

(No Model.)

2 Sheets—Sheet 1

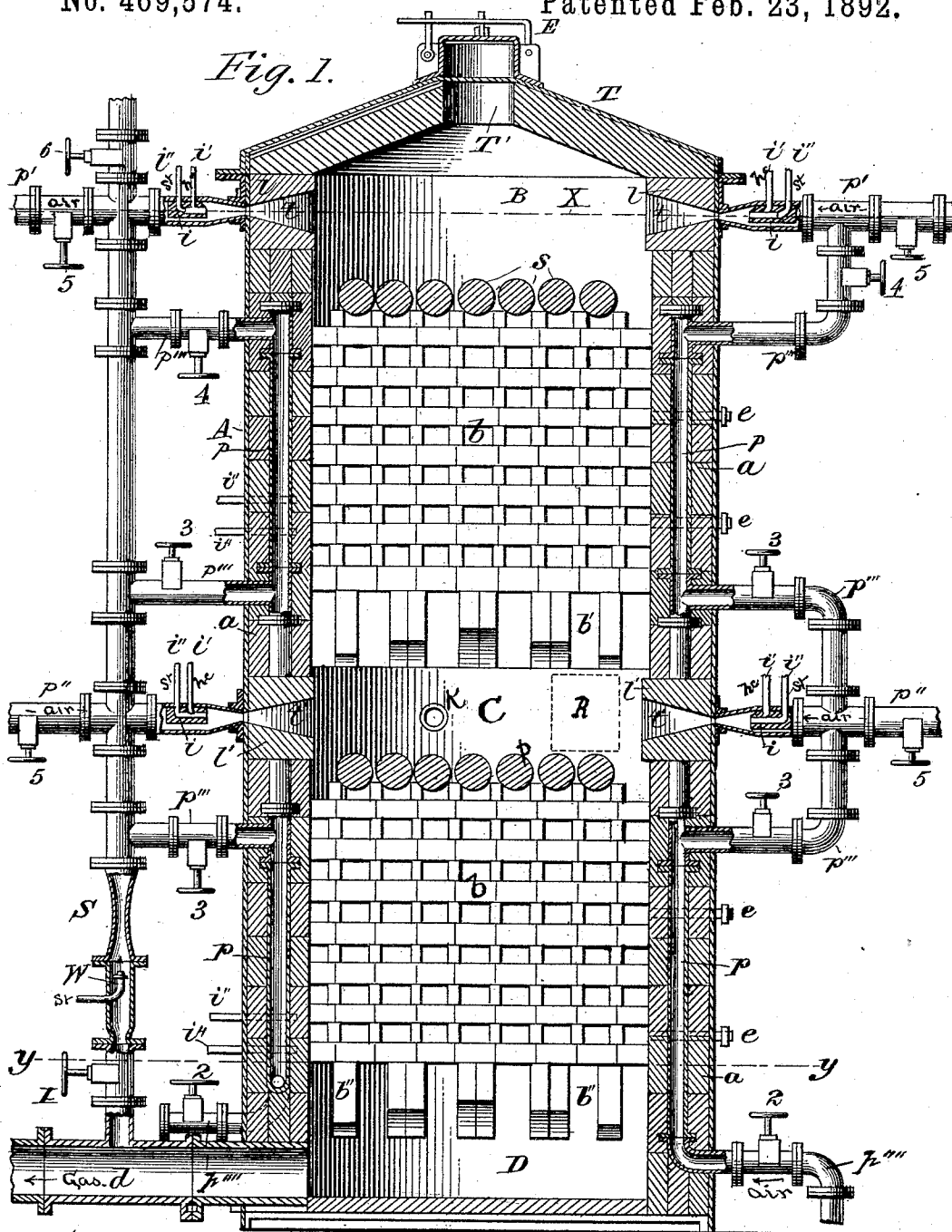
J. R. KENDALL.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 469,574.

Patented Feb. 23, 1892.

Fig. 1.



Witnesses:

T. R. Stuart.

H. G. Davis.

Inventor.

