2 Sheets—Sheet 1.

H. STACEY.

GAS-ENRICHING APPARATUS.

No. 183,719. Patented Oct. 24, 1876

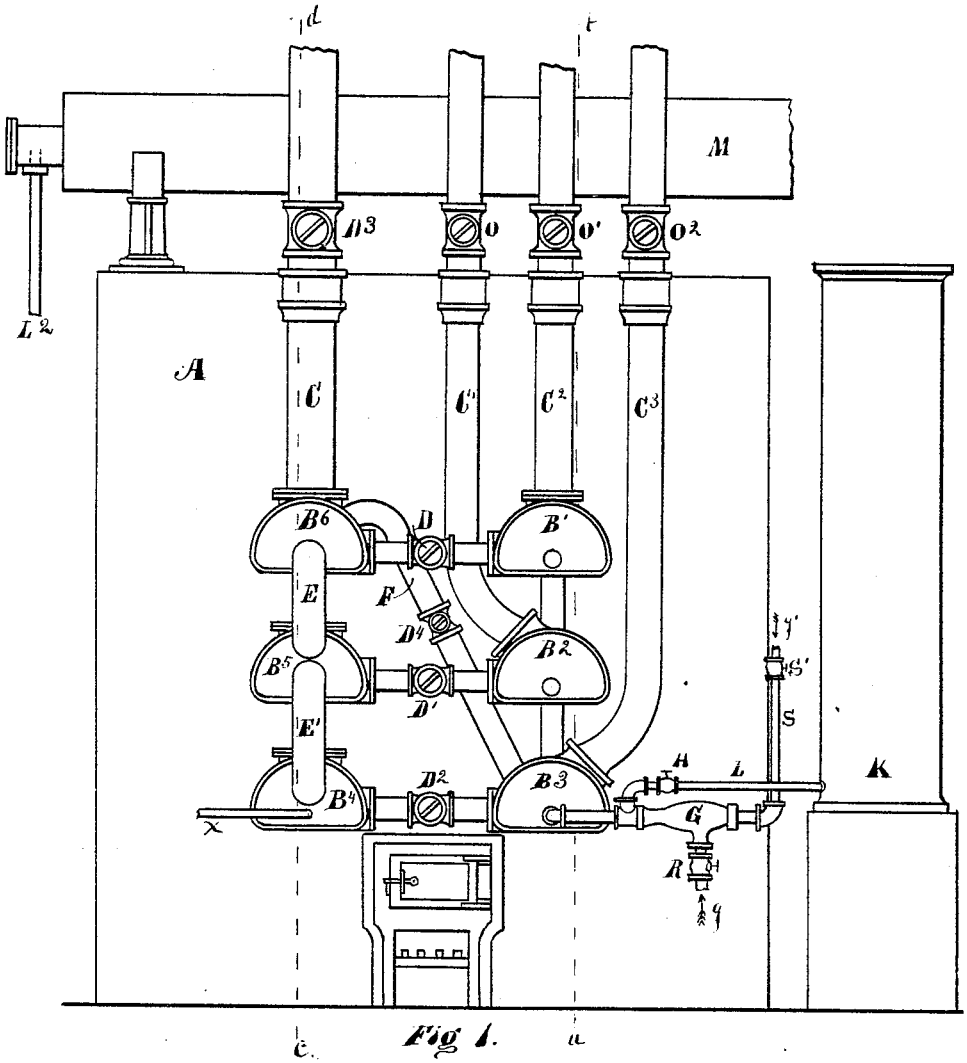

Fig 1.

Witnesses
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E. C. Whitney

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2 Sheets—Sheet 2.

