# L. STEVENS.

*Generating Gas for Heating Purposes*

108302

PATENTED OCT 11 1870

*Fig. 1.*

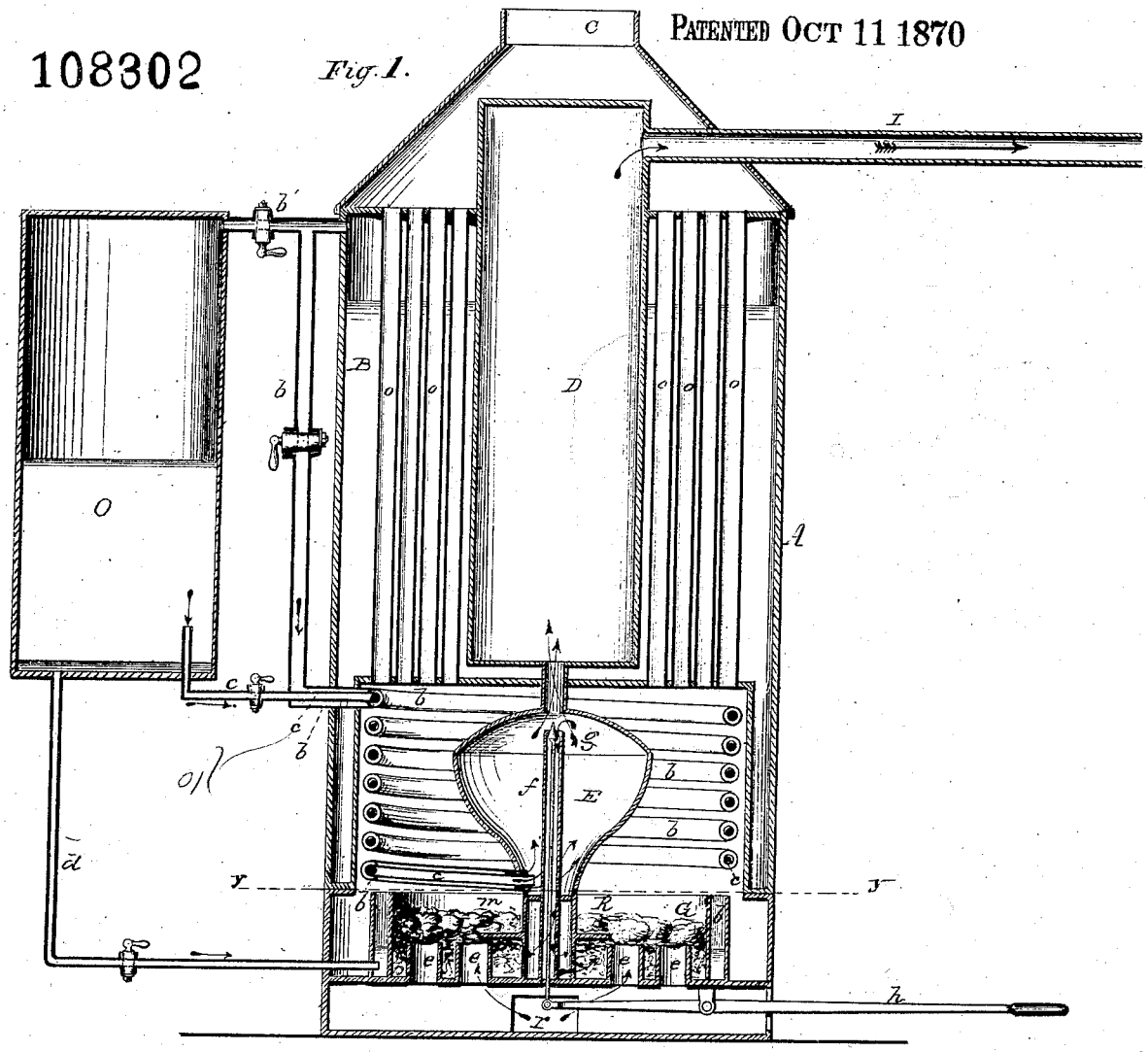
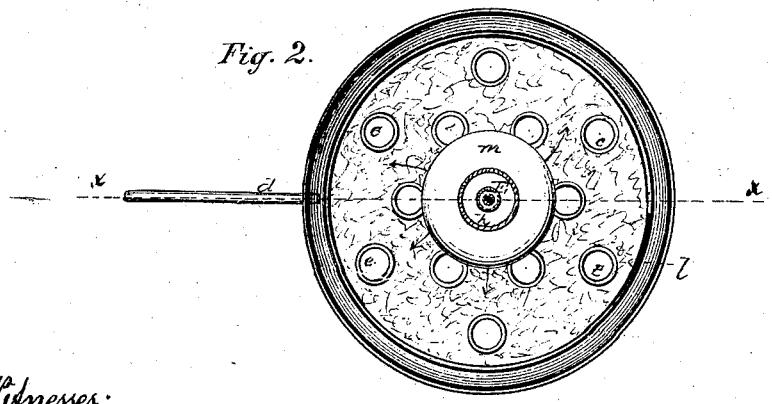



*Fig. 2.*

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# United States Patent Office.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

Letters Patent No. 108,302, dated October 11, 1870.