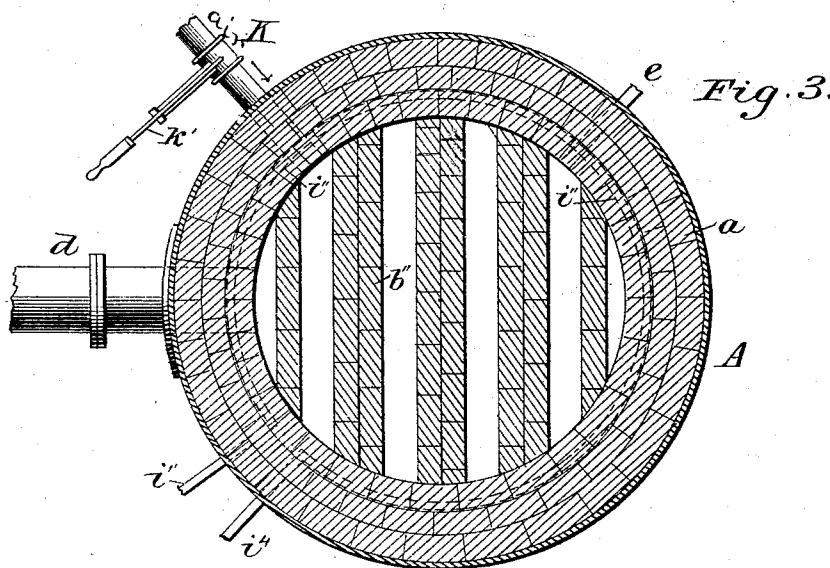
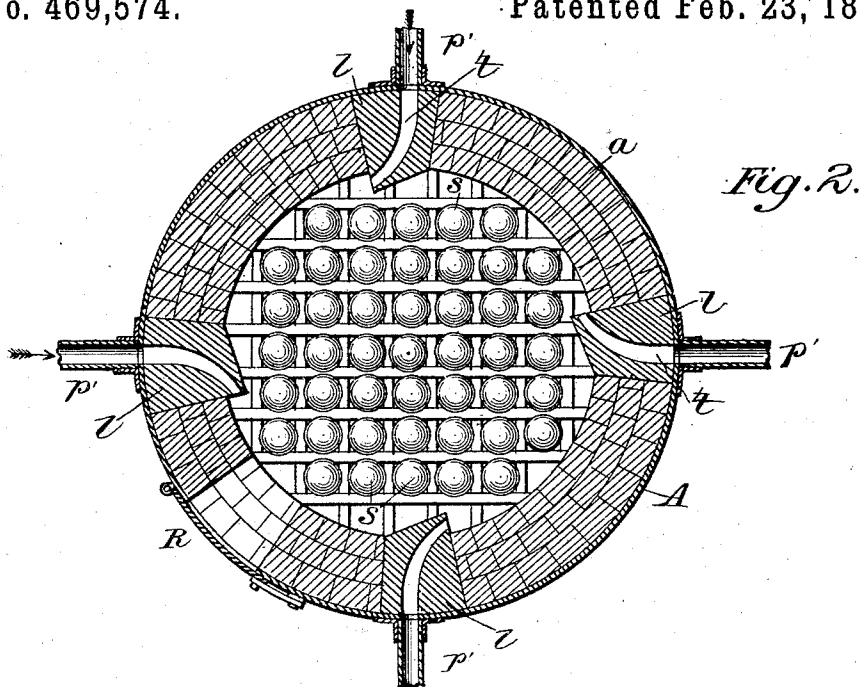
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UNITED STATES PATENT OFFICE.

JAMES R. KENDALL, OF TERRE HAUTE, INDIANA.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 469,574, dated February 23, 1892.

Application filed February 27, 1891. Serial No. 383,133. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. KENDALL, a citizen of the United States, residing at Terre Haute, in the county of Vigo and State of Indiana, have invented certain new and useful Improvements in Apparatus for the Manufacture of Illuminating and Heating Gas; and I do hereby declare that the following is a full, clear, and exact description of the invention, which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form part of this specification.

My invention relates to an improved apparatus for the manufacture of illuminating and fuel gas from hydrocarbons, steam, and air; and it consists in the novel construction and arrangement of its parts, which will be more fully hereinafter described, explained, and pointed out in the claims.

The objects of my invention are, first, to provide a better apparatus for the manufacture of illuminating and fuel gas than has heretofore been produced, and thus to facilitate and cheapen its production, my invention being peculiarly adapted to localities where the same gas is used for both heating and illuminating purposes, and, second, to overcome the objections or defects existing in prior apparatus of this class, and, further, to produce an apparatus which shall be comparatively inexpensive in construction, simple, and effective in operation, strong, not liable to get out of order, and easily managed. These objects are attained in the improved apparatus illustrated in the accompanying drawings, which form a part of this specification, in which the same reference letters or numerals indicate the same or corresponding parts.

