

H. R. EARL.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 498,005.

Patented May 23, 1893.

Fig: 1.

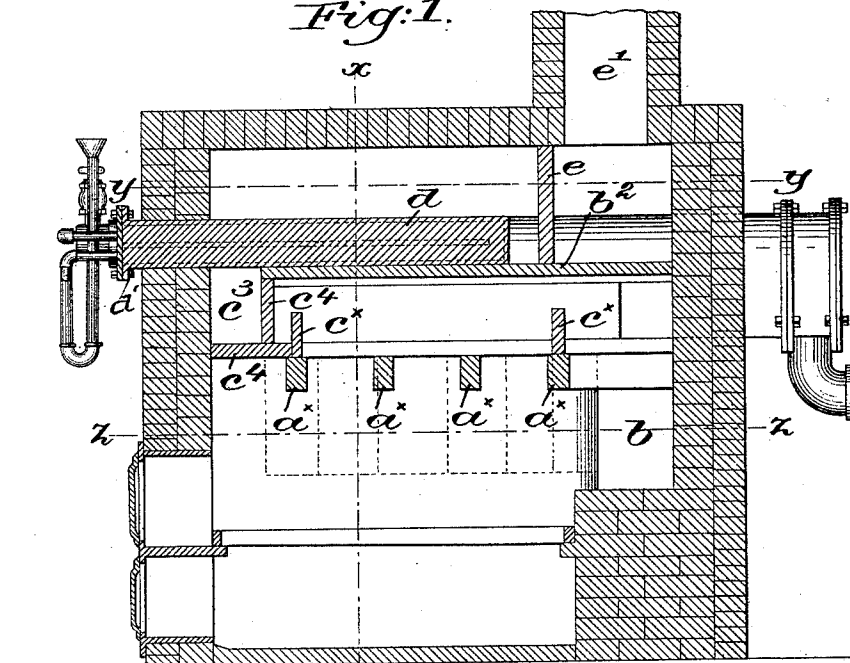
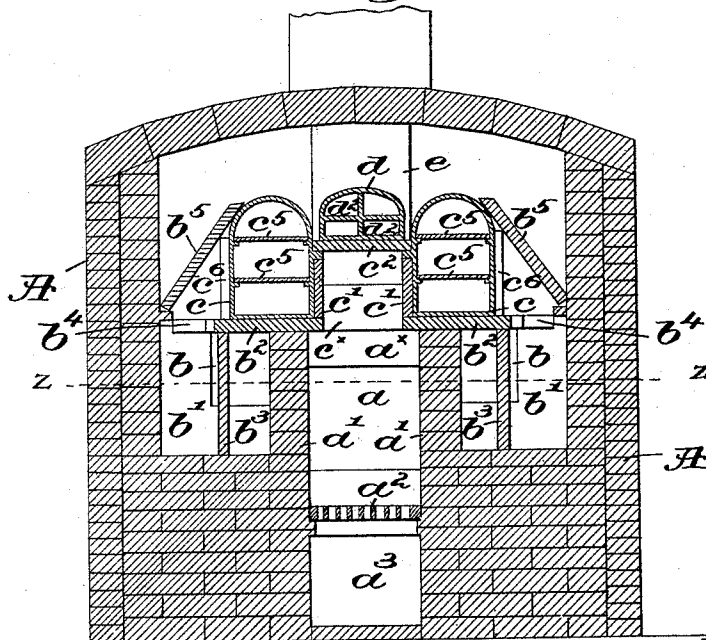


Fig: 2. 2 x x fig 1.



Witnesses.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3. 2.4.4. fig. 2.

