

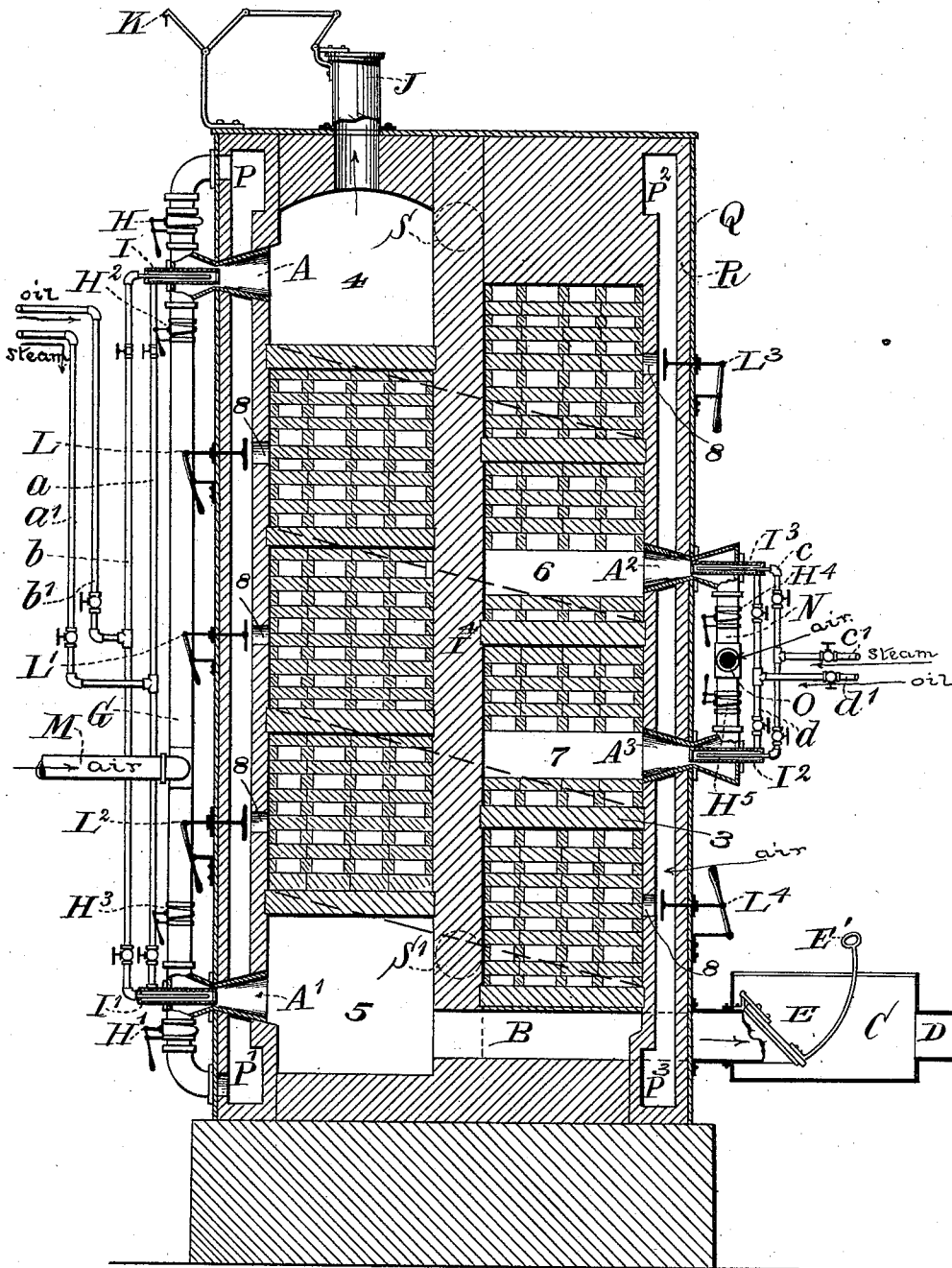
(No Model.)

2 Sheets—Sheet 1.

E. R. ELLSWORTH.
APPARATUS FOR THE MANUFACTURE OF GAS.

No. 523,112.

Patented July 17, 1894.



