B. F. GRIMES.

Gas Carbureting Machines.

No. 154,475. Patented Aug. 25, 1874.

Fig. 1.

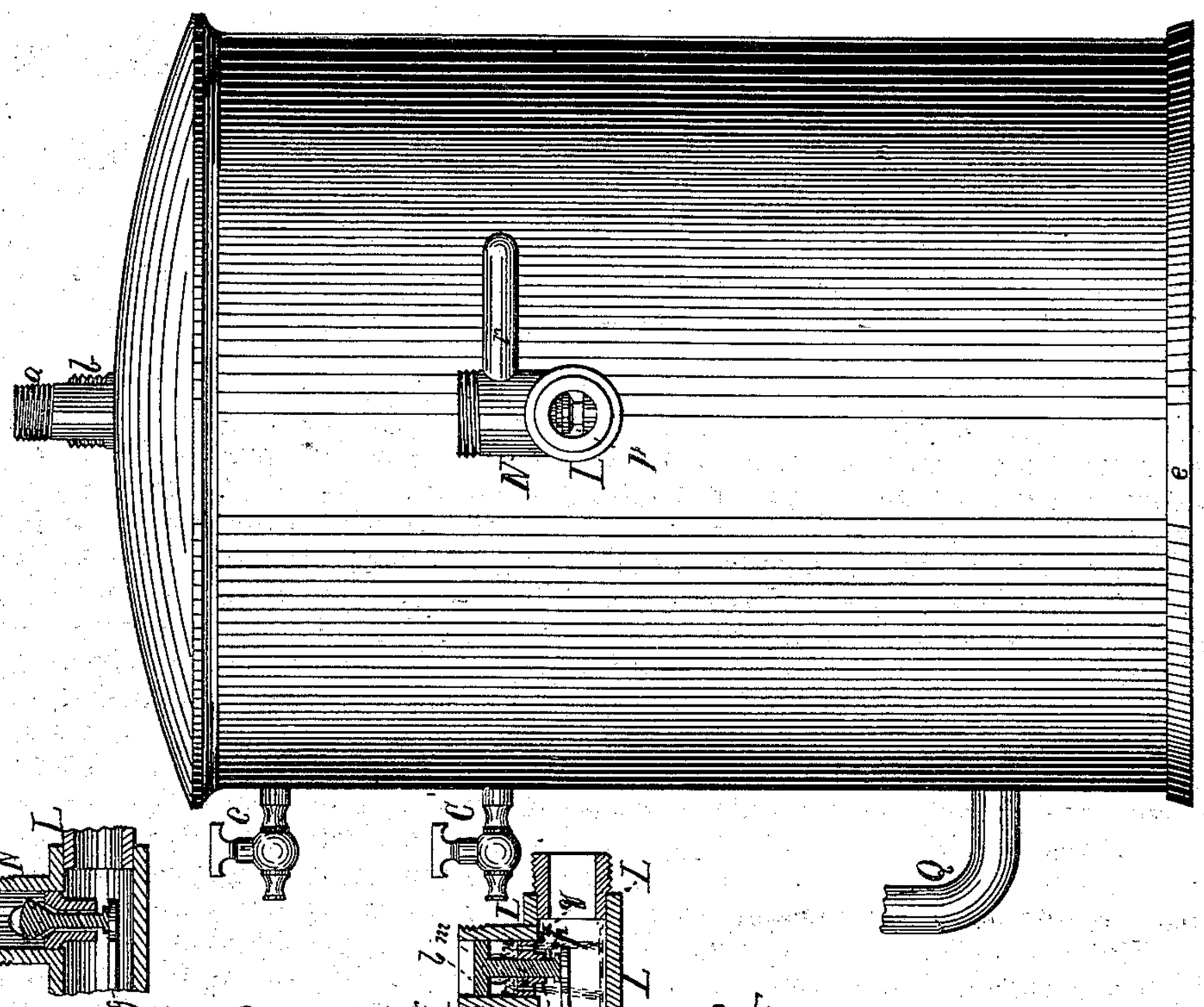
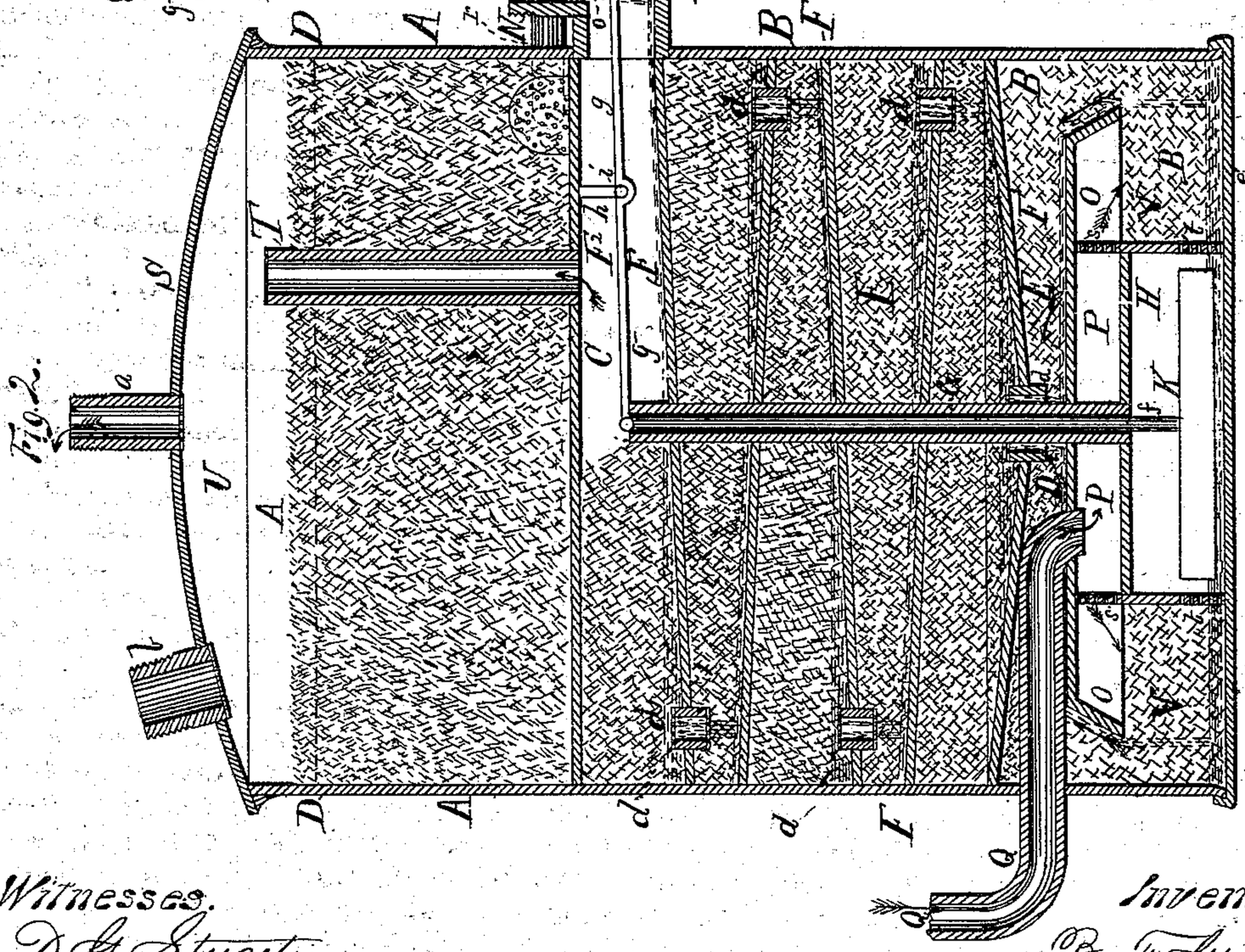


