2 Sheets--Sheet 1.

R. P. SPICE.
Gas-Apparatus.

No. 165,268. Patented July 6, 1875.

Fig 1

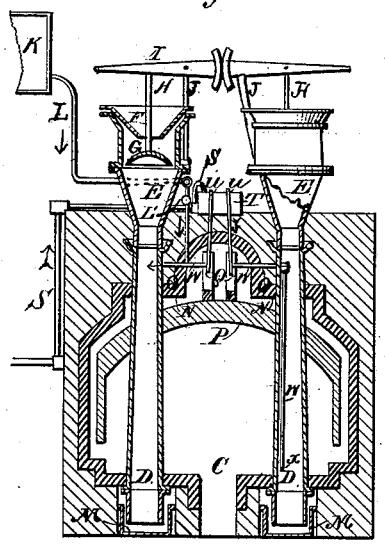
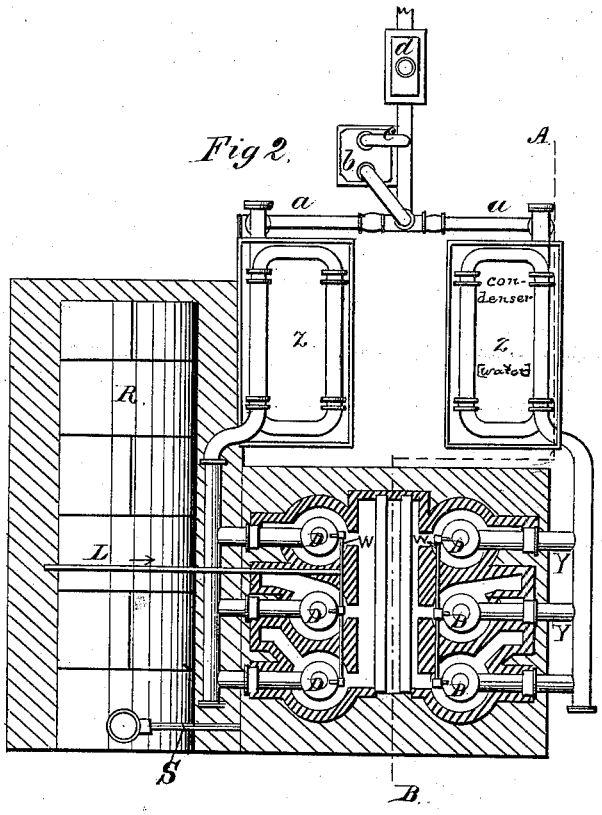


Fig 2.



Witnesses
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James J. Finley.

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2 Sheets--Sheet 2.

R. P. SPICE.
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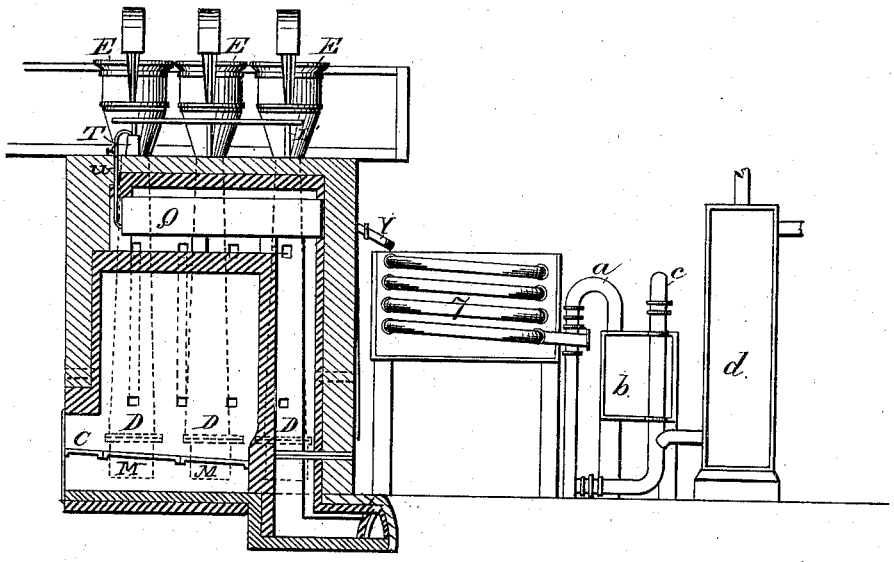
Fig 3.



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UNITED STATES PATENT OFFICE.

ROBERT PAULSON SPICE, OF WESTMINSTER, GREAT BRITAIN.

IMPROVEMENT IN GAS APPARATUS.

Specification forming part of Letters Patent No. **165,268**, dated July 6, 1875; application filed March 6, 1875.

