FOR CARBURETING AIR.

SPECIFICATION forming part of Letters Patent No. 544,945, dated August 20, 1895.

Application filed May 2, 1895. Serial No. 547,901. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. ALDRICH, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented new and useful Improvements in Apparatus for Manufacturing Gas, of which the following is a specification.

This invention relates to apparatus for the manufacture of gas for heating and illuminating purposes from a hydrocarbon liquid, such as gasoline, adapted to carburet a volume of compressed air; and the invention consists in the novel features of construction and combinations of devices, as hereinafter described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a partly-sectional elevation of my improved gas-making apparatus. Fig. 2 is a view of one form of air-compressor from the side opposite to that shown in the preceding figure. Fig. 3 is a partly-sectional view illustrating the operation of the safety-valve for the compressed-air reservoir, and showing a carburetor arranged within the gas-holder. Fig. 4 is a partly-sectional elevation illustrating a form of air-compressor arranged more particularly for operation by power. Fig. 5 is a view of the gas-making apparatus as inclosed in a cabinet for household uses. Fig. 6 is a view illustrating a modification in the carburetor.

In the drawings, the reference-numeral 1 designates a cabinet or casing in which are inclosed the gas-holder 2, air pump or compressor 3, and other parts of a portable gas-making apparatus constructed according to my invention and adapted to furnish gas for illuminating, heating, and cooking purposes. The contents of the cabinet 1 may constitute a hand gas-machine, to be located at any convenient point in or adjacent to a dwelling, and which need not occupy a floor-space of more than two by four feet; but it is obvious that the apparatus may have any required dimensions, according to circumstances. The carburetor 4 is preferably inclosed in a separate cabinet or casing 5, designed to be placed out of doors at any desired distance from buildings to be supplied with gas, and is to be connected with the air-pump and the gas-holder by means of suitable pipes.

It will be convenient to explain first the construction and operation of the carburetor 4 and afterward describe in detail the other parts of the apparatus and the arrangement and operation of the same as an entirety.

The carbureting vessel or chamber 4 is constructed of any suitable metal, and is preferably of larger diameter at the top than at bottom, and may have any required capacity. It may be supported in its casing 5 by means of standards 6 or in any convenient manner. Communicating with the top of the carburetor is a filling-nozzle 7, fitted with a cock 8, above which a rubber-bushed inlet 9 is provided.

In supplying the carburetor with hydrocarbon a can containing, say, five or more gallons of gasoline or other suitable liquid hydrocarbon may be placed on the top of the cabinet 5, with the discharge spout or nozzle of the can inserted into the rubber-bushed inlet 9, whereupon the inlet-cock 8 of the carburetor and the discharge-cock 10 of the can may be opened and the supply of gasoline be permitted to feed into the carburetor without any loss from evaporation or spilling. The carburetor may be charged with gasoline 87° proof, and the apparatus may be operated with five gallons of the hydrocarbon or a larger or smaller quantity, as desired, and the carburetor may be made of any required size or capacity. In the bottom of the carburetor 4 is secured a vertical pipe 11, closed at its upper end by a cap 12, or otherwise, and provided with a large number of lateral perforations 13 for passage of air and gasoline. The lower end of this perforated pipe 11 communicates, through elbows 14 and their connecting-tube 15, with a pipe 16, extended vertically within the cabinet or casing 5 to a point at or near a level with the top of the carburetor and preferably above the same, where it connects through elbows 17 with a descending air-pipe 18, arranged on the outside of the carburetor-casing and leading from the air pump or compressor 3 of the gas apparatus.

It will be obvious that when the carburetor is charged preparatory to making gas, the gasoline or other liquid hydrocarbon will stand at the same level in the main carbureting-chamber 4 and in the pipe 16, a free

passage for the liquid being afforded through the perforations in the pipe or tube 11 at the bottom of the carburetor. There may be connected with the pipe 16 or with the main body of the carburetor a glass gage 19 to indicate the height or surface level of the body of gasoline supplied to the carburetor.