Figure 1 represents a vertical sectional view of my improved apparatus; Fig. 2, a horizontal section looking down on the same at the line X of Fig. 1, and Fig. 3 a horizontal section looking down on the same at the line Y of Fig. 1.

In the drawings, A represents the main casing or body of my apparatus and is an upright cylinder made of suitable material, preferably of sheet metal, and is lined with

fire-brick *a* or other suitable material, as is its cover T, which has in it the valve T', closed by the hinge E.

The apparatus A has within it three chambers B, C, and D, of which B and C are heating and decomposing chambers, and D the gas-receiving chamber, the remaining space within the cylinder being filled, as shown in the drawings, with layers of fire-brick or other suitable material *s s b b*, supported on fire-brick arches *b' b''*. The fire-brick are laid in rows a short distance apart, alternate layers being laid in rows at right angles, forming a brick "checker-work," in which the currents of gas passing through the cylinder are interrupted and broken up, thus causing a thorough diffusion and mixture of the gases throughout the cylinder or retort. The top layers of the checker-work are covered with a layer of fire-brick balls or spheres *s s*, which form grate-like bottoms for the heating or decomposing chambers.

Access to the chamber B for the purpose of cleaning, repairs, and inspection is had through the valve-opening T', before mentioned, and to the chamber C through the man-hole R. (Shown by dotted lines in Fig. 1.) The valves K and T' are used to admit air while the retort is being heated to the proper degree for fixing the gas and are closed during the operation of fixing.

Blocks *l l'*, of suitable refractory material, which contain the curved and vertically-flared tuyeres *t t'*, as shown in Figs. 1 and 2, are set into the lining of the retort in such position that the tuyeres will open into the chambers B and C. These tuyeres, as shown in Figs. 1 and 2, are curved and flared in such a manner as to cause the hydrocarbon vapor, steam, and air passing through them to spread out and rotate around the chambers, thereby diffusing and commingling the same.

The gas-receiving chamber D is provided with the discharge-pipe *d*, through which the gas which has entered it from the chambers B and C and passed through the checker-work *b b*, leaves the retort or generator.

Embedded in the lining of the retort are the circumferential steam-pipes *i'' i'''* and the vertical air-pipes *pp*, which connect by means of the pipes *p''' p'''* and *p' p''* with the tuyeres *t t'*. These pipes *p' p''* at the point

where they enter the retort and are connected to the tuyeres are considerably contracted in diameter, forming nozzles *ii*, at the larger end of which, as shown in Fig. 1, enter the nozzles *i' i'*, which admit the hydrocarbon to the retort, and behind them the pipes *i'' i''* in the lining of the retort, through which is admitted steam to the retort at *i⁴ i⁴*. The nozzles *ii* are really injectors, the steam-jet spraying and vaporizing the oil as it enters the nozzle and carrying it into the decomposing-chambers. The pipes *p' p''*, connecting with the nozzles or injectors *i i*, are used to admit air directly to the retort.

Suitable peep-holes *ee* are provided for examining the interior of the retort while it is in operation.

Connecting with the pipe *d* is the vertical stand-pipe or stack *S*, leading out into the open air and which has in it the steam-jet *W* for producing a draft in said stack.

The air-pipes *pp* and *p''' p'''* are provided with the valves 2, 3, and 4, and the pipes *p' p''* with the regulating-valves 5 for controlling the admission of air to the retort.

The stack *S* is provided with the valves 1 and 6 for controlling the admission of gas to the stack.

The operation of the apparatus is as follows: In firing up, wood, shaving, waste, or other suitable material are thrown into the chamber *B* and ignited. The valves in the oil and steam pipes *i' i'* and *i'' i''*, are opened and the hydrocarbon spray or vapor is injected by steam into the chambers *B* and *C* and ignited. The valves 1 and 6 in the stack *S* are now open, and the steam entering through the jet *W* creates a draft which draws the products of combustion downwardly through the chambers *B* and *C* into the pipe *d* and thence upward through the stack *S* into the open air, a portion—the heavier products of combustion—passing back again into the chambers *B* and *C* through the injectors *i''' i'''*, where they are again subjected to heat. At the commencement of the operation air is allowed to enter through the opening *T' K* and the air-pipes *pp*. After a time the valves *K* and *T'* are closed by handle *K'* and cover *E*, and the air is allowed to enter only through the pipes *pp*, in passing through which it becomes heated and thus supplies the retort with a hot blast. In the same manner the steam entering at *i⁴* and passing through the pipes *i'' i''* in the lining of the retort becomes highly superheated and, passing into the injectors *i i*, completely vaporizes the oil as it enters. Under the influence of the intense heat caused by the combustion of the mingled hydrocarbon vapor, steam, and air the brick checker-work and lining of the retort become highly heated. This heating is continued until the interior of the retort and the brick checker-work are heated to incandescence, which fact the operator can determine by looking through the peep-holes *ee*. When the interior lining of the generator or retort, together with the spheres and brick