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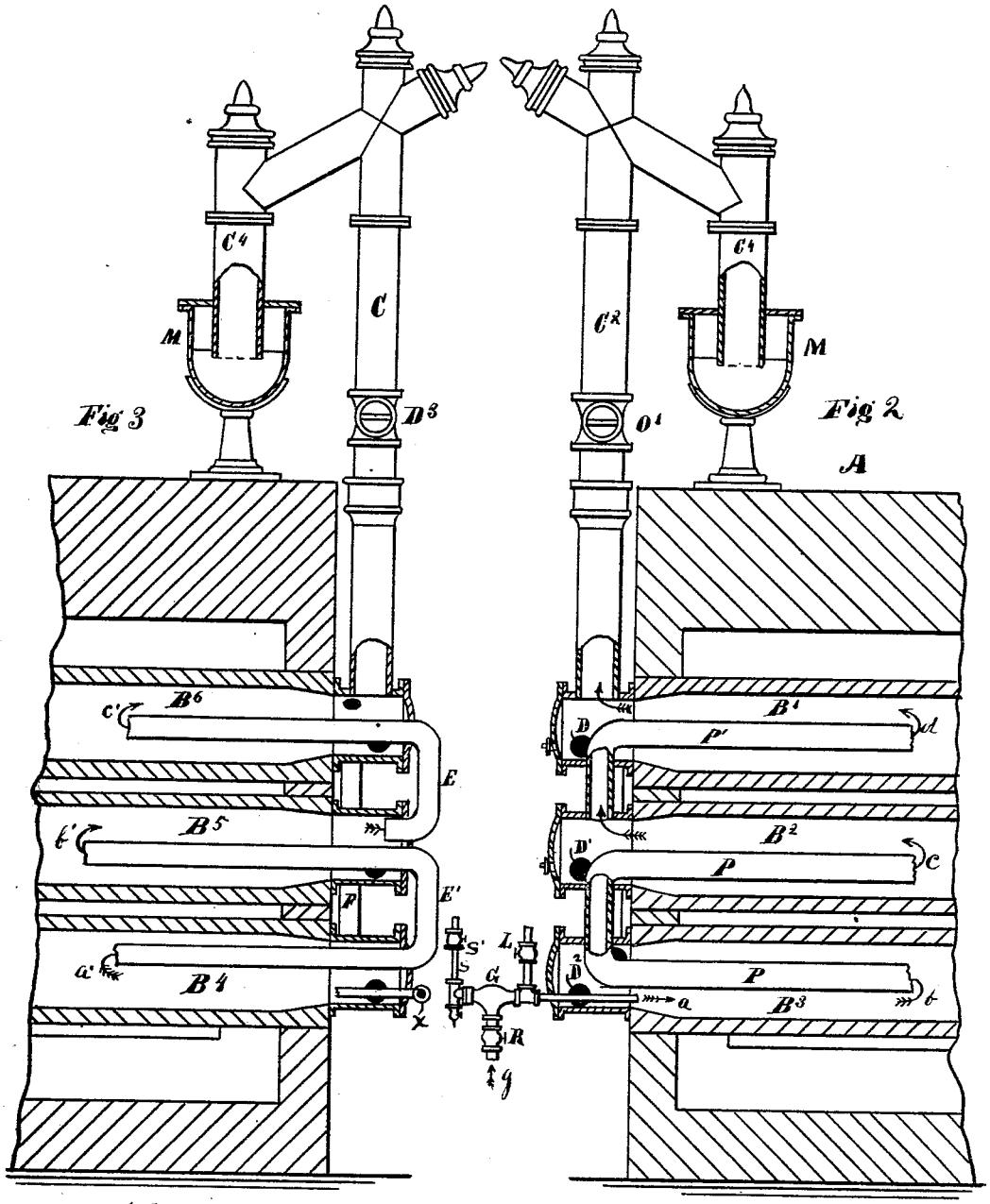

Witnesses;
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UNITED STATES PATENT OFFICE.

HENRY STACEY, OF INDIANAPOLIS, INDIANA.

IMPROVEMENT IN GAS-ENRICHING APPARATUS.

Specification forming part of Letters Patent No. **183,719**, dated October 24, 1876; application filed March 20, 1876.

To all whom it may concern:

Be it known that I, HENRY STACEY, of Indianapolis, county of Marion, State of Indiana, have invented an Improvement in Apparatus for Enriching Poor Gas, or gases that have little or no illuminating qualities, of which the following is a description, reference being had to the accompanying drawings.