The air to be carbureted in the making of gas is supplied under a strong pressure from the air pump or compressor through the pipe 18, leading therefrom into the pipe 16, that communicates with the perforated pipe 11 in the bottom of the carburetor. Before the air can gain entrance into the carbureting-chamber 4 it must drive before it and blow out of the pipes 16 and 11 all the gasoline standing therein, thus raising the gasoline in the chamber 4 in proportion to the quantity previously contained in said pipes. This operation involves a geyser-like action, the liquid hydrocarbon naturally seeking to maintain a uniform level in the carburetor and connected pipes, which is resisted by the pressure of the entering currents of compressed air, so that the gasoline is lashed and churned, tossed and tumbled, and thereby beaten into a foam that results in converting all the gasoline into gas of uniform quality.

It will be observed that the body of gasoline in the carburetor 4 is agitated from the bottom by the numerous laterally-entering air-currents that are forced into the carburetor under a strong pressure from the pump or compressor. The lower portion of the carbureting-chamber 4 is preferably contracted in diameter for a distance somewhat greater than the height of the perforated pipe 11, which will thus be immediately surrounded by a comparatively small body of gasoline. The air finds its entrance into the body of gasoline through the lateral perforations 13 in the pipe 11, and the bulk of gasoline in the contracted lower portion of the carburetor will be sufficiently small to secure a violent and thorough agitation from the bottom of the carburetor to the top of the perforated pipe, and even above the same, and the consequent intimate mingling of the gasoline and entering compressed air, that tends to expand on escape from the perforated pipe, will result in a speedy, thorough, and uniform carburation. The gas thus produced will rise to the top of the carburetor and pass thence through a pipe 20 to the gas-holder 2, hereinbefore mentioned. This pipe 20 is passed out through the carburetor-casing 5, and may run to the ground and thence through a trench or covered way to the gas-holder. In the top of the carburetor, below the entrance to the gas exit pipe 20, may be arranged a trap 21 to prevent gasoline from being blown into said pipes. The operation of the carburetor is perfectly safe, and is so simple that no skilled attendance is required. As only a small quantity of gasoline is required, the quality of the gas is always under easy and safe control, a greater quantity of gas than usual will be produced from a given quantity of gasoline, and the gas will be of better and more uniform quality.

The carburetor can be easily moved from one location to another, its simplicity of construction insures durability and efficiency, and it is cleanly, thorough, and economical in operation.

The gas holder or receiver 2 may be of the ordinary construction, comprising a base portion or tank 22, open at the top and supplied with water to a sufficient depth to provide a seal for the vertically-movable upper portion or gas-holder 2, which is a little smaller in diameter than the base-section or tank, so as to work freely up and down therein, the water sealing the gas contents after the usual manner of such holders. The gas-pipe 20, from the carburetor 4, may connect with the gas-holder at any suitable point, and a pipe 23 will also be provided to deliver the gas, as required, to the points of consumption.

Where it is desired to economize space, or for other purposes, a modified form of carburetor may be arranged within the gas-holder, as shown in Fig. 3. In this case the carbureting-chamber 4^a may be made in cylindrical form, open at the top, and with the bottom resting upon or formed by the bottom of the tank 22. The inclosed perforated pipe 11 will communicate at its lower end with an outside vertical pipe 16^a for admission, first, of gasoline, and then air under pressure. The pipe 16^a may have a branch 24, provided with a funnel 25, through which the gasoline is to be poured, and a cock 26 to close off the said branch-pipe after the carburetor has been charged. With the pipe 16^a is also connected a tube or hose 27 for connection with an air pump or compressor, and through which, after the cock 26 is closed, air may be forced into the lower part of the carburetor and mingled with the gasoline by agitation therewith, in the same manner as already described.