Fig. 3.

Fig. 2.



Witnesses.
D. G. Stuart
L. E. Truesdell

Inventor.
B. F. Grimes
per L. Hanmay
Atty.

UNITED STATES PATENT OFFICE.

BENJAMIN F. GRIMES, OF FLORENCE STATION, OHIO.

IMPROVEMENT IN GAS-CARBURETING MACHINES.

Specification forming part of Letters Patent No. **154,475**, dated August 25, 1874; application filed June 25, 1874.

To all whom it may concern:

Be it known that I, BENJAMIN F. GRIMES, of Florence Station, in the county of Preble and State of Ohio, have invented certain new and useful Improvements in Carbureting and Gas-Generating Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked theron, which form a part of this specification, in which—

Figure 1 represents a side elevation of an apparatus having my improvements applied thereto; Fig. 2, a vertical section of the same; and Fig. 3, a sectional view of a modified form of feed-valve.

My invention relates to a new and improved construction of apparatus for generating gas for illuminating purposes from the more volatile of the hydrocarbon oils, such as gasoline, &c., or for carbureting the gas of ordinary city gas-works, which, as a rule, is usually poor, and the light-yielding element from the absence of a sufficiency of olefiant gas or heavy carburet of hydrogen; and its nature consists, first, in a new and improved device for automatically feeding the carbureting or gas-generating chamber with the hydrocarbon compound or oil from which the gas is generated; secondly, in a new and improved construction of the gas-generating chamber, by means of which the air or gas to be carbureted is made to pass in an upward and zigzag direction through the carbureting-chamber by dividing the latter into a series of compartments, each filled with sawdust or other absorbent, porous, or fibrous material, saturated with the hydrocarbon element from which the gas is to be generated, each of said chambers for this purpose communicating in succession, the one with the other, in order that the air or gas shall, on its exit from the carbureting-chamber, be fully saturated with the thereby-volatilized hydrocarbon oil, that, on being ignited, it may afford at once a steady and brilliant light.

To enable others skilled in the art to make, construct, and use my invention, I will now proceed to describe it in detail.

My apparatus, in the first place, is formed in two main divisions, the upper one, A, of which consists of the oil chamber or reservoir, and the lower one, B, of the carbureting or gas-generating chamber, the two being separated by a division-plate or diaphragm, C. The supply tank or reservoir A may or may not be filled with sawdust or other suitable porous or fibrous material up to the dotted line D; but I prefer to fill it with such material, as such renders it less liable to explosion, and for other reasons here unnecessary to be detailed. The top of that chamber is provided with a vaulted roof, S, which extends upward for a distance above line D, to form a gas-chamber, whence the gas is drawn directly through suitable connections with the distributing-pipe for consumption, or indirectly by being led to a mixing apparatus for further admixture with air, if such is deemed either desirable or necessary. This arrangement, however, for mixing the air is only used where the gas generated results from the use of air as the menstruum of taking up the volatile vapors of the hydrocarbon oil used, and which vapors form the illuminating elements of the gas thus produced, and not where gas from the city gas-works is passed through the carbureting-chamber with the view of being enriched by taking up a small portion of the vapor of the oil used, as such would render the gas so mixed explosive the moment a light was applied to the gas-burner. A small tube, *a*, is inserted in the top of this chamber, to the upper end of which is secured, in any suitable manner, the pipe that connects with the gas-distributing pipes, or, as the case may be, with the air-mixer, and which latter, as perfected by me, will hereafter form the separate subject-matter of another application for Letters Patent. Another opening is also formed in the vaulted roof, which is provided with a screw or removable cap, the use of which, it being fitted with a small mouth-piece or tube, *b*, for the purpose, is to fill the reservoir or chamber A when necessary, this being indicated by the use of two cocks, *c c'*—the one, *c*, at or about the line of the top of the sawdust or line D, to indicate when the chamber is sufficiently full, and the other, *c'*, at or near the bottom