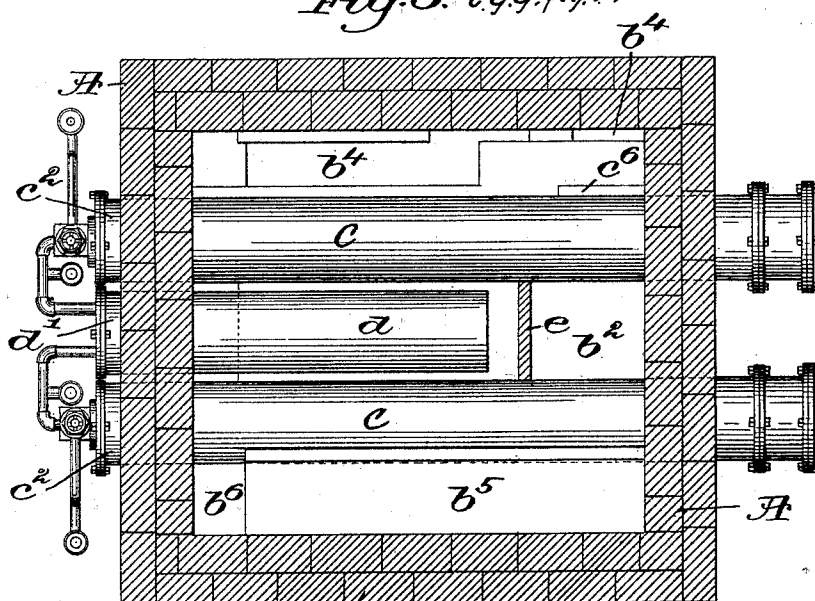
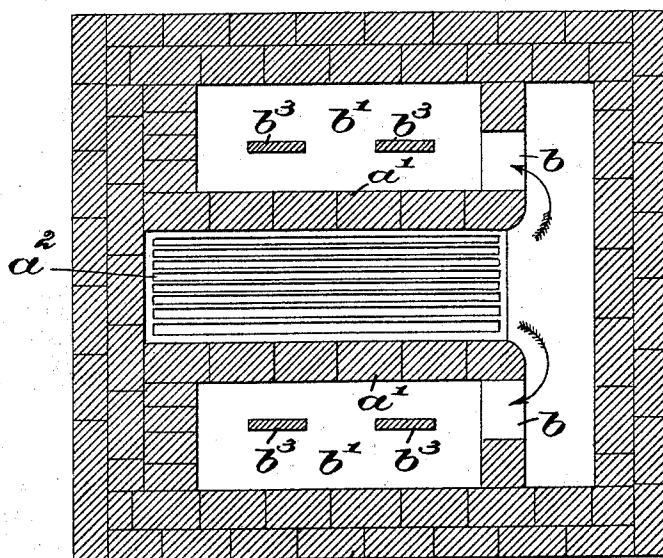


Fig. 4. 2.2.2. fig. 2.



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UNITED STATES PATENT OFFICE.

HENRY R. EARL, OF LEXINGTON, MASSACHUSETTS.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 498,005, dated May 23, 1893.

Application filed December 12, 1892. Serial No. 454,886. (No model.)

To all whom it may concern:

Be it known that I, HENRY R. EARL, of Lexington, county of Middlesex, State of Massachusetts, have invented an Improvement in Apparatus for the Manufacture of Gas, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

10 This invention relates to apparatus for the manufacture of gas from petroleum, the invention having especial reference to the construction of the furnace in which the gas is generated and to the arrangement and location of the flues and retorts therein. In furnaces of this class as now commonly constructed, a large percentage of the heat generated is unutilized by reason of the arrangement of the flues within the furnace which
15 permits the products of combustion to pass almost directly to the chimney without first traversing the length of the furnace in contact at both sides with the retorts therein which are to be heated. Again, the most intense heat in the furnace, viz:—that within the fire box or chamber in which the grate is located, is practically unutilized being cut off from the retorts by a top wall of brick or tile which prevents the heat in the fire chamber
20 from reaching and coming into direct contact with the retorts.

The object of this invention is to construct a furnace in which a greater percentage of the heat generated shall be utilized to heat the retorts, and to heat them uniformly, and thereby effect an economy in the quantity of fuel consumed and improve the quality of the gas produced.

25 In accordance with this invention, the fire box or chamber is carried upwardly between the retorts in order that the latter may at their inner sides receive heat directly therefrom. The products of combustion after leaving the fire chamber at the rear of the chamber are caused to pass along the outer sides of the retorts in contact therewith to the front of the furnace, and back over the tops thereof to the flue or chimney. The retorts are thus heated uniformly at both sides
30 throughout their entire lengths.

Figure 1, represents in vertical longitudinal section a furnace constructed in accord-

ance with this invention; Fig. 2, a vertical cross section thereof taken on the dotted line $x-x$; Fig. 3, a horizontal section taken on the dotted line $y-y$, Fig. 2, one of the inclined
35 slabs b^5 being removed to show the opening b^4 ; and Fig. 4, a horizontal section taken on the dotted line $z-z$, Fig. 2.

