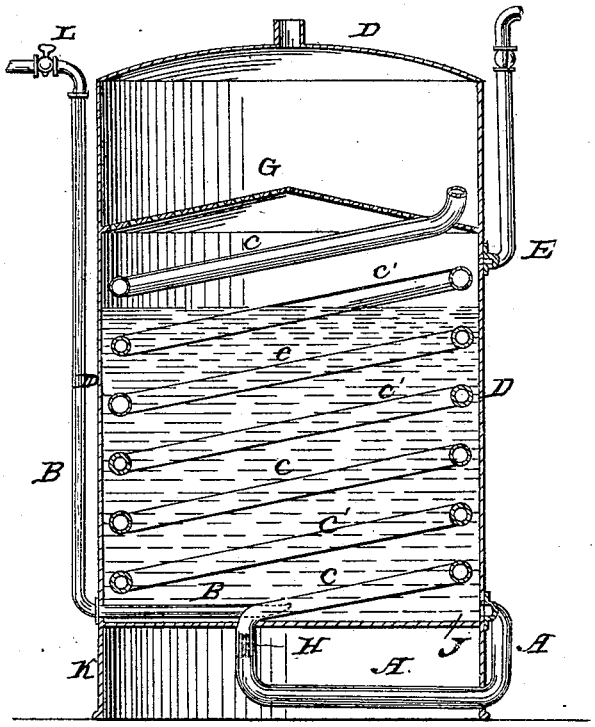
POND & RICHARDSON.

Apparatus for Carbureting Air.

No. 53,481. Patented March 27, 1866.



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UNITED STATES PATENT OFFICE.

E. A. POND AND M. S. RICHARDSON, OF RUTLAND, VERMONT.

IMPROVED APPARATUS FOR CARBURETING AIR.

Specification forming part of Letters Patent No. **53,481**, dated March 27, 1866.

To all whom it may concern:

Be it known that we, ERASMUS A. POND and MARK S. RICHARDSON, both of Rutland, in the county of Rutland and State of Vermont, have invented certain new and useful Improvements in Gas-Machines or Gas-Generators; and we hereby declare the following to be a full, clear, and exact description of the the same, reference being had to the accompanying drawing, which represents a vertical section of a gas-generator constructed in accordance with our invention.

This invention relates to the construction and arrangement of that class of gas machines or apparatus in which the gas is formed by forcing atmospheric air through the light and volatile hydrocarbon fluids, such as benzine, naphtha, &c.—*i. e.*, the secondary products of the distillation of coal-oil or petroleum; and it has for its object the production of an apparatus or generator which shall be of simple and comparatively cheap construction, and light and portable, so that it may be used to advantage as a portable apparatus in steamboats, railroad-cars, &c., as well as a stationary one, and yet at the same time effective in its operation, affording a steady and sure flow of gas.

The gas-generator thus constructed consists of a fluid-holding can or sealed vessel or reservoir, in which is placed a pipe coiled spirally or in any other convolute manner, substantially as has been shown in the invention relating to the same subject-matter for which Letters Patent have been granted to us on the 19th day of September, 1865.

The coil is filled with the liquid to the height of the level line of the fluid in the reservoir by means of a communicating pipe, which is simply a continuation of the coil, terminating in the reservoir at or near the bottom thereof. This communicating pipe is so arranged as to extend some distance below the bottom of the vessel. A little above the bottom of the said vessel there is an air-tube, which enters the coil, and, being smaller that the latter, forms a valvular connection with it. The column of liquid formed by the relative position just mentioned of the communicating pipe to the coil causes by its pressure the air discharged from the air-tube to rise in the coil, instead of seeking the shorter passage through the supply or communicating pipe. The air is thus forced up through the liquid in the coil, and by the time it is ejected from the coil is well saturated and charged with the hydrocarbon vapor. That portion of the can above the surface of the hydrocarbon liquid forms a chamber, in which the carbureted air is collected, and the fluid which may be carried off by the current of air falls back upon a finely-perforated diaphragm, whence it returns to the reservoir.

To enable those skilled in the art to understand and use this invention, we will now proceed to a more detailed description of its nature and operation by reference to the drawing which accompanies and forms part of this specification.

D is the can or vessel which contains the hydrocarbon fluid, coil, &c., needed to generate the gas. This vessel has two bottoms—one, J, the true bottom, which supports the fluid in the can, the other, K, a false bottom, to protect the communicating or supply pipe A from injury.

Instead of a false or second bottom, the vessel may be provided with a vertical flange inclosing the supply-pipe, or other means equivalent thereto may be employed.

The coil C, placed within the can spirally or in any other convolute manner, is the tube or passage through which the air discharged from the air-tube B is forced.

The coil is supplied with the hydrocarbon fluid from the reservoir by means of the supply-pipe A, one end of which communicates with the reservoir, extending downward some distance below the bottom J of the reservoir and then up to where it is joined with the coil. The column of liquid produced by this arrangement of the supply-pipe and comprised between the lowest point of the pipe A and the level line F of the liquid being greater than the column of the same embraced between the level line F and the point where the air-tube B enters the coil, the air discharged from the tube is forced upward through the coil.

