T. F. FRANK.

Carbureter.

No. 59,991. Patented Nov. 27, 1866.

Fig. 1.

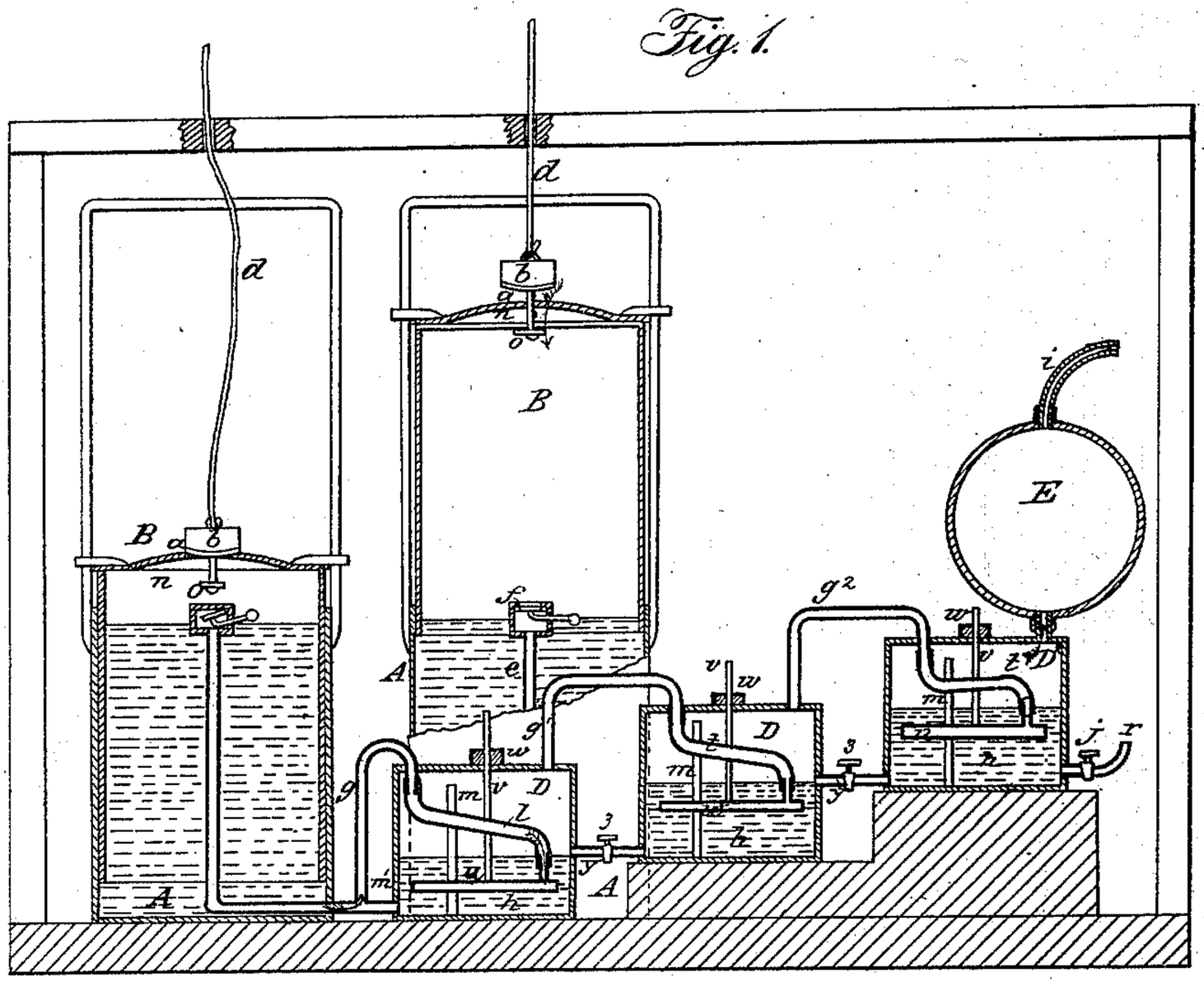
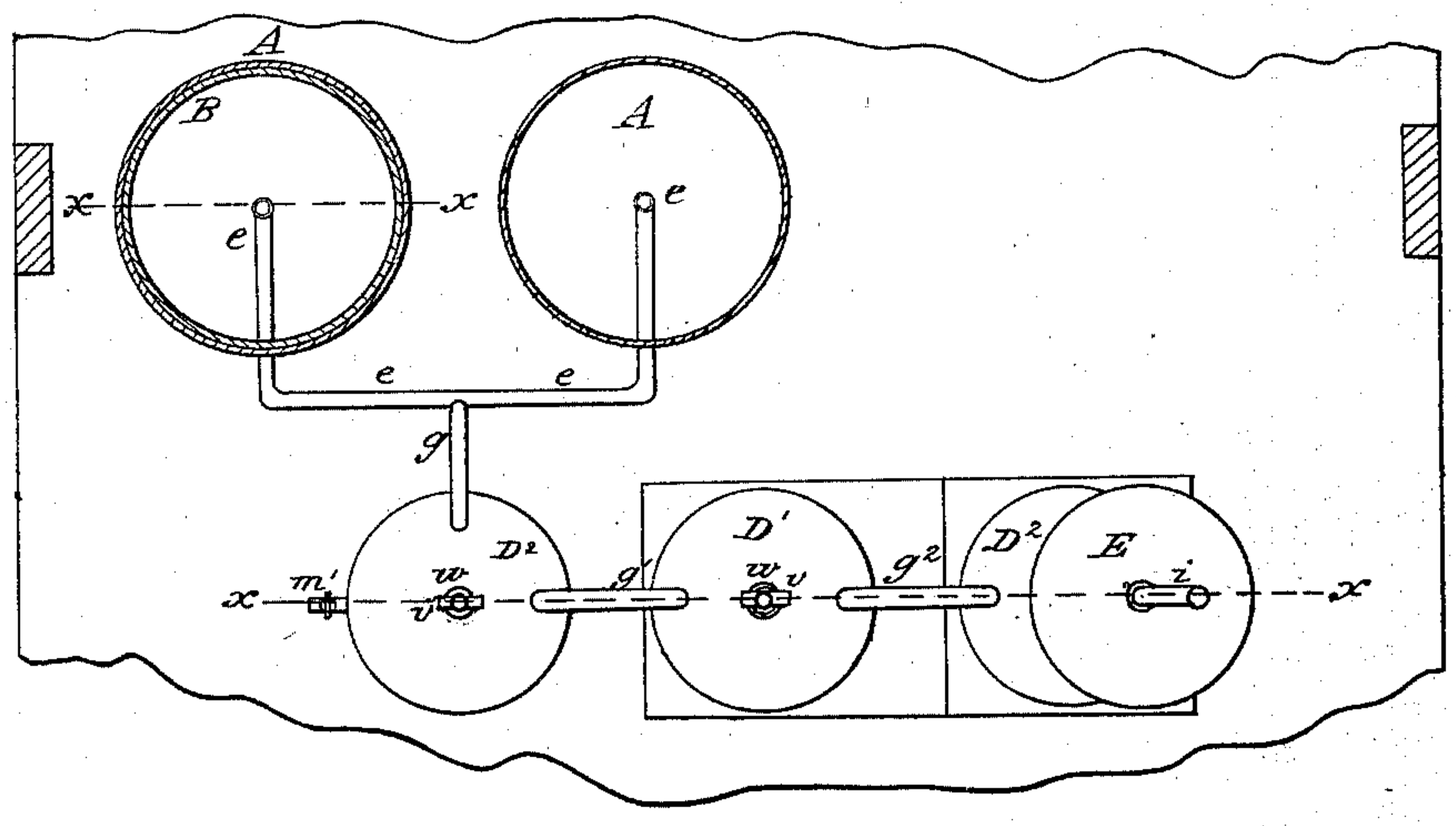


