(No Model.)

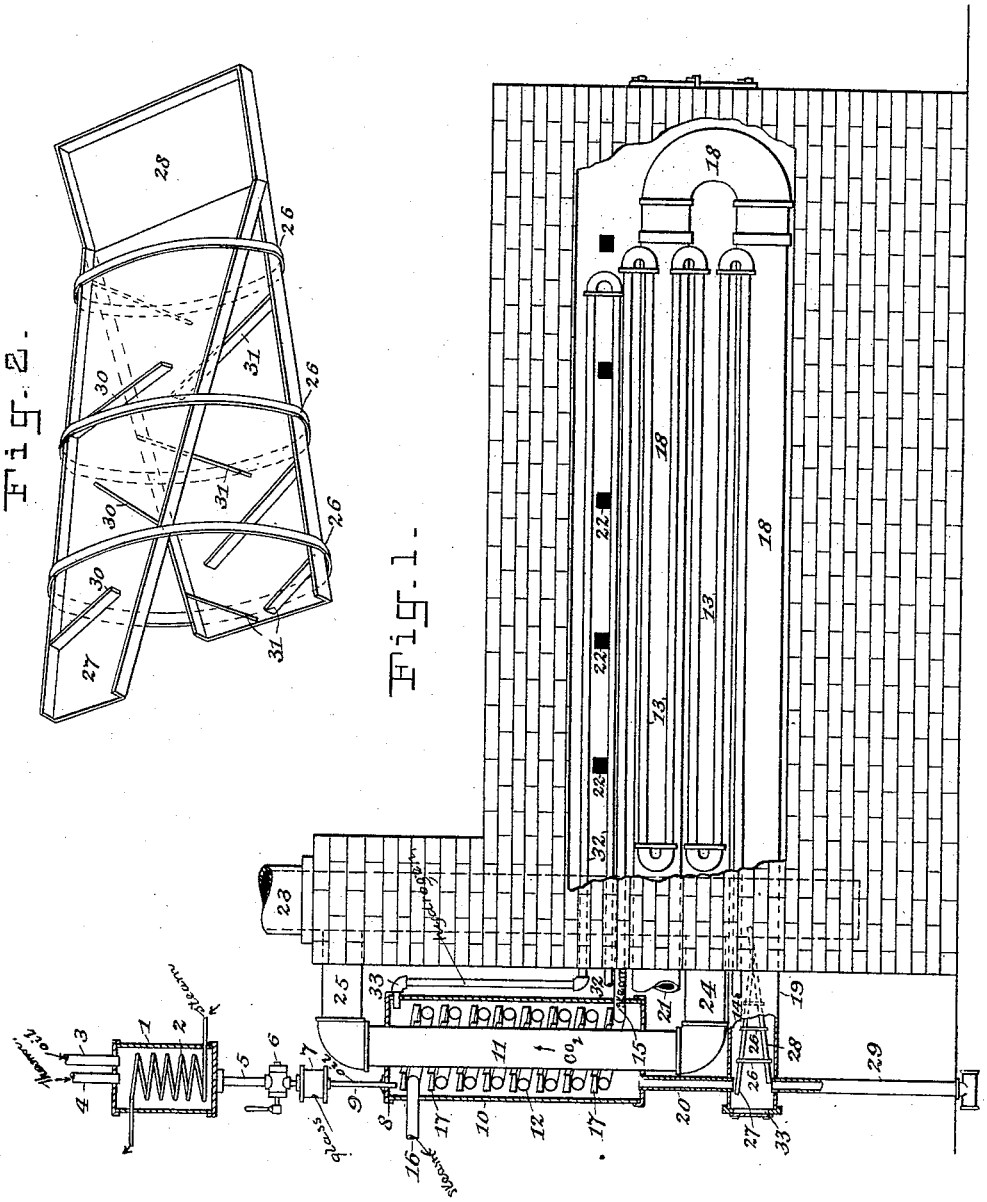
J. S. ROGERS & J. H. BAKER.

APPARATUS FOR PRODUCING GAS.

