F. B. HILL & G. J. W. WESTWOOD.

CARBURETING APPARATUS.

APPLICATION FILED SEPT. 28, 1908.

947,639. Patented Jan. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

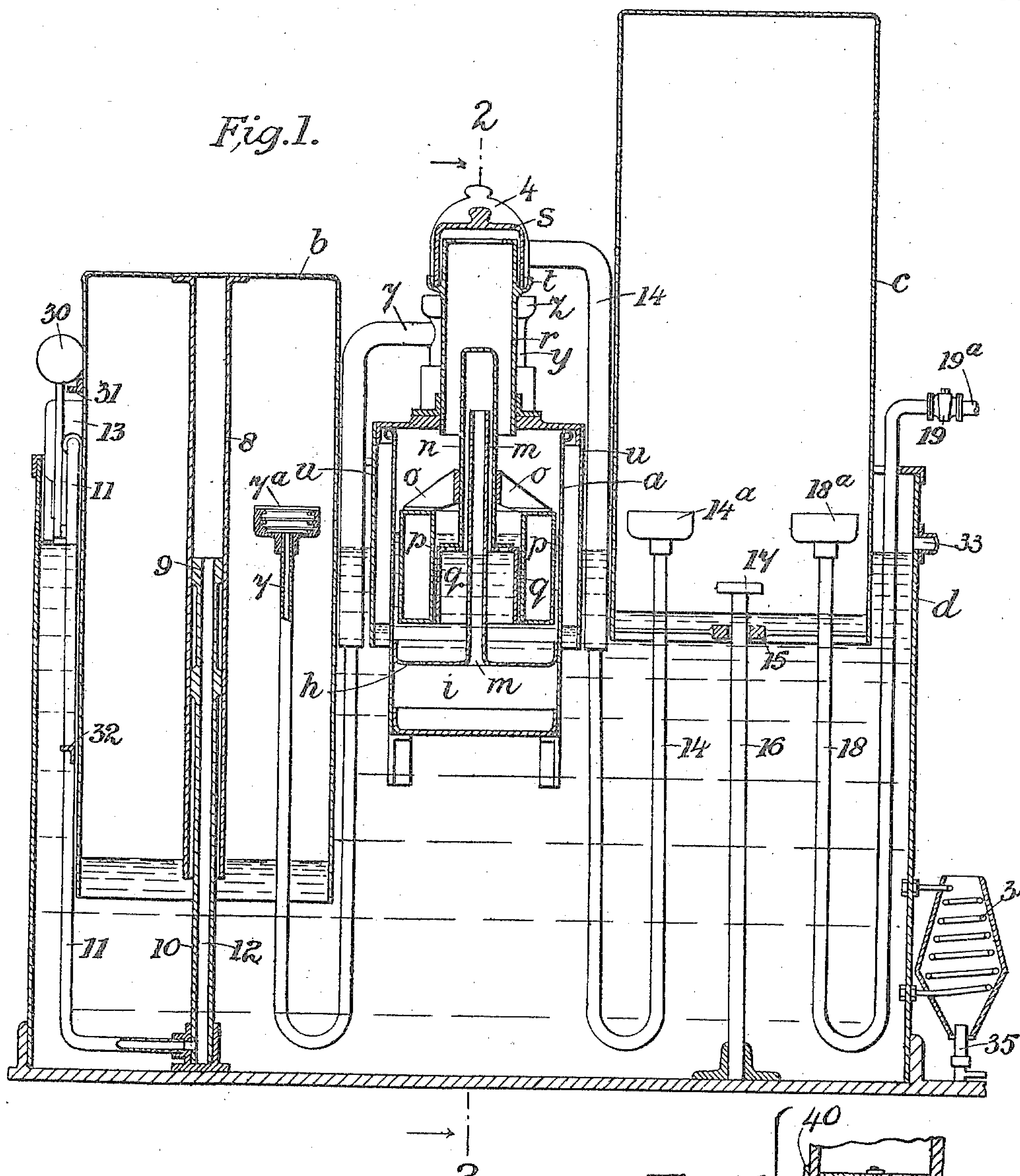