Fig. 2.



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UNITED STATES PATENT OFFICE.

THEODORE F. FRANK, OF BUFFALO, NEW YORK.

IMPROVED APPARATUS FOR CARBURETING AIR.

Specification forming part of Letters Patent No. **59,991**, dated November 27, 1866.

To all whom it may concern:

Be it known that I, THEODORE F. FRANK, of the city of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Apparatus for Carbureting Air for Illumination; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a vertical section of my improved apparatus in plane of line *x x*, Fig. 2. Fig. 2 is a plan of the carbureting-vessels and the air-reservoirs in horizontal section.

Like letters of reference designate corresponding parts in both figures.

The object of my invention is the generating of hydrocarbon vapors suitable for the purpose of illumination; and the invention consists in the arrangement of the alternately-acting air-reservoirs, with their valves and pipes, for continuously supplying the necessary air, and in the arrangement of the carbureting-vessels containing the hydrocarbon liquid, through which the air is successively forced, the device of the adjustable air-discharge pipe, and the special combination of the apparatus with a regulator for producing a uniform flow of the gaseous mixture to the burners.

As represented in the drawings, A A are two vessels, partly filled with water, each of which contains an air-holding cylinder or other formed vessel, B, inverted so that its open end is immersed in the water in A. These vessels are, in general construction, similar to the gasometers in common use, but differ in the arrangement and use of valves and pipes, by which only one of the pair A B operate at the same time, as will presently be described.

The air-cylinders B are supplied with air through ports *a* in the top, provided, as shown, with a valve, *b*, which rests over the ports. A stem, *c*, extends from the bottom of the valve downward, passing loosely through a cross-bar, *n*, or other support, and terminating in a head, *o*, to prevent its withdrawal when the valve is raised, as will presently be described. This valve is loaded with a weight sufficient, in combination with the weight of the cylinder, to produce the necessary pressure of the air within the reservoirs B, and is provided with a cord or chain, *d*, according to its weight, which passes up through the ceiling C above, and thence to any convenient place, where it may be fastened, when required.

The reservoirs B are filled by raising, first, the valve, by means of the cord *d*, till the head of stem *c* comes in contact with the cross-bar, when the cylinder itself is elevated, the air filling in through the now open port *a*, (shown in Fig. 1,) and then, by letting go of the cord *d*, the valve closes the port.

Instead of this arrangement of the valve, any other suitable one may be employed which will open inward by the influx of the air in raising the cylinder, in which case the cord *d* would be attached to the top of the cylinder, which would be of the necessary weight for producing the requisite pressure.

The vessels A are provided, each, with a pipe, *e*, which extends above the water-line, so as to open into the air-chambers, with a valve, *f*, opening downward to allow the passage of the air, but closing by pressure upward. These pipes unite outside of the vessels, and form a junction with a main pipe, *g*, which conducts the air to the first one, D, of the series of carbureting-vessels D D^1 D^2. Of these vessels there may be any required number, and of any size suitable for holding the hydrocarbon liquid *h*, which should only partly fill the same, as represented.

Each of the carbureting-vessels is provided with a flexible portion or section of pipe, *t*, of india-rubber or other suitable material, which connects pipes *g* g^1 g^2, respectively, with horizontal pipes *u u*, or equivalent, provided with fine perforations, preferably at the bottom, for the escape and general diffusion of the air through the liquid *h*. A rod, *v*, extends from these perforated pipes upward through the cover, and a stuffing-box, *w*, at the top of the vessels D D^1 D^2, which enables the discharge-pipes to be adjusted higher or lower, according to the height of the liquid and the pressure of the air, as shown. This arrangement is a matter of considerable importance, as the amount of pressure required to force the air through the vessels depends very much upon the depth of the discharge-pipes below the surface of the liquid therein.

The air, escaping through the perforations

in the pipe *u* in the first vessel, D, becomes thoroughly diffused through the liquid *h*, from which each particle of air absorbs more or less of the volatile elements. When rising from the surface, it retains and carries the same with it, as it ascends, through the pipe g^1, which conducts it to the bottom of the second vessel, D^1, of the series, where it becomes more thoroughly saturated with the inflammable vapors, from whence it passes through g^2 into the third vessel, D^2, and so on until it becomes sufficiently charged with hydrocarbon for the purpose of illumination. The gaseous mixture then passes into a regulator, E, of elastic material, as india-rubber, or into what would be an equivalent, a small vessel or chamber with an elastic side or portion, the elasticity of which, as the bag or chamber becomes distended, causes a steady and uniform efflux through the pipe *i*, which conducts it to the different points where it may be required for illumination. This aeriform and gaseous mixture may be ignited through an ordinary gas-burner, with or without a chimney.