No. 489,594. Patented Jan. 10, 1893.

Fig. 2.

Fig. 1.



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JAMES S. ROGERS AND JAMES H. BAKER, OF SARATOGA SPRINGS, NEW YORK.

APPARATUS FOR PRODUCING GAS.

SPECIFICATION forming part of Letters Patent No. 489,594, dated January 10, 1893.

Application filed March 17, 1892. Serial No. 425,232. (No model.)

To all whom it may concern:

Be it known that we, JAMES S. ROGERS and JAMES H. BAKER, citizens of the United States, and residents of Saratoga Springs, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Apparatus for Producing Gas from Hydrocarbons, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention is an improvement in apparatus for the manufacture of heating and illuminating gas from hydrocarbons, or from hydrocarbons and hydrogen, and consists of the construction fully described hereinafter, and pointed out in the claims.

In the accompanying drawings forming a part of this specification, and in which like numerals of reference refer to similar parts wherever found throughout the several views, Figure 1, is a side elevation of a furnace provided with our improved apparatus for manufacturing gas, part of the side wall being removed, and portions of the apparatus being broken away so as to show the interior construction and combination of parts, portions of which are shown in section, and, Fig. 2,—a perspective view of a detached portion of the apparatus.

The invention described and claimed herein is an improvement on that for which Letters-Patent of the United States were granted on our application, December 15, 1891, No. 465,077, and the improvements constituting the invention claimed herein are intended for application to, or use in connection with, the apparatus described and claimed in the patent referred to, only such parts of which are shown in this case as are necessary to illustrate our present invention.

The object of this invention is to produce a fixed gas of superior quality for heating or illuminating purposes, from hydrocarbons, or from hydrocarbons and hydrogen, by a simple and economical process, and in an apparatus cheaply constructed and readily understood and operated, and which may be adapted to furnaces of ordinary construction, with but little if any modification, or which may be used in connection with the improved form of furnaces described and claimed in our prior patent referred to.

Many attempts have been made to produce a fixed gas from hydrocarbons, or from hydrocarbons and water or steam, or from hydrocarbons and hydrogen, by various processes and forms of apparatus, but so far as known, with only partial success, and this want of success has resulted principally from defects in the apparatus employed, and in the methods pursued. Under the process and with the apparatus described herein, the gas may be formed from hydrocarbons alone, after which atmospheric air may be mingled therewith, if desired, in the well known manner in any desired quantity, or after the hydrocarbons have been converted into vapor, or while being vaporized and while heated to a high degree, hydrogen gas from any preferred source highly superheated may be mingled with such hydrocarbon vapor thereby producing a gas possessing the necessary qualities for heating or illuminating, as may be desired. As in the patent referred to, the purposes for which the gas is intended will govern to some extent the amount of the hydrogen employed, or the amount of atmospheric air which is used. These are all details which form no part of this invention, however, and as the mingling of atmospheric air with gas is so well known it is not thought necessary to show means for doing so herein.

Referring to the drawings, and the reference numerals thereon, 1, Fig. 1, designates a device for heating hydrocarbons, which consists of a casing closed at the top and bottom, provided with a steam coil 2, through which steam from any source is passed, both the inlet and outlet thereof being controlled by suitable valves of ordinary construction. Hydrocarbon is conducted to the heater by means of a pipe 3, filling all the space not occupied by the steam-coil 2. The hydrocarbon is taken from a storage tank situated preferably, above the heater and this tank being kept filled at a uniform height by means of an automatic valve of well known construction allows a steady and equal pressure of the liquid flowing into the heater. The hydrocarbon thus brought into contact with the steam-coil, is raised to a degree of heat which materially

assists in its vaporization; and the temperature of the hydrocarbon in the heater can be shown at all times by placing a thermometer at some convenient point, as at 4. The hydrocarbon being thus heated is conducted through a pipe 5, and regulating valve 6, through a sight glass 7, which enables the operator to see at all times the flow therethrough, and assist in detecting instantly any irregularity in the feed, and then passes into the vaporizer 8, through the pipe 9.