Fig. 4ª

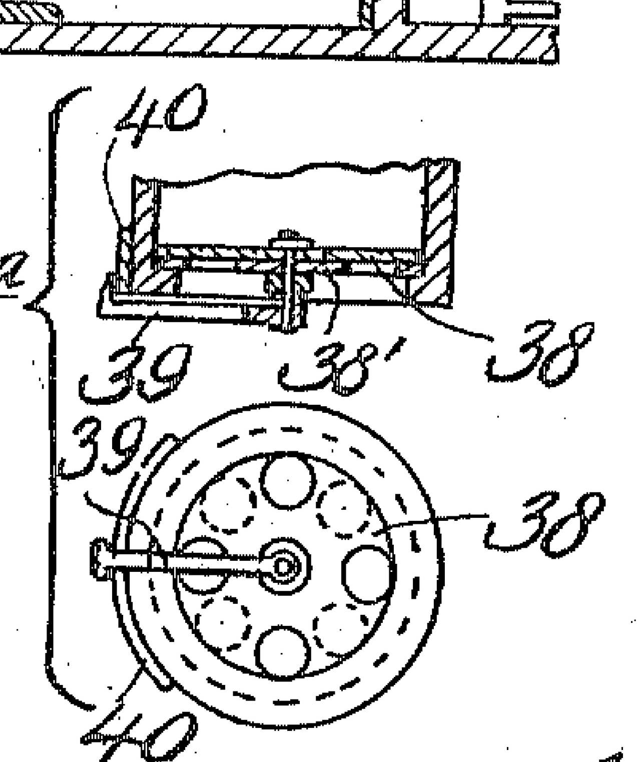


Fig. 3.

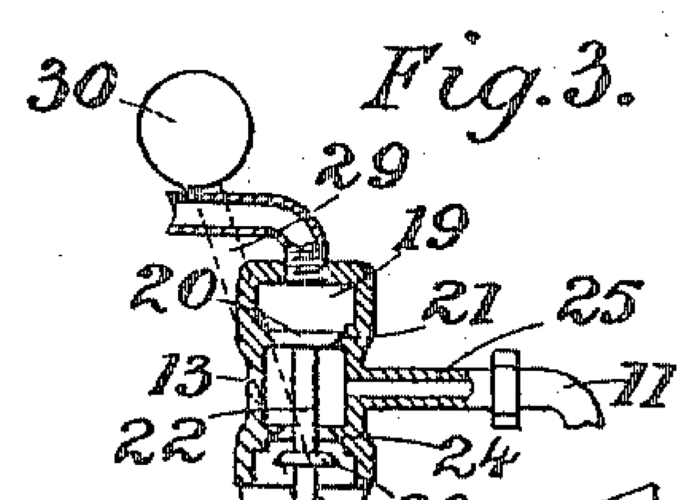
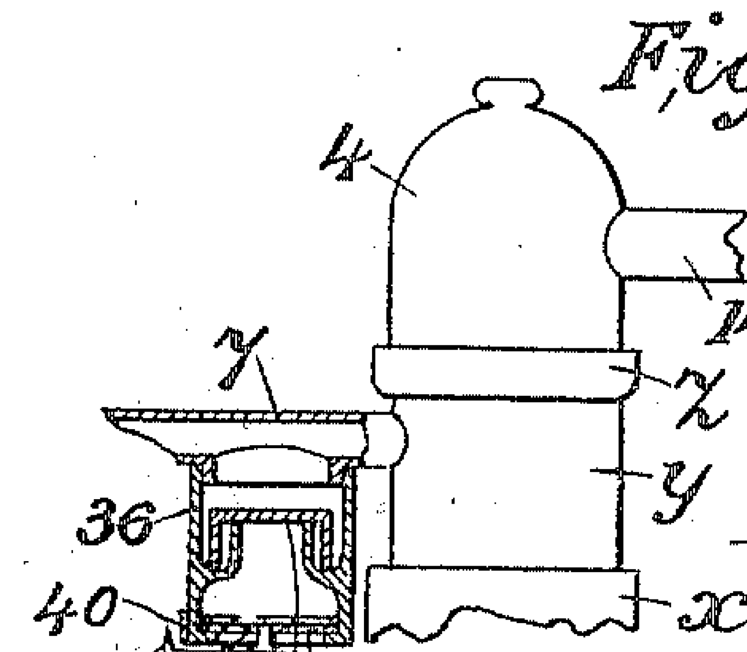


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 2.