For the ordinary purposes of a gas-machine designed for use in dwellings a hand-pump or air-compressing device comprising a pair of bellows 28 will be sufficient. These bellows 28 are supported in a suitable frame 29, and are arranged with their smaller ends or discharge-orifices downward and each in immediate communication with one of the two air-inlet apertures 30 of an air chamber or reservoir 31 for compressed air that is arranged below the bellows or pump. These apertures or ports 30 of the air-chamber are controlled by downwardly-opening flap-valves 32, normally closed by springs 33, and a suitable air-supply valve 34 is also provided for each bellows. Each inlet-port 30 of the air-chamber 31 has the same area as the entire end of the bellows connected thereto. In the top of the frame 29 is journaled a horizontally-arranged rock-shaft 35, that carries about midway its length a vertical arm 36, to the upper end of which are pivotally connected two levers 37, extended in opposite directions

and pivoted at their outer ends to arms 38, secured to the movable side or half of each bellows. One end of the rock-shaft 35 is extended outside the cabinet or casing 1, and has attached thereto an operating hand-lever 39, that may have either one or two arms or handles. Within the cabinet there may be secured to the rock-shaft 35 a normally-depending arm or pendulum 40, to which may be attached an adjustable weight 41, the pendulum being designed to serve the purpose of a fly-wheel to aid the operation of the pump or bellows. By means of the hand-lever 39 the rock-shaft 35 and attached arm 36 may be oscillated to cause an alternate operation of the bellows 28 to force air into the chamber or compressed-air reservoir 31, before mentioned, and to which the air is thus supplied with great regularity at a rate of about fifteen cubic feet per minute, with one-twentieth horse-power propelling-power. This hand-operated air compressing and forcing device is well adapted for the requirements of my gas-machine when designed particularly for domestic purposes, illuminating, heating, and cooking.

When gas is to be supplied on a larger scale, it may be desirable to mount in the frame 29 a double crank-shaft 42, Fig. 4, having its cranks connected, each by a pitman 43, to cross-heads 44, working in suitable guides 45 on said frame. Each cross-head 44 carries the rod 46 of a piston 47, working in the cylinder 48 of an air-pump. The lower end of each air-pump cylinder 48 opens into one of the air-inlet ports 30 of the air-chamber 31 or compressed-air reservoir. These ports 30 should have the same shape and area as the inside diameter of each pump-cylinder. As the plunger or piston 47 descends, a valve 49 located therein is closed by air-pressure, and the air below the piston being thus compressed forces open one of the valves 32 and enters the chamber or reservoir 31 below the pump. The ports 30 being of the same area as the pump-cylinders, there is no resistance aside from air-compression. Consequently, no matter at what speed the plungers work the air from the cylinders will be forced into the reservoir 31 with comparative ease. The crank-shaft 42 of the pump may be driven from a small gas-engine of one-fourth horse-power by gearing to a driving-pulley 50 on one end of the said shaft, and the engine may be so connected with the rising and falling gas-holder 2 as to start and stop automatically with variations in the gas contents of said holder. The pump may have a capacity of, say, fifteen cubic feet of air per minute, and will give a very high compression under a light-driving power.

The valved inlet-ports 30 of the compressed-air chamber or reservoir 31 may have an aggregate area of sixteen square inches. The pipe 18, through which the compressed air is discharged from the chamber or reservoir 31 and conveyed to the carburetor, has, on the other hand, an inside cross-sectional area of less than one square inch. The large area of the inlet-ports 30 enables the bellows 28 or the pump-cylinders 48 to empty their air contents into the chamber 31 with the least possible resistance, freely and speedily, while the pipe 18, through which air passes from the chamber 31 to the carburetor, being much smaller than the said ports 30, it is obvious that a high degree of compression must take place in the air chamber or reservoir. The bottom section 51 of the air-chamber 31 has a flexible construction after the manner of a bellows, so as to be capable of expanding and collapsing to vary the capacity of the said chamber according to the pressure therein. In its normal position the bottom board 52 of the chamber 31 is closed upward against the upper section of said chamber by means of spiral springs 53, arranged beneath and bearing upward on said board. When the air in the chamber 31 becomes compressed beyond a given point, the bellows-like bottom of said chamber lowers as the pressure within overcomes the resisting power of the supporting-springs, and this manner of compressing and storing the air renders the work so light that fifteen cubic feet of air per minute can be readily supplied to the carburetor during the time that the pump or compressor is in operation. The importance of compressing the air supplied to the carburetor is well understood, as by reason of its expansion after entering the carburetor it will more readily take up or absorb the gasoline vapors. By introducing this air into the bottom of the carburetor and under a strong pressure the gasoline will be thrown into violent agitation, as previously explained, and a better and more uniform quality of gas will be obtained and the entire body of gasoline will be utilized, so that its consumption will be greatly economized. When gasoline is at rest, the dead or heavy portion of the liquid invariably settles to the bottom; but by causing the air to enter in strong currents at the bottom of this liquid, as in my carburetor, the dead or heavy liquid of the lower levels will be caused to thoroughly mix with the lighter portion of liquid above, thus obviating any residue of dead gasoline and converting the entire bulk of the liquid into gas. This effect is greatly aided by forcing the air-supply for the carburetor through a vertical pipe, as 16, in which the gasoline normally stands at the same level as in the main carbureting-chamber. Hence the most violent agitation takes place within the carburetor when the air is forced into the body of gasoline through the said pipe 16 and thence upward from the bottom of the carburetor, and consequently the gasoline is made of uniform density and the air and liquid become thoroughly commingled. As another effect of this arrangement, the gasoline normally standing in the pipe 16 will serve to seal the pipes 16 and 18 securely, so that no valve will be needed to prevent gas from escaping to the chamber