My invention consists in the arrangement of retorts, conducting-pipes, and valves, whereby I am enabled to transfer the gas from one retort to another, or to transfer the product of each retort, independent of the other, to the hydraulic main or other receptacle.

In the drawings, Figure 1, Sheet 1, represents a front elevation of an ordinary bench of six retorts, showing the arrangement at the front of pipes and valves by means of which I accomplish certain parts of the work of enriching and permanently fixing poor or non-illuminating gases. Fig. 2, Sheet 2, is a sectional side elevation of the retorts on one side of the bench, taken through the line *a b* of Fig. 1, and shows the arrangement of pipes in the retorts, and the manner in which the retorts are connected with each other and with the hydraulic main. Fig. 3, Sheet 2, is a sectional side elevation of the retorts on the opposite side of the bench from that of Fig. 2, and is taken through the line *c d* of Fig. 1, and shows the manner in which each retort is connected with the other, and the upper retort alone connected with the hydraulic main.

A represents the brick-work of the furnace, in which are embedded the retorts B^1 B^2 B^3 B^4 B^5 B^6, in the usual manner—that is, there are three retorts, one above the other, on each side of the bench. Each of the retorts B^1 B^2 B^3 is connected to the hydraulic main M by the usual stand-pipes C^1 C^2 C^3, and each of the stand-pipes is provided with a valve, O O^1 O^2, for the purpose of allowing any one or more of the stand-pipes to be shut off, and prevent the gas from entering the hydraulic main when required, which will hereafter be described. The retorts B^4 B^5 B^6 are united together at the front by suitable pipes, and only the upper retort B^6 is connected with the hydraulic main by the stand-pipe C, which is also provided with a valve, D^3, the operation of which will be hereafter described, and the three retorts on each side of the bench are also united to each other by suitable pipes and valves D D^1 D^2 at the front, and the upper retort B^6 is also united to retort B^2 by a cross-pipe, F, the operation of which will be hereafter described.

In the manufacture of water-gas the retorts used are arranged as in Fig. 3, and steam is allowed to freely flow into the mouth of the heated retort B^4 by means of the steam-pipe X. The retort is charged with coke, &c., in the ordinary manner, so as to combine carbonic oxide and form hydrogen gas when mixed with the steam. The steam thus admitted into retort B^4 is carried to the rear end thereof, and is then conducted into retort B^5 by means of the pipe E′, and is again conducted into retort B^6 by means of the pipe E, after which the hydrogen gas is conducted into retort B^3, on the other side of the bench, by means of the pipe F, (the valve D^3 in pipe C being closed to prevent the gas from reaching the hydraulic main, and the valves D D^1 D^2 in the connecting-pipes of retort B^4 B^3, B^5 B^2, and B^6 B^1 are also closed.) The hydrogen gas, as it enters the front end of retort B^3, becomes mixed with other gases that are themselves poor in illuminating qualities, but are being enriched as they pass through the injector G by means of hydrocarbons, with which the gases are saturated, and the saturated gases are then conveyed through the heated retort from front to rear, and become mixed and fixed, and then return to the front in the pipe P and out of retort B^3, when the gas thus enriched and fixed may be carried direct to the hydraulic main M, or be conveyed into retort B^2, as shown. If conveyed into retort B^2, the gas is more permanently fixed, and after passing out of retort B^2 it can be then conveyed to the hydraulic main M, or into retort B^1, for further beneficial results, after which the gases, being well mixed and permanently fixed, are conveyed to the hydraulic main M by means of the stand-pipe C^2. In this last case the valves O O^2 are closed to prevent the gas from retorts B^3 B^2 from entering the hydraulic main, and the valve O^1 of retort B^1 is opened. In like manner the other

valves are operated when either of the other retorts are to deposit the gas in the hydraulic main.

In the manufacture of water-gas, as above described, I use other gases already generated to become saturated with the hydrocarbons in the injector, before the saturated gases are allowed to enter the retort B^3, and then become mixed with the hydrogen gas from retorts B^4 B^5 B^6.