Referring to the drawings, A, A, represent the side walls of a furnace embodying this invention, a , being the fire or combustion chamber formed in the center of the furnace between the vertical side walls a' , the fire grate a^2 being located at the bottom of the fire chamber, below which is the usual ash
40 pit a^3 access to the fire chamber and ash pit being had through suitable doors at the front of the furnace. At the back of the furnace, the fire chamber at each side communicates through the side flues b , see Figs. 1 and 4, with the side chambers or return flues b' , located between the interior vertical walls a' of the fire chamber and the side walls A of the furnace. These side flues b' are partially
45 closed or covered at their tops by the horizontal tile or brick floors b^2 , supported at their inner edges upon the vertical walls a' , and at their outer edges upon the pillars b^3 . Upon these floors b^2 , rest the usual retorts c , arranged at opposite sides of the fire chamber a , the inner sides of the retorts constituting parts of the vertical sides of the fire chamber, such inner walls, however, except for a short distance at their rear ends, being protected from the direct action of the flames by
50 thin slabs c' of fire brick or tile, see Figs. 1 and 2. A slab c^2 of fire brick or tile, supported by ribs on and near the tops of the retorts, forms the top of the fire chamber. Cross tiles or bricks a^x , serve to stay the vertical walls a' , while the protecting slabs c' for the retorts are held in place against the latter by interposed cross pieces c^x . The retorts c at their front ends have at their tops shallow
55 necks c^2 of a depth equal to the depths of the upper compartments of the retorts, which necks extend through the front walls of the furnace, see Figs. 1 and 3. Within the furnace, just back of the front wall, and between it and the front of the deep parts of the retorts, is a cross flue c^3 connecting the sides of the furnace and passing beneath the necks c^2 of the retorts. Tiling c^4 separates this flue

from the fire chamber between the retorts. The side flues b' communicate with the upper part of the furnace through the openings b^4 and tile slabs b^5 , are inclined inwardly to the retorts over these openings to compel the products of combustion as they rise through the openings to pass along in contact with the outer sides of the retorts to the front of the furnace whence they escape through the flues b^6 into the space above the retorts, a part also passing into the cross flue c^3 and thence upwardly between the retorts. The outer sides of the retorts for a short distance at their rear ends are protected from the direct action of the products of combustion by thin slabs of tile c^6 , the remainder of the said sides being unprotected. The usual super-heater d is arranged between the retorts and rests upon the top c^2 of the fire chamber, its front end d' protruding through the front of the furnace, as shown in Figs. 1 and 3. A vertical wall e stands between the retorts directly in front of the entrance to the uptake or chimney e' , and compels the products of combustion to follow along the sides of the furnace and therefore over and in contact with the retorts in order to find an outlet through the chimney. The retorts c , each contain two shelves c^5 over which and on the bottom of the retort the oil to be vaporized is caused to flow. The super-heater d contains four chambers d^2 through which water is passed and vaporized into steam which is then conducted to the retorts to force the gas as formed, through the retorts and out at the rear ends thereof.

The passage of the oil and gas, and the steam, through the retorts is precisely the same as in apparatus of this class now in common use, and need not be herein described in detail, this invention relating solely to the construction of the furnace and the arrangement of its flues, whereby a better distribution of heat is effected.

By reference to Fig. 2, it will be seen that with a fire upon the grate a^2 , the most intense heat will be concentrated in the upper part of the fire chamber a , between the retorts c , which thereby receive directly at their sides along substantially their entire lengths a heat sufficient to maintain them always at the required temperature, usually a white heat. The products of combustion from the fire pass out through the flues b at the rear of the furnace into the side chambers or flues b' , from which they pass upwardly through the openings b^4 into the space between the inclined slabs b^5 and the retorts being compelled to pass along toward the front of furnace in contact with the unprotected sides of the retorts until they reach the front ends of the slabs, when a portion will pass upwardly and back to the uptake, while another portion passes around into the cross flue c^3 and up between the retorts and super-heater, and thence back to the uptake. It will thus be seen that both sides of the retorts are necessarily subjected

to an intense heat, the inner sides directly from the fire chamber between them, and the outer sides from the products of combustion passing along beneath the inclined slabs b^5 . The most intense heat is in the fire chamber, being greater than that in the side flues beneath the inclined slabs. Therefore, by protecting the inner sides and leaving the outer sides beneath the inclined slabs unprotected, the retorts are heated uniformly, and heated at both sides. As the tendency of the flames at the extreme rear end of the fire chamber is downwardly in order to pass through the outlet flues b , a portion of the inner sides of the retorts above the flues is left unprotected to compensate for the difference in heat, and vice versa a short portion of the outer sides immediately above the rear openings b^4 , Fig. 3, through which a part of the very hottest gases from the fire chamber rise to the narrow flue beneath the inclined slabs, is protected by the short slabs c^6 .

By a judicious use of the slabs in addition to the flues the uniformity of heat is still further obtained.

In practice, it has been found that by thus heating the retorts uniformly, they last much longer than when it is necessary to heat one side to an intense heat in order to keep the other side even at a moderate heat as in apparatus as now constructed. It is not possible for any of the products of combustion to pass directly from the fire chamber to the uptake, but they must first pass the entire length of the retorts to the front of the furnace and then back again over and along the tops of the retorts before reaching the uptake.