The object of the vaporizer 8, is to vaporize the hydrocarbon rapidly, perfectly and with the greatest economy. It consists of an outer cylindrical pipe or casing 10, inclosing a pipe or casing 11, the outer casing being closed, and the inner one open at the top and bottom, and an annular space being formed between them. The smaller or inclosed pipe or casing 11, is so arranged as to serve as an escape flue, for a short distance, of the heated gases or products of combustion, from the furnace, in such a manner as to make a large portion of the heat of such gases or escaping products of combustion, available for the purpose of vaporizing the hydrocarbons as in our prior patent referred to.

Arranged within the annular chamber of the vaporizer is a steam-coil 12, through which is passed superheated steam obtained from any desired source and preferably passed through the steam pipes 13, arranged within the retort furnace. This steam enters the pipes 13, at 14, and being superheated to the required degree it emerges therefrom and enters the steam-coil 12, within the vaporizer through pipe 15, and is discharged from said coil through the pipe 16. A coiled pan, or flanged plate or plates 17, which rests upon the steam-coil 12 and conforms to the convolutions thereof, is arranged within the annular chamber of the vaporizer as shown, in such manner as to form a channel or trough supported by the coil and following the course thereof from the top to the bottom of the vaporizer.

One end of the gas retort 18, within the furnace, is provided with an extension 19, which is in communication with the bottom of the vaporizer by means of a pipe 20, and the other end of the retort emerges from the furnace at 21.

As in our prior patent hereinbefore referred to, the heated gases or escaping products of combustion pass through openings 22, into flues or passages, not shown herein, which communicate with the chimney or flue 23, which by means of pipes 24, and 25, are in direct communication with the inner, or central tube or casing 11, of the vaporizer, and by means of dampers or valves, not shown, the hot gases, or escaping products of combustion from the furnace or a portion thereof may be directed through the tube or casing 11, at will.

Within the extension 19, of the retort 18, is arranged a secondary vaporizer, shown in detail in Fig. 2, on an enlarged scale. This vaporizer consists of two plates or pans, each of which is flanged at the sides and wider at one end than at the other, and held together in the manner shown by bands or rings 26. The narrow ends of these pans are directed outwardly, and the outer end of the upper pan or plate, 27, terminates directly under the discharge opening of the pipe 20, from which point it extends inwardly and downwardly gradually widening, to a predetermined point, where it terminates directly over and in close proximity to the inner widest end of the lower plate or pan 28, which extends backwardly and downwardly, gradually narrowing, and terminates directly over the inner opening of a pipe 29, which communicates with the bottom of the extension 19, at this point. The upper surface of the upper pan 27, is provided with inwardly inclined vanes or ribs 30, alternately arranged on opposite sides thereof and the upper surface of the lower pan or plate with corresponding outwardly inclined ribs or vanes 31, the operation of which will be hereinafter described.

The operation of this apparatus is as follows: The hydrocarbon in a heated condition passes from the heater, into the vaporizer at the top as shown, and drops into the coiled pan 17, and follows around it, traversing the whole length thereof from the top of the vaporizer to the bottom thereof, and the entire vaporizer being highly heated by the superheated steam passing through the steam-coil and by the hot products of combustion passing through the central tube or casing thereof, the result is to vaporize all or nearly all of the hydrocarbon before it reaches the bottom of the vaporizer. If for any reason, however, a portion of the hydrocarbon is not vaporized, it is discharged from the pan or plate 17, into the bottom of the annular chamber of the vaporizer, and passes through the pipe 20, into the extension 19, of the retort, and drops on to the upper outer end of the plate 27, of the secondary vaporizer, from which point it spreads out over the surface of said plate and flows forwardly and downwardly over said surface, being compelled by the vanes or ribs 30, to take a winding or tortuous course in its passage. At the inner lower end of the plate 27, the hydrocarbon, if any still remains unconverted into vapor, is discharged upon the upper surface of the inner end of the plate 28, from which point it passes downwardly and backwardly, over the surface of said plate in the same manner as over the surface of plate 27, till it reaches the lower outer end thereof, where, if any particles thereof still remain unconverted into vapor, they are discharged into the pipe 29, being directed thereinto by the last two vanes or ribs 31, which converge, and form a narrow discharge passage directly over the opening into this pipe. From the pipe 29, the waste material, or that part of the hydrocarbon that has not been, and cannot be converted into vapor, passes through pipes