The injector may be made in various ways, so that the desired results—that of saturating the poor gas with hydrocarbons and steam—are effected before the saturated gases are allowed to enter the heated retort, and the injector I now employ is that secured to me by Letters Patent No. 165,431, July 13, 1875.

Having thus described the arrangement of retorts, &c., I will now describe the manner in which coal-gas, &c., are produced and enriched by my apparatus.

In the manufacture of the water-gas, it will be seen that the pipes E E′ are inserted or connected with the lids of the retorts B^4 B^5 B^6, and these pipes and lids are removed from the retorts, leaving them in the ordinary manner, except the cross connection-pipes and valves D, D^1, D^2, and F. Then the retorts are charged in the usual manner and ordinary lids placed thereon. The valves D D^1 D^2 in the connecting-pipes to retorts B^3 B^2 B^1 are opened, and the valve D^4 in the connecting-pipe F is also opened, thus connecting retort B^6 with B^3, and the valve D^3 in the stand-pipe D to hydraulic main is closed.

All the gas that is formed in the retort B^4 is conducted into retort B^3, and the gas from retort B^5 into retort B^2, and gas from retort B^6 into retort B^1, and also into retort B^3, by means of the pipe and valve F and D^4, and the gas from retorts B^4 B^5 B^6 may enter retort B^3 by closing the valves D D^1 D^2 and opening valve D^4, and become mixed with the saturated enriching gases that are admitted to the retort B^3 through the injector G, and the gases are mixed and permanently fixed in their passage through the retort or retorts to the hydraulic main M. Each retort B^2 B^1 may be provided with an injector, G, or the gases formed in retorts B^4 B^5 B^6 may be conveyed to the hydraulic main M by having the valves D^1 D^2 D^4 closed and the valve D^3 in stand-pipe C opened, after which the gas can be returned to the injector G, and then become saturated with hydrocarbons, and introduced in a saturated state into the lower retort B^3, and after passing through the other retorts is again returned to the hydraulic main permanently fixed, and enriched to any desired illuminating power required, or into each one of the retorts B^3 B^2 B^1. All the gases or air that enters the injector G enter in the direction of the arrow *g*, through the pipe and valve R, which regulate the amount that is used in connection with the steam that enters the pipe S through the valve S′, and the hydrocarbons enter the injector by means of the pipe L from the tank K.

I do not claim, broadly, the retorts for making gas; neither do I claim a hydrocarbon-still adapted to vaporize and evolve its contents by heat; neither do I claim a heater or vaporizer combined with a series of two or more continuously connected retorts; neither do I claim a heater for vaporizing gas, or the connection of a heater with a series of connected superheaters or retorts for fixing the vapor; neither do I claim the combination of two or more retorts, the first of which raises the temperature of the vapor, and the succeeding ones complete the transformation thereof into fixed gas; but

What I claim as new, and wish to secure by Letters Patent, is—

1. In an apparatus for enriching gas, the combination of retorts B^4 B^5 B^6 and the pipes E E′, said pipes extending from the rear end of retort B^4 to the rear end of the next retort B^5 above, and from the front of retort B^5 to the rear end of retort B^6 above, for the purpose of conducting the gas made in one retort to the other, in the manner shown, and presenting an extended heating-surface, and the single stand-pipe C, arranged with valve D^3, to operate in the manner specified and set forth.

2. In an apparatus for enriching gas, the retorts B^4 B^5 B^6, connected with the retorts B^3 B^2 B^1 by pipes and valves D D^1 D^2, and the retort B^6, connected with retort B^3 by means of pipe F and valve D^4, in the manner shown, for the purpose set forth and described.

3. In an apparatus for enriching gas, the combination of the pipes P and P′, said pipes extending from the rear end of retort B^3 to the rear end of retort B^2, and from the front end of retort B^2 to the rear end of retort B^1, arranged to operate in the manner specified and set forth.

4. In an apparatus for enriching gas, the combination of retort B^6, or upper retort on one side of the bench, and retort B^3, or lower retort on the other side of the bench, and pipe F and valve D^4, arranged to operate in the manner shown, for the purposes set forth and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY STACEY.

Witnesses:
E. O. FRINK,
E. C. WHITNEY.