of chamber A, to indicate when it is nearly empty. The inner mouth of the cocks *c c'*, as well as tubes *a* and *b*, may be covered with a piece of fine wire netting or gauze, so as to exclude therefrom the sawdust or other fibrous material with which the chamber A is partially filled to prevent them from clogging up. The lower or carbureting chamber proper B is divided into several distinct compartments, each of which, like A, are filled with coarse sawdust, or other loosely porous or fibrous material E, for a purpose to be hereafter explained. In dividing this chamber into these compartments, the partitions F used are slightly inclined in opposite directions to each other, as shown in Fig. 2, and are each provided at or near their lower side with an opening fitted with a short section of a tube, *d*, the upper end of which must lie in a plane below the higher side of its partition, so as to form an overflow. By means of these short tubes *d* each compartment is provided with a channel or communication with each of the others in regular succession. The lower partition, F^1, differs in its form from that of the others, being made of a dish or funnel shape, and is provided with its short communicating tube *d* at its center or most depressed portion. Its communicating tube *d* is made larger in diameter than that of the others in order to give passage to an upright tube, G, the lower end of which is secured to the top of a float-chamber, H, while its upper end passes through the partitions F in succession, and rises above the sawdust-line of the uppermost compartment, F^2, for a purpose to be hereinafter described. On the bottom *e* of chamber B, in its lowest compartment V, is erected and firmly secured a small chamber, H, closed on its sides and top, which forms what I term the float-chamber, and in the top of which is secured the lower end of tube G, before referred to. Into this chamber is arranged a float of conformable shape, which may be made of any suitable material or constructed in any suitable manner in order to render it buoyant. To the upper side of this float K, in a vertical plane, is secured a lever or rod, *f*, which passes through and extends for a short distance above tube G, when said float rests on the bottom of chamber H. To the upper end of rod *f* is connected, by means of a hinged joint, a lever, *g*, pivoted at *i* to a hanger, *h*, which is secured to and depends from the under side of the bottom C of chamber A, as seen in Fig. 2. The other end of lever *g* is widened to present a broad surface for the support and actuation of the stem of a slide or lift valve, *l*, arranged in a valve-chamber, *m*, formed in or otherwise secured to the outside of the apparatus; or, if desired, it may be so made, arranged, and operated as to be inclosed in chamber A; but I prefer, for various reasons, to arrange the valve-chamber on the outside of the apparatus—for instance, by so arranging it that openings covered by suitable caps may be so made therein as to give access to the valve for repairs or adjustment, should such become necessary. With this view I construct it as follows: A short section of a tube, L, is inserted into and suitably secured to the side of the apparatus immediately below the line of the bottom of chamber A, and above the line of the top of the surface of the partition F of the uppermost compartment of chamber B. The outer end of this tube I close with a cap, and into its upper side insert the section of another and smaller tube, N, to form the valve-chamber proper. For this purpose the bottom is provided with a diaphragm, *n*, into the center of which is inserted a hollow guide-stem, *o*, for the reception of the stem *p* of the valve *b*, as shown in Fig. 2. The valve is made of a width sufficient loosely to fit the interior of the valve-chamber N, and rests on diaphragm *n* when the valve is not raised by the action of lever *g*. The adjacent faces of the valve *l* and diaphragm *n* are turned smoothly off, so that they shall fit snugly together, and thus prevent the passage of oil from the reservoir A to the carbureting-chamber B; as, for this latter purpose, the diaphragm *n* is provided with a number of small holes, *q*, for the passage of oil from the one chamber to the other when the valve is raised, and which will shortly be described. The valve and its port may be modified so as to operate in the manner shown in Fig. 3; in which case the valve is represented as being made of conical form on its under side, where it is joined to its stem, and its valve-seat correspondingly made, the opening for the passage of the valve-stem being made somewhat larger than the latter, so as to give free passage to the oil when the valve is raised. In this case the upper side of the valve, if desired, may be provided with a guide-stem, so as to take into a tubular socket secured to the under side of the top of the valve-chamber, in order to retain the valve in a vertical position when raised and lowered. In either case the valve closes its port by virtue of its own gravity when the pressure of lever *g* is withdrawn therefrom. In the side of valve-chamber N is secured one end of a supply-pipe, *r*, the other end of which communicates with the reservoir A at or near its bottom. Over the mouth of tube *r*, on the inside of reservoir A, is arranged a wire-netting, in order to prevent the sawdust or other fibrous material contained in that chamber from entering therein and choking up its passage. This netting may either be secured directly to the mouth of the pipe or to the interior side and bottom of reservoir A, in any known and suitable manner. The ends and sides of float-chamber H may be extended above its roof and a flat diaphragm or partition, O, secured thereto, the periphery of which is turned down, so as to leave a space between its outer edge and the wall of chamber B, as shown in Fig. 2, thereby forming a gas or air distributing chamber, P. Into the top of this chamber is inserted the end of a pipe, Q, which supplies

the air or city gas to be carbureted. The pipe Q, for this purpose, in the one case, will be attached to the gas service-pipe of the house in which the apparatus is to be used, and in the other case to the ordinary air-forcing apparatus in use for similar purposes, in order to give passage, to the carbureting-chambers, to the air or gas thus supplied to chamber P, the end walls of the latter being provided with an opening or openings, *s*, for its passage into the lowest compartment V. The ends of chamber H, at the bottom of the latter, are also provided with similar openings, *t*, for the passage of the oil contained in the bottom of chamber B to the interior of chamber H, by which means float K is raised and lowered according to the amount of oil contained in that chamber.