or mains to any desired receptacle or seal arranged therefor. As fast as vapor is formed in the vaporizer it is allowed to escape in a highly heated condition through the pipe 20, by way of the extension 19, into the retort 18, where by a high degree of heat, it is converted into a fixed gas, in the manner well known and emerges from the retort at 21, after which it may be reduced to the required candle-power if intended for illumination purposes, by the admission of atmospheric air, and then conveyed into a gas-holder in the usual manner by an exhauster, such as are in ordinary use.

The means for producing gas from hydrocarbons and hydrogen, consist in this case, of a pipe or pipes 32, which receive the hydrogen gas, from any preferred source, and after conducting it through the retort furnace, where it is highly superheated, it emerges from the furnace, and is discharged into the vaporizer, preferably at the top, by means of pipe 33, where it mingles with the vapor of the hydrocarbon and is conveyed together therewith into the retort where the combined product is superheated and converted into a fixed gas. While we have referred herein to gas formed from hydrocarbons and from hydrocarbons and hydrogen, and to the mingling of air with such gases, and have described the pipes 32, and 33, as means for uniting hydrogen with the vapor of hydrocarbons, it will readily appear that these pipes may be employed for mingling water-gas, or air, or any other dilutent, with the vapor of hydrocarbons as herein described for the purpose of producing a fixed gas from the product.

It is evident that the improvements herein described may be applied to gas-retorts and furnaces arranged in banks, as described in our prior patent referred to, and that many changes in the construction and arrangement of the retort within the furnace; in the location and arrangement of the steam and hydrogen pipes within the furnace; and the manner in which the same are brought in communication with the vaporizer, without departing from the scope, of our invention, as these details or arrangements of the parts of the general apparatus form no part of our present invention, and it is also evident that the improvements which constitute this invention may be applied to other forms of apparatus, than that described herein, or in our prior patent to which reference has been made.

We prefer that the arrangement of the inclined pan 17, within the vaporizer be such as to prevent its coming in contact with the inner tube or casing 11, and it is not necessary that it should be in direct contact with the steam-coil 12. As thus constructed, there is no danger of "coking," which usually results when hydrocarbons are brought in contact with highly heated surfaces.

The secondary, or auxiliary vaporizer, is removable from the extension 19, of the retort 18, through a door or other movable end piece, and should the parts of this vaporizer become "coked" during the operation of the apparatus, it may be easily removed and cleaned of any deposits that may have collected thereon, after which it can be placed in position again.

With this apparatus the possibility of "coking" within the retort proper, from any cause is avoided, because nothing but superheated vapor ever enters therein, and in this vapor there are not substances to be deposited whereby this result is produced. The amount of hydrocarbon converted into a fixed gas in a given time is materially increased since the work of fixing the gas is half accomplished before the vapor is admitted into the retort, and the cost, with the form of apparatus shown, is reduced to a minimum, as the heat required to keep the retort in proper condition for "fixing" the gas is also sufficient to superheat the steam within the vaporizer and also that employed in the heater, if desired, while the escaping products of combustion also materially aid in the process of vaporization, the heat therefrom being otherwise thrown away.

Having fully described our invention, we claim and desire to secure by Letters Patent, the following:

1. In an apparatus for producing gas from hydrocarbons, a vaporizer having a chamber therein, and hydrocarbon supply and vapor exit pipes communicating therewith, a steam coil located in said chamber, and a coiled pan into or onto which the hydrocarbon is discharged, the pan being arranged in proximity to the steam-coil, the arrangement of the pan and steam coil being such that the steam coil does not come in contact with the hydrocarbon as it flows through the pan, substantially as shown and described.