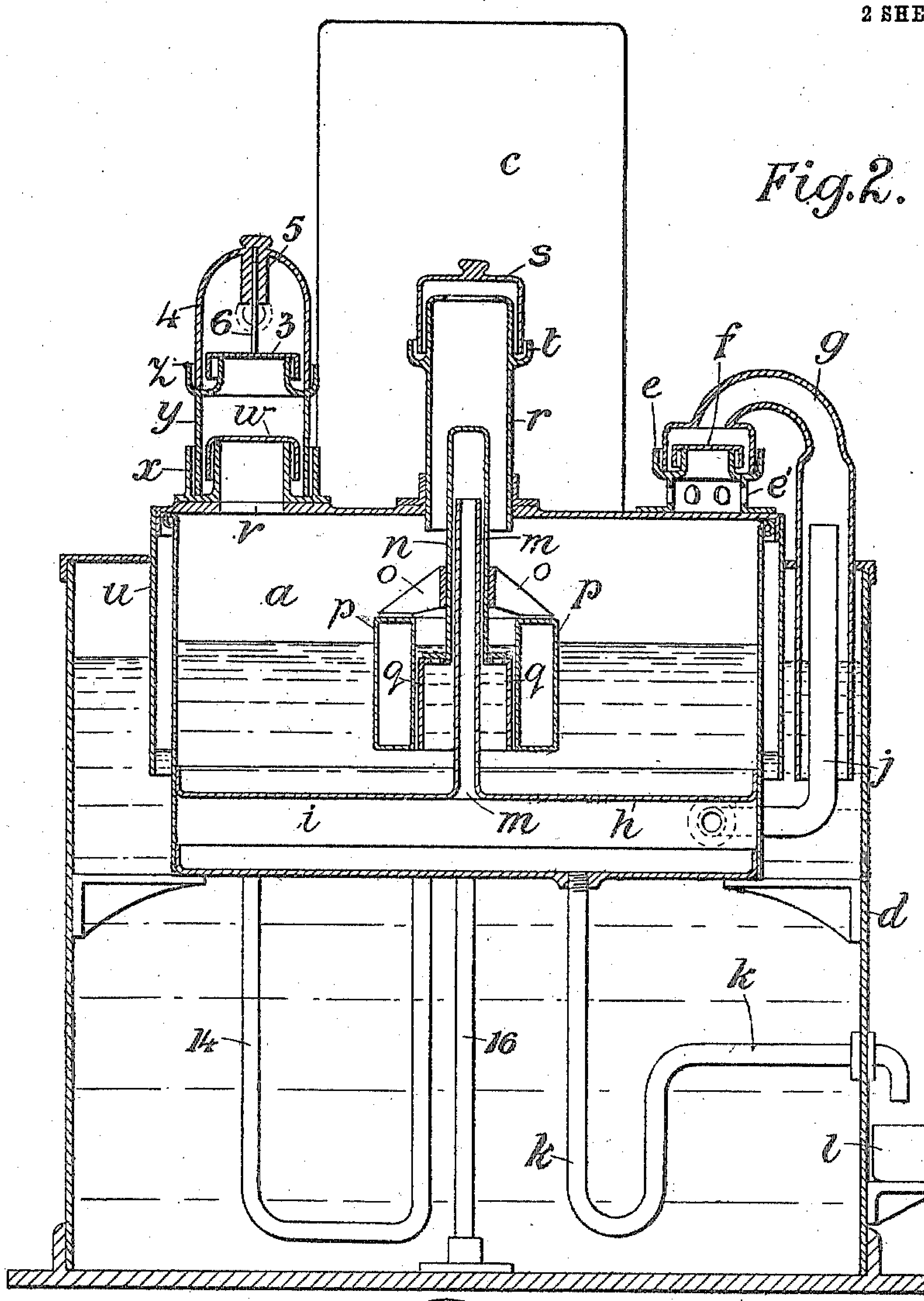