In order to more effectually prevent the air discharged by the tube B from passing back through the supply-pipe A, and to carburet it in case any should accidentally be forced back, a piece of bamboo, H, or other suitable porous substance, is placed in the supply-pipe, as shown in the drawing. The air-tube B, through which the air is supplied to the apparatus, enters the

coil at its rise a little above the bottom of the reservoir and the point where the supply-pipe A is joined to the coil. Being smaller in diameter and preferably with contracted nozzle, it forms a valvular connection with the coiled pipe, and is so inserted that it may act in some degree on the principle of an arterial valve, preventing in a measure the reflux of the liquid into the air-tube, while the air as it approaches the outlet is compressed proportionately to the contraction of the nozzle, so that on being discharged into the coil it will expand rapidly and more readily and thoroughly absorb the hydro carbon vapor formed, as explained more fully in the patent granted E. A. Pond on the 17th day of October, 1865.

L is a valve on the air-tube to prevent any pressure from forcing back the fluid or air. The upper part of the coil C terminates in an open end just above the partition or diaphragm G, perforated with small holes, through which the liquid thrown out of the coil by the action of the air descends in a shower of fine rain into the reservoir below.

F is the level line of the liquid in the can when first filled. The can may, however, be filled to any point under where the pipe E, by means of which the gas is taken out to be burned, is inserted. The upper portion of the can between the liquid and the top of the can operates as a gas-holder, into which is discharged the carbureted air. Suitable stop-cocks may be provided at the bottom to draw off the fluid, and an opening furnished with valves may be arranged in the cap of the reservoir, through which the reservoir is filled.

To operate the machine the hydrocarbon liquid is first poured into the reservoir D until it stands as high in the can as, for instance, the line F, a little under the point where the gas-cock E is placed. By means of the communicating or supply pipe A the coil is filled level with the surface of the liquid in the reservoir. Air is then forced by any suitable mechanism into the air-tube B, whence it is discharged into the coil. The air, being prevented from passing back through the pipe A, for reasons above given, is forced upward, and in its passage through the coil becomes saturated and charged with hydrocarbon vapor. The air, when passing through the coil, sometimes carries with it some of the liquid, throwing it out of the upper end of the coil upon the finely-perforated diaphragm G, through which it falls into the reservoir below, and thus a continuous circulation is kept up until the fluid is exhausted.

The carbureted air is discharged from the coil into the upper part of the can, the heavy well-carbureted air falls and is drawn off through the gas-pipe E, while the light gas remains above, nearest the top of the can, until fully carbureted by the liquid thrown out of the coil, as already described, and which descends in a shower of fine rain through the newly-made gas and perfects its saturation. As soon as this is accomplished the gas descends and in its turn passes out of the generator. The upper part of the can D thus operates as a gas-holder and regulates and steadies the light.

The coil should be so formed as to gradully rise—that is to say, that in no part shall the air pass a lower level than that already attained. There may be one or more such coils used, and in the accompanying drawing a second coil having its own fluid and air-supply pipe is shown. (Marked C′.)

From the above it will be seen that by the arrangement of the air-tube within the coil the fluid is caused constantly to fill the coil as the formation of the gas progresses, the effect of the blast on the fluid surrounding it being similar to that of the Giffard injector. The circulation of the fluid through the coil is therefore continuous, thus answering the best conditions for vaporization.

Two or more gas-machines thus constructed may be together, and the hydrocarbon vapor therein used may be of different densities, so as to act compensatingly and allow of the regulating of the quality of the gases according to circumstances, or the two machines (if two be used) may be so combined that less air may be passed through the very light material and the air there charged with vapor may be allowed to pass into the air, which shall have passed in larger quantity through the heavier liquid. But one pump may be used, the current of air, however, should be divided to pass into the machines or parts of the same machine (if it be a double machine) in quantities as needed for the respective liquids. With the gas-generator constructed and operating as described there may be combined an apparatus for generating hydrogen gas for the purpose of supplying that gas in small quantities to the mixture of hydrocarbon vapor and air, whereby it is prevented from being condensed and precipitated.

Having thus described our invention and the manner in which the same is or may be carried into effect, we claim—

1. The improved gas-machine, substantially as herein described, the same consisting of one or more coils of pipes so combined with a fluid-vessel and air-forcing apparatus that the said coil or coils shall be constantly supplied with fluid by the action of the blast and hydrostatic pressure and a continuous circulation of fluid maintained therein, as set forth.

2. The arrangement of the coil in relation to the fluid-reservoir so that the air shall be discharged from the coil above the level of the fluid in the reservoir, substantially as herein shown and described.

3. The arrangement of the air-supply pipe relatively to the coil and the fluid-reservoir, substantially as herein shown and described, so that the current of air shall be impelled upwardly and along the tubular coil, as set forth.

4. The method herein described of combining the air-supply pipe with vaporizing-coil by

inserting the contracted end of the former into the larger tube of the latter for operation as an injector, substantially as set forth.

5. The employment, in connection with a communicating pipe or coil-extension under the bottom of the fluid, of a stopper of bamboo or other porous material, as and for the purposes set forth.

6. The use, in combination with a fluid-vessel and coil, of a perforated diaphragm or dome for returning the fluid ejected from the coil in spray-like form to the reservoir, and thus fill the gas-collecting chamber with hydrocarbon vapor, as set forth.

In testimony whereof we have signed our names to this specification before two subscribing witnesses.

ERASMUS A. POND.
MARK S. RICHARDSON.

Witnesses:
JOHN PROUT,
WALTER C. DENTON.