31 and connected air-pump when the latter is not in operation.

In case the air pump or compressor should be operated for a longer time than necessary, or after the gas-holder has become filled, it is advisable that a safety-valve 54 be provided, preferably in the air-chamber 31, to prevent the gas-holder 2 from being forced out of its tank or base portion. The valve 54 is preferably arranged to close upward and control a safety-port 55 in the top of the air-chamber 31, and the said valve is connected by a rod 56 to a lever 57, fulcrumed on a standard 58 at the top of said chamber. One end of this lever 57 supports a weight 59, and the other end is pivotally connected to the lower end of a rod or link 60, that has its upper end pivoted to one end of a lever 61, fulcrumed midway its length to a support 62 at the top of the cabinet 1 and carrying on its other end a dog 63, arranged in position to be struck by the top of the gas-holder 2 when the latter is forced fully upward by the pressure of gas beneath it, the said holder being then charged to its full capacity. When the gas-holder 2 is in a lowered position or not fully charged, the weight 59 will act on the lever 57 and connected rod 56, so as to close the valve 54 upward and prevent any escape of air from the chamber 31 through its safety-port 55; but on the rise of the gas-holder 2 a sufficient distance to make contact with the dog 63 the lever 61 and connecting rod or link 60 will oscillate the weighted lever 57 in a direction to open the safety-valve 54, and consequently relievethe pressure in the air-chamber 31 and connected carburetor, even though the hand air-pump should be operated, as by a careless attendant, longer than may be needed. On descent of the gas-holder the weight 59 will close the safety-valve 54, so that the chamber 31 will again serve as part of the compressor when needed.

There may be connected to the top of the vertically-movable gas-holder 2 one end of a cord 64, that is passed over pulleys 65 at the top of the cabinet 1 and thence downward adjacent to the inner side of the cabinet front. From this cord 64 is suspended a small weight 66, carrying an index-finger 67, that is passed through a vertical slot 68 in the front of the cabinet. On the cabinet front and adjacent to the indicator-finger 67 is a vertical scale-plate 69 for showing the cubic contents of the gas-holder. It is obvious that the rising and falling of the gas-holder will cause a corresponding reverse movement of the weighted indicator, whereby the position of the concealed gas-holder and the volume of its contents may be shown on a properly-graduated scale.

It is preferable to provide the top of the gas-holder 2 with a cross-head 70, working in vertical guides 71 to cause the holder to move steadily.

The cabinet 1 is provided with a door 72, that will afford access for oiling the air-pump, setting the indicator, and other purposes. This cabinet, inclosing the gas-holder and accompanying air-pump and other parts of the apparatus, may be arranged as an article of kitchen furniture and is provided with suitable pipe connections and attachments for burners arranged for illuminating, heating, and cooking purposes, as required.