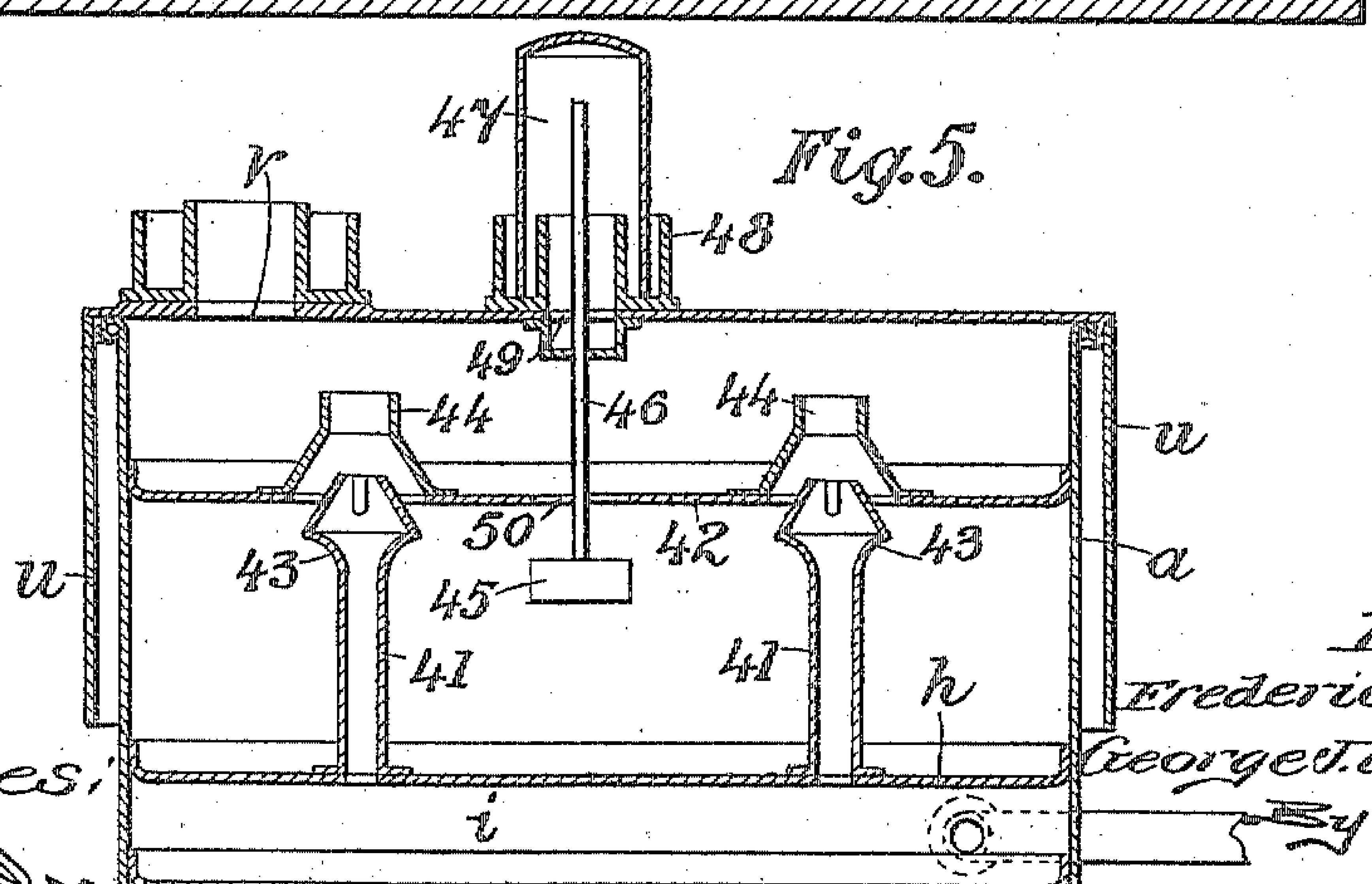


Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

FREDERICK BARKER HILL AND GEORGE JAMES WILLIAM WESTWOOD, OF LONDON, ENGLAND.

CARBURETING APPARATUS.

947,639. Specification of Letters Patent. Patented Jan. 25, 1910.

Application filed September 28, 1908. Serial No. 455,155.

To all whom it may concern:

Be it known that we, FREDERICK BARKER HILL and GEORGE JAMES WILLIAM WESTWOOD, subjects of the King of Great Britain, residing at London, England, have invented certain new and useful Improvements in Carbureting Apparatus, of which the following is a specification.

This invention relates to improvements in apparatus for carbureting air by charging a relatively large proportion of atmospheric air with a small proportion of a light hydrocarbon vapor, such as the vapor of petrol, the said apparatus operating automatically to supply carbureted air suitable for heating and illuminating purposes, of substantially uniform composition, in varying quantities according to demand.

The said invention moreover relates to apparatus of the kind in which there is a rising and falling dome that in its ascending movement draws air through liquid hydrocarbon and in its descending movement forces the vapor laden air into a reservoir.

The chief object of the present invention is to so construct such apparatus that tooling of the parts is almost entirely avoided and liquid seals are used throughout where joints are required, so that the parts of the apparatus can be readily taken apart and reassembled when necessary. Moreover the use of these valves and liquid seals enables the apparatus to be worked with a partial vacuum above the liquid hydrocarbon, such partial vacuum being maintained both when the machine is producing carbureted air and when it is not producing carbureted air. When the dome begins to descend the delivery valve closes and prevents back pressure on the surface of the liquid hydrocarbon.

An important feature of our invention is the provision of an air cooling or condensing chamber through which the air passes before it is drawn through the hydrocarbon liquid or vapor. The said air cooling chamber is kept at a mean temperature by the water in the above-mentioned tank, and any water vapor entering with the atmospheric air is condensed and led away by a suitable drain pipe.

The present invention also comprises certain modifications in the arrangement of such apparatus, and improvements in the details of construction of the same as hereinafter set forth.

In the accompanying drawing:—Figure 1 is a vertical central section of the improved gas making apparatus. Fig. 2 is a section taken on the line 2, 2 of Fig. 1. Fig. 3 is a detail view, partly in section, of a water supply valve comprised in the said apparatus, and Fig. 4 is a detail view of an auxiliary air admission valve hereinafter described. Fig. 4ª is an underneath plan view of the auxiliary air admission valve illustrated in Fig. 4. Fig. 5 illustrates a modified arrangement of hydrocarbon tank.

Like reference characters denote corresponding parts in the several figures.

Referring to the drawing, *a* is a tank containing liquid hydrocarbon, *b* is a dome to which a rising and falling motion is imparted, and *c* is a telescopic receiving chamber or reservoir in which the gas produced in the apparatus is collected. These parts are arranged in a water tank *d*. The tank *a* is attached to the sides of the said tank *d*, and supports an annular cup *e* containing mercury, or other liquid, to form a liquid seal. Dipping into this cup is the flange of a check valve *f* which controls the admission of air entering the apparatus through apertures *e'* below the cup *e*. One end of a bent pipe *g* also dips into this cup and the other end of the said pipe dips into the water tank *d*. The tank *a* is divided by a horizontal partition *h* to form a compartment or chamber *i* in open communication with a pipe *j* which extends from the chamber *i* upwardly within the pipe *g* to a height higher than the water level in the tank *d*. A siphon or trapped drain pipe *k* extends from the said compartment *i* to a position above a drip cup *l* supported outside the tank *d*. An open pipe *m* extends upwardly from the chamber *i* within a tube *n* which is closed at its upper end and is supported by arms *o* attached to a float *p* rising and falling with the level of the liquid hydrocarbon in the tank *a*. As shown in Figs. 1 and 2, the lower end of the tube *n* opens beneath the level of the liquid, within a bell-shaped chamber formed by baffles or perforated screens *q* carried by the float *p*.

The upper end of the tube *n* moves in a cylinder *r* arranged above the tank *a*, the upper end of this cylinder being closed by a cap *s* dipping into a cup *t* containing mercury or other liquid forming a liquid seal. The top or cover of the tank *a* is detachable from the tank and is formed with downwardly extending walls *u* forming a liquid seal preventing the escape of vapor or admission of air. An outlet aperture *v* in the upper part of the tank *a* is controlled by a non-return valve *w* the flange of which dips into a mercury or other liquid seal contained in a cup *x*. A short cylinder *y* resting in the cup *x* supports a cup *z* containing a liquid seal into which the flange of a non-return valve 3 dips. The rim of a cap 4 also rests in the cup *z* and this cap is provided internally with a hollow extension 5 in which a rod 6 on the valve 3 is guided.

A pipe 7 (Fig. 1) opening out from the chamber formed by the short cylinder *y*, between the valves *w* and 3, extends downwardly in the tank *d* and then rises within the dome *b*. The pipe 7 is made in two parts one of which telescopes in the other. Within the said dome *b* is a tube or cylinder 8 which is slidable on a fixed piston 9 integral with a rod 10 secured to the bottom of the tank *d*. A water supply pipe 11 is in free communication with the interior of the cylinder 8 through a conduit 12 extending through the piston 9 and rod 10. The flow of water through this pipe is controlled by a valve 13 in a manner hereinafter described.