It will be noticed that the outlets b from the fire or combustion chamber and the uptake e are both at the back of the furnace, while the flues b' , and the flues within the inclined slabs b^5 are at the front of the furnace thereby compelling the products of combustion to traverse the entire lengths of the retorts and back over the tops thereof before they can reach the uptake.

This invention is not limited to the particular construction of apparatus herein shown, for the same may be varied without departing from the scope of the invention, as claimed.

I claim—

1. An apparatus for the manufacture of gas, containing a fire or combustion chamber having closed sides and top, and provided with an outlet opening at its rear end for the escape of the products of combustion, combined with two retorts arranged at opposite sides of and constituting parts of the side walls for said fire or combustion chamber, whereby the inner adjacent sides of said retorts receive heat directly from the fire in the chamber between them, substantially as described.

2. An apparatus for the manufacture of gas, containing a fire or combustion chamber having closed sides and top and provided with

an outlet opening at its rear end for the escape of the products of combustion from the chamber, combined with two retorts arranged at opposite sides of said fire or combustion chamber and constituting parts of the side walls thereof, and a super-heater resting upon the top of said chamber, whereby the inner adjacent sides of the retorts and the under side of the super-heater receive heat directly from the fire in the chamber inclosed by them, substantially as described.

3. In an apparatus for the manufacture of gas, the combination with a combustion chamber, retorts arranged at opposite sides of and constituting parts of the side walls thereof, and an outlet at the rear end of said combustion chamber for the escape of the products of combustion, of return flues to conduct the products of combustion from the outlet back along the parts of the retorts not exposed to the direct heat in the combustion chamber to the opposite ends of said retorts traversing substantially the entire lengths of the same, substantially as described.

4. In an apparatus for the manufacture of gas, a fire or combustion chamber having a closed top and sides, two retorts arranged at opposite sides and constituting parts of the side walls for said chamber, whereby the inner adjacent sides of said retorts receive heat directly from the said chamber, and an outlet opening at the rear end of said chamber for the escape of the products of combustion, and a chimney adjacent the rear end of the furnace, combined with return flues connected with said outlet opening and leading therefrom in contact with the parts of the retorts not exposed to the direct heat from the combustion chamber to compel the products of combustion after leaving the said chamber to traverse substantially the entire lengths of said retorts and back again to the chimney, substantially as described.

5. In an apparatus for the manufacture of gas, a combustion chamber having closed sides and top, and two retorts arranged at opposite sides thereof and constituting parts of the side walls for said chamber, inclined slabs b^5 resting against the sides of the retorts most remote from said chamber, and protecting slabs for the sides of the retorts adjacent the fire chamber, the return chambers b' below the retorts, openings therefrom into the flues between the said inclined slabs b^5 , and their respective retorts and the chimney e' , all substantially as described.

6. In an apparatus for the manufacture of gas, a combustion chamber having closed sides and top, and two retorts arranged at opposite sides thereof and constituting parts of the

side walls for said chamber, inclined slabs b^5 resting against the sides of the retorts most remote from said chamber and protecting slabs for the sides of the retorts adjacent the said chamber, the return chambers b' below the retorts, openings therefrom into the flues between the said inclined slabs b^5 , and their respective retorts the chimney e' , and the wall e , substantially as described.

7. In an apparatus for the manufacture of gas, the combination with two retorts, of a fire or combustion chamber extending vertically between them, protecting slabs for the sides of the retorts adjacent the said chamber the inclined slabs b^5 resting against the outsides of said retorts, the return chambers b' below the retorts, the openings therefrom into the flues between the said inclined slabs and retorts, the chimney e' , and the cross flue e^3 , substantially as described.

8. In an apparatus for the manufacture of gas, a fire or combustion chamber having closed top and sides, two retorts arranged at opposite sides and constituting parts of the side walls for said chamber, whereby the inner sides of said retorts receive heat directly from the said chamber, and an outlet flue for the products of combustion at the rear end of the said fire chamber, and return flues at the outsides of the retorts connected with said outlet flue, combined with protecting slabs for the inner sides of the retorts adjacent the fire chamber except for a short distance next the outlet flue, and short protecting slabs for the outer sides of the retorts next the connecting opening between the side flue and the outlet flue, substantially as described.

9. In an apparatus for the manufacture of gas, the combination with two retorts, of a combustion chamber having closed top and sides and extended vertically above the bottoms of and between said retorts, an outlet at the rear end of said combustion chamber, flues located outside of and adjacent said retorts and connected with said outlet to thereby conduct the products of combustion from said combustion chamber along the outer sides of said retorts, whereby said retorts at their inner adjacent sides receive heat from the combustion chamber between them and at their outer sides from the products of combustion in said flues, substantially as described.

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

HENRY R. EARL.

Witnesses:

CHARLES W. SWAN,
FREDERICK L. EMERY.