checker-work, has been thus heated to incandescence, which fact can be observed through the peep-holes *ee*, the air-valves 1, 2, 3, 4, and 6 and the valves *K* and *T'* are closed and the hydrocarbon vapor and steam, together with such amount of air as will be drawn into the retort through pipe *p'*, the regulating-valve 5 in pipe *p'* being partly or wholly opened, as may be necessary, are subjected to the heat of the chambers *B* and *C* and the spheres *ss* and checker-work *bb* and are thereby converted into fixed gas, the products derived from the heating in the chamber *B* passing down through the upper spheres *ss* and checker-work *bb* into the chamber *C*, where additional hydrocarbon vapor and superheated steam are added thereto, and then the commingled vapors and gas are passed downwardly through the lower spheres and checker-work *bb* and by the heat therein, as above stated, converted into fixed gas and conveyed into the lower chamber *D*. Through this lower chamber *D* the gas thus produced and fixed is drawn off through the pipe *d* and through a water-seal (not shown in the drawings) into a gas-holder. This process of producing gas in the retort thus heated to incandescence is continued until the interior of said retort becomes too cool to convert and fix gas, which fact is ascertained through the peep-holes *ee*, and then the air-valves are again opened and the reheating of the retort is again commenced, as first mentioned. It will thus be seen that in the manufacture of heating and illuminating gas in the apparatus herein described the heating of the generator or retort and the converting or fixing of the gas follow each other alternately.

I do not limit myself to the precise construction of apparatus shown and described in this application, but claim the right to use in any apparatus similarly constructed.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus for manufacturing heating and illuminating gas, the combination, with a retort, as *A*, lined with fire-brick or other refractory material, as *a*, and containing two communicating heating-chambers, as *B* and *C*, each of which has a bottom composed of spheres, as *ss*, made of refractory material, and a mass or checker-work body of refractory material beneath it, as *bb*, of means, as the injectors *i i i'' i''*, pipes *p' p''*, and tuyeres *t' t'* for passing hydrocarbon vapor, steam, and air into each of said chambers separately, and air-pipes located in the walls of the retort and provided with valves and connected with pipes *p' p''*, and an uptake provided with valves connected with the lower end of said retort for causing the resultant products to pass downwardly through the refractory material under them and into a single chamber, as *D*, for collecting the fixed gas for transmission through an outlet, as *d*, substantially as described.

2. In an apparatus for manufacturing heating and illuminating gas, the combination, with a retort, as A, lined with fire-brick or other refractory material, as *a*, and containing two communicating heating-chambers, as B and C, each of which has a bottom composed of spheres, as *s s*, made of refractory material, and a mass or checker-work body of refractory material beneath it, as *bb*, of means, as the injectors *i i i'' i''*, pipes *p' p''*, and tuyeres *tt'*, arranged tangentially to the chambers for passing hydrocarbon vapor, steam, and air centrifugally into each of said chambers separately, and air-pipes located in the walls of the retort and provided with valves connected with the lower end of said retort and the pipes *p' p''* for causing the resultant products to pass downwardly through the refractory material under them and into a single chamber, as D, for collecting the fixed gas for transmission through an outlet, as *d*, substantially as described.

3. In an apparatus for manufacturing and producing heating and illuminating gas, the combination, in a cylindrical generator or re-

tort, of two communicating heating and decomposing chambers lined with refractory material and having circumferential steam-pipes and vertical air-pipes embedded in said lining and connected to the tuyeres *tt'* by the pipes *p''' p''' p' p''*, each of said chambers being provided with separate injectors and having separate bottoms composed of fire-clay balls or spheres resting upon a body of fire-brick checker-work and supports, with a receiving-chamber situated below said decomposing-chambers for receiving the gas produced therein and having an outlet-pipe connected with a stack or pipe for exhausting the gases or vapors in the decomposing-chambers and also with a main for conveying fixed gas to a gas-holder, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JAMES R. KENDALL.

Witnesses:

JOHN C. ROBINSON,
GEORGE M. DAVIS.