## IMPROVEMENT IN APPARATUS FOR GENERATING GAS FOR HEATING.

The Schedule referred to in these Letters Patent and making part of the same.

*To all whom it may concern:*

Be it known that I, LEVI STEVENS, of Washington, in the county of Washington and District of Columbia, have invented certain Improvements in Apparatus for Generating Gas for Heating, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates to the generation of a gas for heating purposes, composed of hydrocarbon-vapor and steam combined under heat and pressure, as secured to me by Letters Patent dated February 22, 1870; and

The present invention consists of an improved apparatus for generating said gas, the special points of novelty in this invention being—

First, a tube conveying the oil, located within a tube conveying steam, for vaporizing the hydrocarbon, superheating the steam, and preventing the formation of carbon within the vaporizer.

Second, the combination and arrangement, within the fire-chamber, of the generating-tubes, and a close receiver for mixing the vapors under heat and pressure.

Third, the combination, with said receiver, of a tube and valve for regulating the flow of the combined gas to the generating burner.

Fourth, a novel construction of the burner for generating the gas.

Fifth, an annular water-chamber surrounding the grate; and finally

The apparatus as a whole, connected to an oil-tank in a suitable manner, all as hereinafter more fully explained.

Figure 1 is a transverse vertical section of the apparatus on the line *x x* of fig. 2.

Figure 2 is a horizontal section on the line *y y* of fig. 1.

The present invention is intended to utilize the combustible qualities of petroleum, or similar hydrocarbons, for heating purposes, and to do so by first vaporizing the hydrocarbon, and by mixing this vapor with steam or hydro-oxygen in a close chamber, under heat and pressure, and thereby to produce an inflammable gas composed of these two vapors united and converted into one.

Hitherto, the greatest obstacle to the use of hydrocarbons as liquid fuel has been the fact, that carbonization occurs in the pipes, furnaces, and other parts, wherever there is applied to the hydrocarbon a sufficient degree of heat to produce combustion, and thus in a short time the pipes or parts become so filled or coated with the carbon thus deposited as to render the apparatus useless.

To avoid this difficulty, and at the same time produce a convenient apparatus for generating an inflammable gas, by the union of steam and hydrocarbon-vapors, and in which the generation of the gas may be carried on by using a portion of the gas itself as a fuel for that purpose, is the object of my present invention.

The apparatus consists of a tubular boiler, B, the outer shell or casing of which extends down below the body of the boiler far enough to form a chamber or furnace for the reception of the vaporizing-tubes, and the receiving or mixing-vessel or chamber E, as shown in fig. 1, there being a larger receiver or chamber, D, connected with the mixing-chamber E, and extending up through the center of the boiler B into the smoke-chamber or dome C, a pipe, I, leading from this receiver D to convey the gas to the point where it is to be consumed.

In the fire-chamber under the boiler, at the bottom, I locate a grate, consisting of a metal plate having a series of short vertical tubes, *e*, or air-passages, and with two vertical annular flanges around its outer edge, said flanges being arranged concentric a short distance apart, thus leaving between them an annular chamber or space, *l*, as represented in figs. 1 and 2.

This circular grate, within the inner flange, is to be filled with broken pumice-stone, brook-gravel, or any material that shall produce a mass having a great number of cavities or spaces for the passage of air and gases through it.

From the center of this grate G rises a tube, R, upon which is supported the mixing-chamber E, as shown in fig. 1.

Attached to and projecting radially from the sides of this tube R, near its base, is a deflecting-plate, *m*, the object of which will be hereinafter explained.

I then provide an oil-tank, O, to be located at any desired point, and connect it to the boiler B by a pipe, *b'*, as represented in fig. 1, this pipe serving to admit steam from the boiler into the top of the oil-tank.

Another steam-pipe, *b*, connects with the pipe *b'*, or directly with the boiler, and from thence passes down to the top of the fire-chamber, where it is met by a smaller pipe, *c*, leading from the lower portion of the oil-tank, this latter or oil-pipe *c* entering through the side of the former or steam-pipe *b*, as represented in fig. 1.