Thus constructed, the operation is as follows: Tank A is first filled with the gasoline or other hydrocarbon oil or compound from whose vapors the air or gas is to be carbureted. At this stage, when the reservoir is being first filled, float K will rest on the bottom *e* of chamber B, thereby opening valve *l* and allowing the oil from chamber A to flow into the upper compartment, F^2, of the carbureting-chamber B, and thence through its small tube *b* into the next compartment below, and so on through the tubes *d* into each of the other compartments in succession, until it reaches the lowest compartment V of chamber B, saturating, by capillary attraction, in its course, the porous material E contained in the several compartments, and afterward collecting in the lowermost compartment of chamber B, and which is also filled with porous or absorbent material until its accumulation gradually raises float K sufficiently far to depress that end of lever *g* which bears against the lower end of the stem of slide-valve *l*, thereby allowing the latter to descend until it closes the valve port or ports *q*, through which the oil from chamber A flows into chamber B. In this condition the apparatus is ready for use.

Where it is intended to be used in connection with the service-pipes of a house which uses city gas, in order to enrich the latter with the vapors of the hydrocarbon-oil with which the apparatus is filled, pipe Q is suitably connected with the eduction-pipe of the gas-meter, and pipe *a* with the service-pipe of the house. Thus connected, the pressure of the gas as it issues from the meter forces the gas through pipe Q into chamber P, and thence through openings *s* into the lower compartment of chamber B; whence it passes through lower tube *d* into the next compartment above of chamber B; thence through the porous material of the latter up through next tube *d* into the compartment above; thence through its porous and saturated material into the next chamber above; and so on through each compartment successively, flowing in a zigzag direction, until it finally emerges into the uppermost compartment, F^2, and which is only partially filled with the porous material, or which may be left entirely unfilled with said material, so as not to clog the operation of lever *g* and valve. From this chamber it passes through a tube, T, secured to the bottom C of chamber A, and which extends above the line of the sawdust in the latter chamber, thus forming a communication between compartment F^2 of chamber B and the gas chamber or reservoir U, formed by the vaulted roof S of chamber A, and thence through tube *a* into the service-pipes of the house to the gas-burners for consumption. By this process the gas is enriched by absorbing a portion of the vapors of the hydrocarbon oils with which the sawdust is charged in the different compartments of chamber B.

The process is the same where air is used, it differing only in this, that pipe Q is suitably connected with a fan or other device for forcing a current of air through Q into chamber P, and thence through chamber V into the other carbureting-compartments of chamber B, up and into reservoir U, and from there through pipe *a* into the service-pipes of the house for use, as before; or, if desired, instead of passing directly from chamber U through the service-pipe for use, it may, if deemed desirable or necessary, first be passed through an air-mixer for further admixture with air, and then, through suitable connections with the air-mixer and the service-pipes of the house, conducted to the burners for use, as before. The rise of the oil in the lowest compartment V through the openings in chamber H correspondingly fills the latter and causes float K to rise until, through the consequent depression of levers *f* and *g*, the feed-valve *l* is allowed to descend and cut off the further supply of oil from chamber A. This condition of things will remain until the oil contained in bottom chamber V has been pretty well absorbed by the air or gas passing through the porous and absorbing material contained therein, and which, as absorbed, allows float K gradually to descend, thereby again raising valve *l* and allowing the oil to flow from reservoir A into chamber B, as before. Meanwhile, as the oil in chamber V has been thus absorbed, the oil in the upper compartments, which accumulated in the lower side of each, supplies the necessary material for the continuing of the saturating process after the supply has been cut off by the closing of the valve *l*.

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

1. The combination of the reservoir A, carbureting-chamber B, valve-chamber *m*, and automatic lift-valve *l*, the whole being constructed, arranged, and operated in the manner and for the purposes substantially as set forth.

2. The carbureting-chamber B, divided into a series of compartments by means of inclined partitions F, having short overflow-tubes *d*, arranged in the manner and for the purposes set forth.

3. The carbureting-chamber B, divided into a series of compartments by inclined partitions F, filled with porous material and provided with overflow-tubes *d*, arranged as described, when used in connection with the pipe Q and chamber P for the supply of air or gas to be carbureted, and with tube T, reservoir U, and exit opening or tube *a*, all operating in the manner and for the purpose substantially as set forth.

4. Chambers B and H, float K, and levers *f* and *g*, in combination with lift-valve *l* and valve-chamber *m*, the whole being arranged and operated in the manner and for the purposes set forth.

5. Valve-chamber *m*, as constructed and arranged with relation to the reservoir A and carbureting-chamber B, for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

BENJAMIN F. GRIMES.

Witnesses:
D. G. STUART,
P. HANNAY.