Starting from the cap 4, above the non-return valve 3, a telescopic pipe 14 descends through the tank *d* and then extends upwardly within the dome *c* which rises and falls in the liquid in the tank *d* and is guided by a ring 15 sliding on a rod 16 secured to the bottom of the tank. The rising movement of the dome *c* is limited by a stop 17 on the rod 16. A pipe 18 leads from the interior of the dome *c* through a controlling valve 19, to a service pipe or main 19^a. The said pipes 7, 14 and 18 are provided with disintegrating and mixing diaphragms, partitions or baffles arranged within boxes 7^a, 14^a, and 18^a, respectively.

In Fig. 3 is shown a convenient form of valve for controlling the supply of water through the pipe 11. This valve comprises a body 13 the inlet side 19 of which is controlled by a valve 20 closing on a seat 21. The rod 22 of the valve 20 also carries a second valve 23 closing on a seat 24. The valves are spaced apart on the valve rod so that when one valve is fully opened the other is closed. The valve body 13 has an outlet 25 which is coupled to the pipe 11. The valve rod 22 is moved by a lever 26 pivoted to an arm 27 at 28, and the valve rod is held by this lever in either of its extreme positions by a tumbler arm 29 carrying a weight 30. The lever 26 is arranged in the path of stops 31, 32 provided on the dome *b*. The tank *d* is provided with an overflow pipe 33.

The operation of our improved apparatus is as follows: The dome *b* sinking in the tank *d* by its own weight, brings the stop 31 into engagement with the lever 26 and opens the valve 20. This closes the valve 23 so that water entering the valve body 13 through the inlet 19 passes through the outlet 25 into the pipe 11 and is conveyed by the conduit 12 to the cylinder 8. This water is supplied under sufficient pressure to raise the dome *b*, the cylinder 8 during this movement sliding on the piston 9. The rising movement of the dome *b* is employed to draw atmospheric air into the apparatus by creating a partial vacuum in the tank *a* with which it communicates whereby the valve *f* is raised to admit air through the pipes *g*, *j* to the chamber *i*, and thence through the pipe *m* into the said tank *a*. The chamber *i* is kept at a mean temperature by the water in the tank *d* and serves as a cooling or condensing chamber for the air entering therein. Any water vapor entering with the air is condensed and led away through the pipe *k* which is trapped or sealed to prevent entrance or escape of air through the same. The air after depositing its moisture, is led out of the chamber *i* through the pipe *m* and descends within the tube *n* escaping into the tank *a* below the level of the liquid hydrocarbon therein. The depth of immersion of the outlet end of the tube *n* in the liquid hydrocarbon is kept substantially constant by the float *p* following variations in the level of the liquid. The air, in ascending through the hydrocarbon liquid, passes through the baffles or perforated screens *q* which break up the rising air bubbles and insure a sufficient saturation of the air with the vapor of the hydrocarbon. The hydrocarbon laden air passes out from the upper part of the tank *a* through the non-return valve *w* (Fig. 2), the pipe 7 and the mixing box 7^a (Fig. 1), into the dome *b*. During the suction or rising movement of the dome *b*, the valve 3 (Fig. 2), is held on its seat so that there can be no back-flow into this dome from the reservoir *c*.

As the dome *b* rises the stop 32 is brought into engagement with the lever 26 and moves the latter whereby the valve 20 is closed and the valve 23 opened. The water in the cylinder 8 can then escape past the said valve 23 and the weight of the dome *b* causes the same to descend whereby the vapor laden air is caused to return through the mixing box 7^a and pipe 7, and again enter the cylinder *y* above the valve *w* which prevents the return of the vapor laden air into the tank *a*. This air then raises the valve 3 and flows through the pipe 14 into the reservoir *c*.

The said dome c is suitably loaded to maintain a sufficient pressure in the main 19^a when the valve 19 is opened. When no gas is being drawn off through the main, the dome c remains raised and the pressure of the vapor laden air in the said dome, the dome b and the connecting conduits, prevents the dome b from falling, and thus the working of the apparatus is automatically stopped. The water returned from the cylinder 8 when the dome b is falling escapes through the valve 23 into the tank d and flows out through the overflow pipe 33 so that, during the working of the apparatus, a constant circulation of water in the tank d is maintained.