2. In an apparatus for producing gas from hydrocarbons, a vaporizer having an annular chamber therein and hydrocarbon supply and vapor exit pipes communicating therewith, a steam coil arranged therein, and a pan or plates also coiled in said chamber and following the convolutions of the steam coil, the arrangement of the pan and steam coil being such that the steam coil does not come in contact with the hydrocarbon as it flows through the pan, substantially as shown and described.

3. In an apparatus for producing gas from hydrocarbons, a vaporizer provided with an outer and an inner tube or casing, having an annular chamber between said tubes or casings, and hydrocarbon and vapor supply and exit pipes communicating therewith, a steam-coil within said chamber, a coiled pan or flanged plates, arranged in proximity to said coil and means for directing the hot products of combustion from the retort furnace through the inner tube or casing, the arrangement of the pan and steam coil being such that the steam coil does not come in contact with the hydrocarbon as it flows through the pan, substantially as shown and described.

4. In an apparatus for producing gas from

hydrocarbons, the combination with a retort furnace, of a vaporizer, provided with an oil supply, a retort in communication therewith, and a removable secondary, or auxiliary vaporizer within one end of the retort, or an extension thereof, substantially as shown and described.

5. In an apparatus for producing gas from hydrocarbons, the combination with a retort furnace of a vaporizer, provided with an oil supply, a retort one end of which is in communication with the bottom of the vaporizer, and a secondary or auxiliary vaporizer within the end of the retort, into, or upon which, the hydrocarbon from the vaporizer which is not vaporized is dropped, substantially as shown and described.

6. In an apparatus for producing gas from hydrocarbons, the combination with a furnace, of a retort provided with an extension as 19, a vaporizer having an oil supply, the bottom of the vaporizer being in communication with the top of said extension, a waste pipe communicating with the bottom of said extension, and a secondary or auxiliary vaporizer within said extension and forming a connection or communication between the opening which leads to the vaporizer and that of the waste pipe, substantially as shown and described.

7. In an apparatus for producing gas from hydrocarbons, the combination, with a furnace, of a vaporizer having an oil supply, a retort in communication therewith provided with an auxiliary vaporizer consisting of inclined pans or plates, as 27, and 28, one of which is adapted to receive the unvaporized hydrocarbon from the vaporizer and the outer to convey the same to a waste pipe communicating with the retort, substantially as shown and described.

8. In an apparatus for producing gas from hydrocarbons, the combination with a furnace, of a retort, a vaporizer in communication therewith and provided with an oil supply, a waste pipe opening, or pipe, also in communication with the retort, and an auxiliary, or secondary vaporizer within the retort and adapted to receive from the vaporizer, the hydrocarbon which has not been converted into vapor and discharge the particles thereof which cannot be converted into vapor into the waste opening or pipe, substantially as shown and described.

9. In an apparatus for producing gas from hydrocarbons, the combination with a furnace, of a vaporizer, provided with an oil supply, a retort having ingress and egress openings, one of which is in communication with the vaporizer and the other in communication with a waste pipe, and a secondary or auxiliary vaporizer which forms a communication or connection between said openings, substantially as shown and described.

10. The combination with a furnace, of the retort 18, and a vaporizer in communication therewith and provided with an oil supply, of the secondary vaporizer located within the retort, or an extension thereof, consisting of the flanged plates 27 and 28, provided with the inclined ribs or vanes 30 and 31, substantially as shown and described.

11. In an apparatus for producing gas from hydrocarbons, the combination of a vaporizer, of a retort furnace, a retort located therein in communication with the vaporizer and means for mingling hydrogen or its equivalents with the vapor of the hydrocarbon within the vaporizer, consisting of a pipe or pipes which extend into or through the furnace and communicate with the vaporizer, substantially as shown and described.

Signed at Saratoga Springs, in the county of Saratoga and State of New York, this 15th day of March, A. D. 1892.

JAMES S. ROGERS.
JAMES H. BAKER.

Witnesses:
J. W. CRANE,
GEORGE M. CRANE.