These two pipes *c* and *b*, thus arranged one within the other, enter the furnace, and are then formed into a coil, extending several times around within the fire-chamber, and finally terminate within the mixing-chamber E, as shown in fig. 1.

The oil-pipe *c* may enter the side of the oil-tank O, a short distance above the bottom, or it may enter through the bottom and have its mouth terminate a short distance above the bottom, within the tank O, as represented in fig. 1, the object being to leave a

space in the bottom of the tank, below the mouth of the oil-tube *c*, for the water that may be formed by the condensation of steam within the tank.

A pipe, *d*, extends from the bottom of the tank O to the annular space or chamber *l*, for the purpose of conveying whatever water there may be from the tank to the grate, as shown.

All of these pipes, as well as the pipe I, are to be provided with stop-cocks in the usual manner, by which the flow of the oil, steam, water, and gas may be regulated at will.

Within the mixing-chamber E, I place a vertical tube, *f*, which has a valve, *g*, attached to a stem within the tube, and which stem extends down below the bottom of the grate, where it is connected to a lever, *h*, as represented in fig. 1, so that by operating this lever, the valve *g* may be closed or opened at pleasure.

The apparatus being thus constructed, the operation is as follows:

A small fire is kindled in the fire-chamber, and in a few moments the water and oil, which has been previously deposited in the pipes *c* and *b* by a condensation of the vapors previously formed therein, supposing the apparatus to have been in use, will become vaporized again, together with what there may be in the mixing-chamber, and as soon as this vapor or gas is thus produced, the valve *g* may be opened, when the gas will pass down the tube *f*, and flowing out through orifices in the sides of the tubes *f* and R, will be deflected by the flange or plate *m*, and, passing outward among the mass of pumice-stone on the grate, will become mixed with inflowing currents of air, which enter through the air-passages *e* of the grate, the whole igniting and burning in a sheet of flame, over the surface of the material on the grate, and thus heating the coil and the water in the boiler above.

In this way steam may be raised very quickly in the boiler, and the moment that is done, the cocks are opened, the steam let into the oil-tank, and both steam and oil let into the coil.

As the oil flows along the inner pipe *c*, it is surrounded by the steam in the outer pipe *b*, by which means it is vaporized by the time it reaches the mixing-chamber E. The oil-vapor and the steam thus both enter the mixing-chamber together, and are there combined under a pressure equal to that of the boiler, and a heat equal to that of the furnace.

As the hydrocarbon in the pipe *c* cannot be raised above the heat of the steam which surrounds it, no carbon can be formed or deposited in the tube *c*, and as the vapor cannot be carbonized, more especially when combined with steam, it is obvious that no carbon can be deposited in the mixing-chamber, or at any other point, except where the gas is consumed.

As the hydrocarbon-vapor and the steam or hydro-oxygen vapor enter the mixing-chamber, and are there subjected to a combined heat and pressure, they are each decomposed more or less, and their elements reuniting form a new combination, and thus produce a new and inflammable gas that burns with great intensity, thus producing heat admirably adapted to a great variety of purposes in the arts, such as heating boilers, blast-furnaces, and all similar uses.

This gas, as it is thus produced in the mixing-chamber E, flows into the receiver D, where it is still held under the same pressure and heat, and from the receiver it is conveyed by the pipe I to any point desired, where it is to be burned for heat-producing purposes.

A very small proportion of the gas generated will be sufficient to keep up the fire in the generating-furnace, and this supply can be regulated by the lever *h* operating the valve *g*, the amount of air being regulated by a valve or door, *r*, in the base.

The drip water from the tank O will carry with it a small quantity of oil, which will rise to the surface in the grate-chamber *l*, where it will be utilized, and will serve to assist in starting the fire.

It is obvious that many of the details may be varied and the principle of operation still be retained.

Having thus described my invention,

What I claim is—

1. The arrangement of a pipe conveying hydrocarbon within a pipe conveying steam, the outer pipe being subjected to heat, so that while the steam vaporizes the hydrocarbon, the steam itself is superheated preparatory to the admixture of the two vapors to form a new gas, substantially as described.

2. The combination of the compound vaporizing and superheating-coil with the chamber E, for receiving and mixing the steam and hydrocarbon-vapor within the furnace, substantially as described.

3. The combination of the mixing-chamber E with its tube *f* and valve *g*, arranged to operate substantially as described.

4. The burner, consisting of the grate G, perforated tube R, and deflector *m*, arranged substantially as set forth.

5. The grate G, provided with the annular water-chamber *l*, substantially as described.

6. A gas-generating apparatus, consisting of a steam-boiler, B, with a fire-chamber having a vaporizing-coil, a mixing-chamber, and burner located therein, and an oil-tank connected thereto by pipes, substantially as and for the purpose set forth.

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Witnesses:

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