The movements of the tube n in the cylinder r may be employed to indicate the level of the liquid in the tank a which moreover can be conveniently filled through the said cylinder r when the cap s is removed. A heating coil 34 warmed by a gas burner 35 or other suitable source of heat, is arranged in communication with the tank a at any desired distance from it and is put in operation to maintain the water in the tank at a suitable temperature during cold weather, or when the apparatus is used in cold climates.

Fig. 4 illustrates means for adjusting the apparatus to supply a mixture of air and vapor in proper proportions in accordance with variations in the atmospheric temperature and pressure. As here shown the pipe 7 is provided with a branch 36 having a non-return valve 37 arranged therein and opening inward. Below this valve is arranged a valve of any suitable construction, the form shown in the drawing consisting of a rotatable plate 38 and a fixed plate 38′, provided with openings adapted to be brought into register. By moving the rotatable plate the size of the openings can be adjusted. Attached to the movable plate 38 is a pointer 39 adapted to move over a graduated scale 40 to indicate the amount of opening. When the grid valve 38 is open and the dome b is rising, air will be drawn into the pipe 7 and mingle with the vapor laden air passing therethrough. On the dome b commencing to fall the pressure in the pipe 7 will close the valve 37 and prevent escape of gas. The scale 40 is graduated to show the position to which the pointer 39 must be brought to effect a proper adjustment of the valve 38 in accordance with the variations in the condition of the atmosphere, in order that the proportions of air and vapor may be kept substantially constant.

In the modified arrangement illustrated in Fig. 5, the chamber i is in communication with the upper part of the tank a through pipes 41. In this case the upper part of the tank a is also divided by a horizontal partition 42 above the partition h. The upper ends of the pipes 41 and the partition 42 respectively carry parts 43, 44 of induction nozzles or injectors. A float 45 carries a rod 46 to give an indication of the level of the liquid in the tank a. This rod moves in a cylinder 47 standing in a liquid seal trough 48 covering a filling hole 49. The partition 42 is perforated at 50 to permit liquid to pass down into the space beneath this partition. By means of this arrangement, air in passing out of the nozzle parts 43 attached to the pipes 41 draws vapor from above the liquid hydrocarbon in the tank through the parts 44 of the nozzles and thus produces a mixture of air and vapor which is withdrawn through the outlet aperture v in the top of the tank a and enters the dome c. This arrangement is particularly suitable for use with highly volatile liquids or in hot climates.

As will be seen from the drawings, all the joints by which the several parts of the apparatus are connected together are, as far as possible, formed by mercury or other liquid seals so that for cleaning or other purposes the different members of the apparatus can be very readily taken apart and they can be reassembled in an equally ready and simple manner.

Parts of the apparatus, such for example as the rising and falling dome b may be duplicated in order to insure a more regular supply of carbureted air to the reservoir c.

What we claim is:—

1. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a dome receiving vapor laden air, and a jointed fluid conduit leading from said cylinder to said dome.

2. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a dome receiving vapor laden air, a liquid seal closing the lower end of said dome, and a telescopic fluid conduit connecting said cylinder to said dome.

3. In apparatus for carbureting air, a hydrocarbon tank, a dome receiving vapor laden air, a jointed fluid conduit in open communication with said dome, a cylinder in open communication with the said conduit, a liquid seal non-return valve, and a liquid seal cup into which said valve and cylinder dip, the said cup and valve bounding a space in open communication with the said hydrocarbon tank.

4. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a dome receiving vapor laden air, a fluid conduit leading from said cylinder to said dome, a liquid seal cup on said cyl-

inder, a cap dipping therein, a reservoir for vapor laden air, and a jointed fluid conduit leading from said cap to said reservoir.

5. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a liquid seal cup on said cylinder, a cap dipping therein, liquid seal non-return valves respectively dipping into the said liquid seal cups, and fluid conduits leading from said cylinder and cap respectively to a receiving dome and a reservoir for vapor laden air.

6. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a liquid seal cup on said cylinder, a cap dipping therein, a receiving dome and a reservoir for vapor laden air liquid seals closing the open lower ends of said dome and reservoir, and fluid conduits leading from said cylinder and cap and extending upwardly within the dome and reservoir, respectively, above the level of the liquid sealing the lower ends of said dome and reservoir.

7. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a liquid seal cup on said cylinder, a cap dipping therein, liquid seal non-return valves dipping into each of said cups respectively, a receiving dome and a reservoir for vapor laden air liquid seals closing the open lower ends of said dome and reservoir, and telescopic fluid conduits leading from said cylinder and cap and extending upwardly within said dome and reservoir, respectively, above the level of the liquid sealing the lower ends of said dome and reservoir.

8. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup and at the other end into a liquid, and a pipe extending from said tank upwardly within the first mentioned pipe.

9. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe and a non-return valve both dipping into said cup, said pipe dipping at its other end into a liquid, and a pipe extending from said tank upwardly within the first mentioned pipe.

10. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a cylinder dipping therein, a liquid seal cup on said cylinder, a cap dipping therein, liquid seal non-return valves dipping into each of said cups respectively, a receiving dome and a reservoir for vapor laden air, telescopic fluid conduits leading from said cylinder and cup and extending upwardly within said dome and reservoir, respectively, a tank adapted to contain water to seal the open lower ends of said dome and reservoir, a liquid seal cup, a non-return valve dipping into said cup, an air inlet pipe dipping at one end into said cup and dipping at the other end into the water in said water-containing tank, and a pipe extending from said hydrocarbon tank upwardly within the first mentioned pipe.

11. In apparatus for carbureting air, a hydrocarbon tank, a dome and a reservoir receiving vapor laden air, a water tank containing water sealing the open lower ends of said dome and reservoir, a liquid seal cup, a cylinder dipping into said cup, a second liquid seal cup on said cylinder, a cap dipping into said second cup, telescopic fluid conduits passing from said cylinder and cap to said dome and reservoir through the water in said tank, an air inlet pipe dipping into the water in said tank and a pipe extending from said hydrocarbon tank upwardly within said air-inlet pipe.

12. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a cylinder dipping therein, a rising and falling dome, a jointed fluid conduit leading from said cylinder to said dome, and a hydraulic motor actuating said dome.

13. In apparatus for carbureting air a hydrocarbon tank, a tank adapted to contain water in which said hydrocarbon tank is immersed, a liquid seal cup on said tank, a cylinder dipping therein, a rising and falling dome having an opening at its lower end sealed by the water in said tank, a telescopic fluid conduit between said cylinder and dome, a hydraulic motor actuating said dome, and means for discharging the exhaust water from said motor into said tank.

14. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup and at the other end into a liquid, an air cooling and condensing chamber in communication with the interior of said tank, and a pipe extending from said air cooling and condensing chamber upwardly within the first mentioned pipe.

15. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup and at the other end into a liquid, a non-return liquid seal valve dipping into said cup, an air cooling and condensing chamber in communication with the interior of said tank, and a pipe extending from said air cooling and condensing chamber upwardly within the first mentioned pipe.

16. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup, an air cooling and condensing chamber in communica-

tion with the interior of said tank, a tank adapted to contain water in which said hydrocarbon tank and said air cooling and condensing chamber are immersed and into which the other end of said pipe dips, and a pipe extending from said air cooling and condensing chamber upwardly within the first mentioned pipe.

17. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup and at the other end into a liquid, an air cooling and condensing chamber in communication with the interior of said tank, a trapped drain pipe leading out from said air cooling and condensing chamber, and a pipe extending from said chamber of the tank upwardly within the first mentioned pipe.

18. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a dome, a telescopic fluid conduit conveying vapor laden air from said cylinder to said dome, and a pipe admitting an auxiliary supply of air into said conduit.

19. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder and a non-return valve dipping into said cup, a dome, a telescopic fluid conduit conveying vapor laden air from said cylinder to said dome, a pipe admitting an auxiliary supply of air into said conduit, and a liquid seal non-return valve controlling the thoroughfare through said pipe.

20. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup surrounding a space in open communication with the interior of said tank, a cylinder dipping into said cup, a dome, a telescopic fluid conduit conveying vapor laden air from said cylinder to said dome, a pipe admitting an auxiliary supply of air to the said conduit, and adjustable means for controlling the passage of air through the said pipe.

21. In apparatus for carbureting air, a hydrocarbon tank, a liquid seal cup, a pipe dipping at one end into said cup and at the other end into a liquid, a pipe extending from said tank upwardly within the first mentioned pipe, a rising and falling dome drawing air through said pipes and tank, and means for loading the air with hydrocarbon vapor during its passage through the hydrocarbon tank.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

FREDERICK BARKER HILL.
GEORGE JAMES WILLIAM WESTWOOD.

Witnesses:
J. MARKS,
ALEXANDER W. ALLEN.