As before stated, only one of the air-holders B is designed to be in operation at the same time. They are first both filled in the manner before specified, when one is secured in that elevated position by its cord *d*, while the cord of the other is loosened, allowing it to compress the air within, as shown at the left in Fig. 1. This causes the valve *f* of pipe *e* to open, when the air passes through the latter to pipe *g*, and thence through the carbureting-vessels, as before described. There being a free communication between the two pipes *e*, the passage of the air through one closes the valve *f* in the end of the other, so long as the air-cylinder into which it opens is supported by its cord. When the air in the one cylinder is exhausted the cord *d* of the other is loosened, allowing it to operate, which closes the valve *f* that opens into the exhausted cylinder, when the latter is raised, filled, and fastened up ready for use, when required by the other becoming empty.

The vessels D D^1 D^2 are provided with a vertical slot, *m*, in the side of each, closed by a strip of glass, through which the height of the gasoline or naphtha can be ascertained.

The carbureting-vessels are arranged one above the other, as represented in Fig. 1, so that the gasoline, naphtha, camphine, or other hydrocarbon liquid employed may be introduced into the upper and last one, D^2, of the series through suitable pipe *r* and stop-cock *j*, whence, after becoming partially exhausted of its volatile elements, it may be let into the next lower vessel by means of the connecting-pipe *y* and stop-cock *z*, and so on to the lowest one, D, where the residuum of the exhausted liquid may be drawn off through a suitable faucet or pipe, provided with stop-cock *m'*.

The object of this arrangement is as follows: It is well known that the most volatile elements of a liquid are first and most easily absorbed and discharged, and that the first action of the air or any other absorbent is the greatest, and that the facility and avidity with which it imbibes any substance diminishes as it becomes partially saturated. Hence, in order to most fully charge the air with the hydrocarbon elements, and also to most thoroughly exhaust the liquid employed, it is essential for the latter purpose that the pure air passes through the partially-evaporated liquid, and for the former purpose that the partially saturated air passes last through fresh unvolatilized liquid. These results are fully accomplished by the use of my arrangement. The pure air first enters the vessel D, which contains the nearly-exhausted liquid, from which it extracts the remaining volatile elements, whence, partially saturated, it passes to the second, D^1, which contains a more volatile liquid, and so on, the volatility of the liquid increasing as the absorbing power of the partially-charged air diminishes, until it reaches the last of the series, whence it passes through the fresh liquid, where it becomes fully charged with hydrocarbon before it passes to the burners.

It is evident that the size of the different parts of my apparatus may vary, from that required to supply the necessary light for a single family to that required for a village or city.

The following advantages of my improvements may be noticed in addition to those already enumerated: The light which is produced thereby, while it equals in clearness and brilliancy that of ordinary gas, can be supplied at less than one-quarter the expense, and much cheaper than that from kerosene and other oils. The expense of the apparatus is comparatively small. The combination of the two air-reservoirs enables the air to be easily and constantly supplied. The use and arrangement of the series of carbureting-vessels enable me to produce the complete saturation of the air and utilization of the liquid, which could not otherwise be accomplished. The use of the regulator E not only prevents any flickering of the light, which might otherwise result from the pulsations of the air as it escapes above the surface of the hydrocarbon liquid, but it also forms a reservoir of sufficient capacity to keep the lights burning while the air-chambers are being filled, in case, through any neglect, the change should not be made at the proper time, the gradual diminution of the light giving sufficient warning to enable the apparatus to be readjusted.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the two air-supplying reservoirs, operating alternately, and provided with valves *b* and *f* and pipes *e*, with the series of carbureting-vessels D D^1 D^2, or equivalent, substantially as and for the purpose set forth.

2. Arranging the series of carbureting-vessels D D^1 D^2 on different planes, and connect-

ing them by suitable pipes and stop-cocks *y z*, substantially in the manner and for the purpose specified.

3. In combination with the carbureting-vessel D, the perforated air-discharge pipe *u*, provided with stem *v*, stuffing *w*, and flexible pipe *t*, for adjusting the former, substantially as and for the purpose set forth.

4. The combination of the air-supplying apparatus and the carbureting apparatus, both constructed as described, with the regulator E, the whole arranged and operating as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

THEODORE F. FRANK.

Witnesses:

JAY HYATT,

ALBERT HAIGHT.