To all whom it may concern:

Be it known that I, ROBERT PAULSON SPICE, civil engineer, of 21 Parliament street, in the city of Westminster, in the United Kingdom of Great Britain, have invented Improvements in the Manufacture of Gas and in Apparatus used for the same, of which the following is a specification:

This invention has reference to the construction of apparatus specially adapted for the manufacture of gas when the decomposition of water is effected, for the purpose of supplying hydrogen and other gases, which are subsequently enriched by their admixture with ordinary coal or cannel gas, or the vapor of petroleum, or other suitable spirit or material; and consists in arranging, within an oven heated by a suitable furnace, any convenient number of retorts set vertically, and made by preference somewhat taper, the largest part being near the bottom. To the upper part of the retort a funnel-shaped mouth-piece or hopper is attached by a spigot and socket arrangement, or by means of a flange. Within the hopper, and at any convenient distance from the top thereof, a disk is suspended by means of a rod or chain attached to a lever, which is furnished with a counter-balance weight, and which when at rest keeps the disk in close contact with the lower end of the hopper, and the retort is thus closed; but, upon the said disk being depressed, the retort will be opened for the admission of coke or other material. The upper part of the oven is formed by two arches, one beneath the other, so as to leave an intervening space, and within this space, one, two, or more steam-superheaters, consisting of a block or blocks of iron with a number of channels, conduits, or passages, are fixed. These superheaters are provided with suitable pipes, which communicate with, and extend to nearly the bottom of, the interior of the vertical retorts. Against the retort-house wall, or in any other convenient situation, is fixed a tank containing heavy oil or spirit of petroleum, and from the tank is led a pipe or pipes connected with the pipes leading from the superheaters to the retorts. The superheaters have also pipes which are connected therewith, and to a steam chest or chamber placed at the top of and exterior to the retort-bench. At one side or end, or in any convenient position, is erected an ordinary steam-boiler for the supply of steam to the steam-chest before alluded to.

The condenser consists of a coil of pipes immersed in a trough of water. From the outlet of the condenser a pipe is led to a vessel of any convenient form and size for containing a quantity of the ordinary petroleum of commerce, such vessel being termed a saturator. From the upper part of the saturator rises a pipe which is in communication with the washer or scrubber and subsequent purifying apparatus.

In order that the foregoing may be more easily understood, drawings are attached hereto, of which the following is a description.

Figure 1 represents a sectional front elevation; Fig. 2 a plan, and Fig. 3 a longitudinal section through A B, Fig. 2.

In Fig. 1, C is the furnace; D D, the retorts with their mouth-pieces E E, one of which is exhibited more completely in section in order to show the arrangement for the supply of coke, and means for closing the retort.

It will be observed that the upper part F of the mouth-piece E is funnel or hopper shaped, and that it is provided with a disk, G, suspended by the rod H to the weighted lever I, which is supported by a standard, J, to the side of the mouth-piece. By pulling upon a chain or rod attached to one end of the lever I the disk G is depressed, and allows the coke or other matter to fall into the retort. On the release of the rod or chain the disk G is raised by the preponderance of the weight at the opposite end of the lever, and thus closes the communication between the hopper and the retort. K is a tank to hold the heavy oil or spirit, and L is a pipe for conveying it into the pipes W W, a tap, L′, being inserted in the supply-pipe to each retort. M M are the troughs or vessels supplied with water, into which the open ends of the retorts D D dip, and are thus sealed. N N is the space between the two arches O and P before spoken of, and in it are placed the two steam-superheaters Q Q. R is the steam-boiler, (seen only in Fig. 2,) and from which a pipe, S, rises and conveys the steam to the steam-chest T. From the upper part of this chest pipes

U U descend to near the bottom of the steam-superheaters Q Q, and at or near the top of the steam-superheaters one end of each of the pipes W W is attached, the other end being introduced into the upper part of the retorts D D. In the retort on the right hand of the drawing the descent of the pipe W is shown, the superheated steam, with or without the heavy spirit or oil, being emitted from the bottom of the pipe at the point marked X. The decomposed steam or resultant gases are taken off near the top of each retort by the pipes Y Y, Fig. 2, and are conveyed by them to the condensers Z Z, which consist of a coil of pipes, arranged as shown, immersed in troughs of water. From the outlet of the condenser pipes *a a* proceed to the saturator *b*, and from this vessel a pipe, *c*, communicates with the washer *d*.

The action or method of using the apparatus is as follows: Steam is conveyed from the boiler R by the pipe S to the steam-chest T, which is placed in such a position as to attain a moderately high heat. From thence the steam, which has been partially dried, is conducted by the pipes U U to the superheaters Q Q, through the passages of which it travels, and acquires a still higher temperature. The steam so treated is then led by pipes W W to the vertical retorts D D, which have been previously charged, through the hoppers F F, with coke, peat, lignite, breeze, clinkers, or other suitable carbonaceous material, and highly heated. The steam, thus introduced, is carried down, with or without the addition of a stream of heavy spirit of petroleum, from the tank K by the pipes W to near the bottom of each retort, where it escapes at the point X, and is diffused among the incandescent carbonaceous matter. Here the steam in its course through the substances just mentioned is decomposed and converted into hydrogen, and—when used with spirit or oil—carbureted hydrogen, and other gases, which, as they are formed, pass off through an outlet in the upper part of the retort, and are conveyed away by the pipes Y Y to the condenser Z. From the condenser, or, if preferred, from a washer in lieu thereof, the hot gas passes into the saturator *b*, containing the ordinary commercial spirit of petroleum. Here the gas combines with not only the light spirit, but with some of the heavier spirits passing forward to the washer *d*, and other suitable apparatus for purification, and leaving in the saturator only the heaviest of the spirit or oil, to be subsequently transferred to the tank K to be treated as before described. The vertical retorts being made open at the bottom and dipping into the troughs M M, it follows that the ash resulting from the partial consumption of the coke, will fall into these troughs, from whence it may be removed at either side of the bench at pleasure, or whenever necessity may dictate.

I claim—

The combination of the superheater W with the fire-box C and arch P, extending down the sides of the fire-box, as shown.

R. P. SPICE.

Witnesses:
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