In Fig. 6 is shown a modified form of carburetor 4^b, which may have an inclined bottom and a contracted chamber 4^c depending therefrom, preferably at one side of the carburetor. The contracted carburetor-chamber 4^c incloses a laterally-perforated pipe or cap 11^a of large diameter and comparatively short length. This cap 11^a takes the place of the pipe 11, hereinbefore described, as an inlet for air and gasoline from the pipe 16, which connects with the under side of chamber 4^c and perforated cap 11^a by the elbows 14 and short connecting-pipe 15, before described. A filling-nozzle 7^a may be connected to the top of the pipe 16, instead of the top of the carburetor, as before described. The principle of operation in this form of carburetor is the same as already described with reference to the other forms illustrated. By arranging the chamber 4^c to one side, as shown in Fig. 6, the pipe 15 will be shortened, thus reducing the quantity of gasoline contained in said pipe and commensurately lessening the work of the air-pump. The short laterally-perforated cap 11^a is submerged with a much lower level of gasoline than a lengthened pipe, as 11, and will continue to permit the making of good gas until the carburetor is almost empty. The cap 11^a is closed at the top and its perforations are lateral, the same as in the pipe 11, but exceed in aggregate area the perforated surface of the pipe 11, before described, thus facilitating expansion of the compressed air admitted to the cap and diminishing the work of the air-pump. By placing the filling-nozzle 7^a so as to connect with the top of the air-pipe 16, in which gasoline also stands when the air compressor or pump is not in operation, it will be possible to feed in gasoline without any obstruction from gas-pressure in the carburetor and connected gas-holder. The gasoline in the pipe 16 seals that pipe and prevents any back pressure of gas when the filling-nozzle 7^a is opened. The gasoline poured into the pipe 16 through the filling-nozzle 7^a will take the same level in the main body of the carburetor, and the pipe 20 leading to the gas-holder will provide all the vent necessary to secure a free flow of gasoline.

What I claim as my invention is—

1. In an apparatus for manufacturing gas from hydrocarbon liquid, the combination of a carburetor having in its lower part a laterally perforated air inlet, an outer pipe communicating with said inlet and extended above the normal level of hydrocarbon liquid in the carburetor, an air compressor having a compressed air chamber communicating with the upper end of said outer pipe, a gas holder com-

municating with the carburetor, and a safety valve communicating with the compressed air chamber and controlled from a moving part of the gas holder, substantially as described.

2. In an apparatus for manufacturing gas from hydrocarbon liquid, the combination of a carburetor, a gas holder in communication with the carburetor, an air chamber or reservoir from which compressed air may be supplied to the carburetor, and a safety valve connected with said chamber and controlled from a moving part of the gas holder, substantially as described.

3. In an apparatus for manufacturing gas from liquid hydrocarbon, the combination with a carburetor and a gas holder communicating with the carburetor, of an air chamber communicating with the carburetor and provided with a safety-valve, lever mechanism for controlling said valve from the gas holder, and an air compressor communicating with the said air chamber through valved ports of larger area than the port through which the said air chamber and carburetor communicate, substantially as described.

4. In an apparatus for manufacturing gas from hydrocarbon liquid, the combination with a carburetor, a gas holder in communication with the carburetor, and an air compressor for supplying compressed air for the carburetor, of an air chamber or reservoir having valved inlet ports communicating with, and of the same area as, the air compressor, a pipe or passage leading from said air chamber to the carburetor and having less area than the air chamber inlet ports, and a safety valve for said air chamber controlled from a moving part of the gas holder, substantially as described.

5. In an apparatus for manufacturing gas from hydrocarbon liquid, the combination of a carburetor, a gas holder communicating with the carburetor, an air compressor for supplying compressed air for the carburetor, an air chamber or reservoir intermediate the compressor and carburetor and communicating with each, a safety-valve for said compressed air chamber, lever mechanism through which said safety-valve is controlled from the movable part of the gas holder, a cabinet inclosing the gas holder, compressor and air chamber, a scale plate secured to the outside of the cabinet, a weight suspended from a cord connected with a moving part of the gas holder and passed over pulleys in the upper part of the cabinet, and an indicator carried by said weight and projected through a slot in the cabinet adjacent to the scale plate to indicate the contents of the gas holder, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses:

ALBERT E. ALDRICH.

Witnesses:
EMMA S. ALDRICH,
J. B. GORHAM.