Witnesses *Fig. 1*
W. J. Horzink
Edward G. Berger

Inventor
Edwin R. Ellsworth
 per *Chas. L. Coombs,*
 Attorney

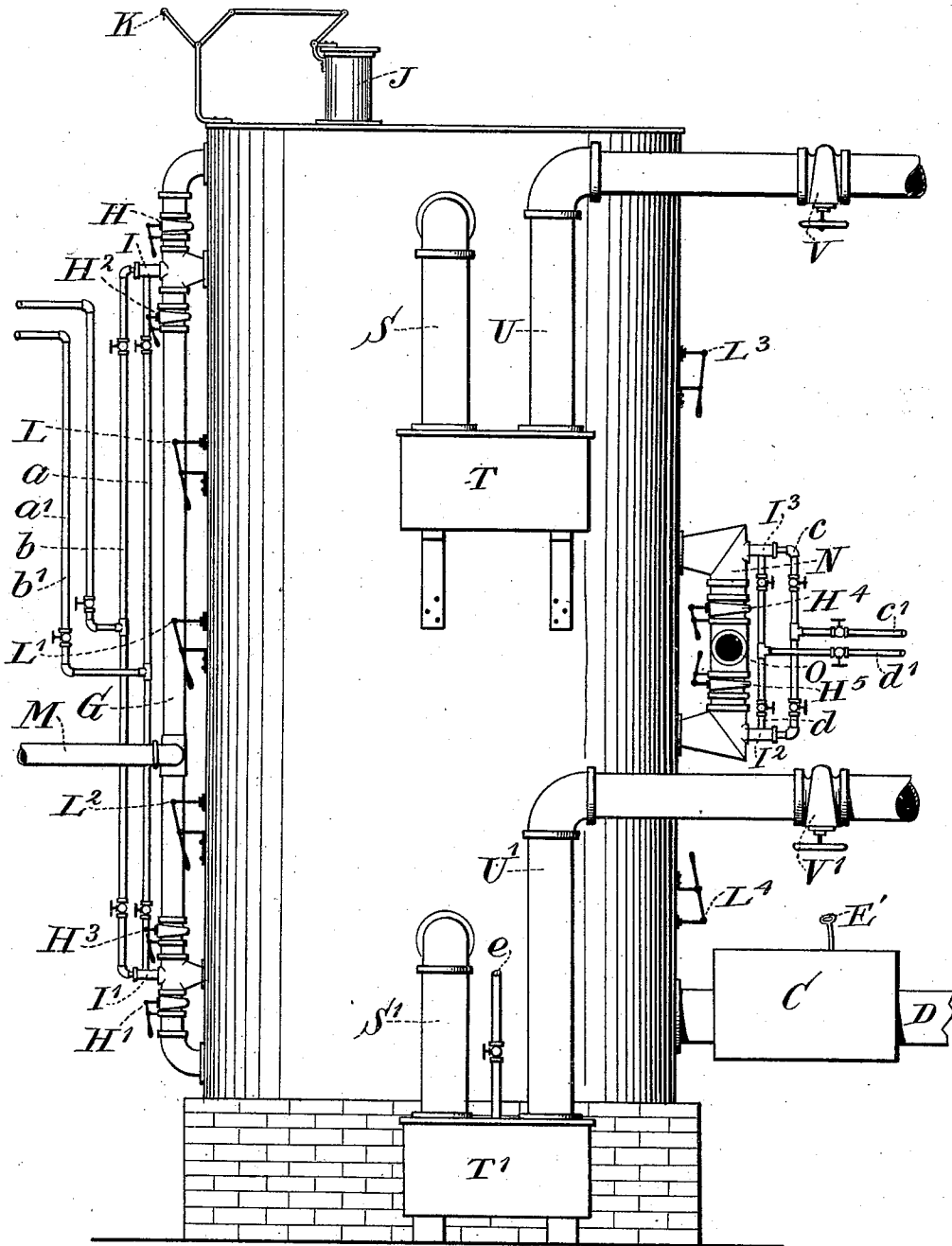
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2 Sheets—Sheet 2.

E. R. ELLSWORTH.
APPARATUS FOR THE MANUFACTURE OF GAS.

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Patented July 17, 1894.



Witnesses *Fig. 2*
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 per
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UNITED STATES PATENT OFFICE.

EDWIN RUTHVEN ELLSWORTH, OF BROOKLYN, NEW YORK.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 523,112, dated July 17, 1894.

Application filed September 14, 1893. Serial No. 485,481. (No model.)

To all whom it may concern:

Be it known that I, EDWIN RUTHVEN ELLSWORTH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to 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 a part of this specification.

This invention relates to certain improvements in the manufacture of gas, and it has for its object to provide an apparatus of improved construction in which such gas can be manufactured.

With these ends in view, my present invention consists in a gas apparatus, circular in cross section, and provided with a concentric pillar or column extending from the lower to the upper portion of the apparatus, around which is extended a spiral chamber, through which the heated products of combustion of liquid hydrocarbons may be passed to heat the chamber, and in which the gas may be ultimately generated as more fully hereinafter explained.

The invention further has for its objects to provide a generator which will be regenerative in its operation by reversing the currents of the products of combustion of the hydrocarbon vapors.

The objects above enumerated I accomplish by the means illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical sectional view of my improved gas apparatus, and Fig. 2, a side elevation of the same.

Referring to the drawings, the letter R indicates the walls of the generator, constructed of fire brick or other refractory material and confined by an outer jacket of wrought iron or other material, as indicated by the letter Q. The interior of the generator is provided with an upright central pillar or column, I¹, around which is constructed a spiral flue, which may be formed of arch work, but which

is preferably formed of tiles of suitable dimensions.

The apparatus at the top and bottom, at which the respective ends of the spiral flue are located, is provided with combustion chambers, 4 and 5, for the purpose hereinafter explained. The spiral chamber is indicated in dotted lines on Fig. 1 of the drawings, and is built in with "checker-work" of fire brick, with the exception of the spaces, 4 and 5, before mentioned, and also the similar intermediate spaces or chambers 6 and 7.

The walls of the generator are made hollow, that is to say, they are provided with air spaces, P³. These air spaces are connected at suitable points indicated by the numeral 8 with the spiral chamber before mentioned.

The letters A and A' indicate openings flaring from the outside to the interior, and communicating with the combustion chambers, 4 and 5. Into said openings extend the hydrocarbon injectors, I and I', which are constructed of concentric tubes, as usual, the outer one being connected with a steam induction pipe, a, and the inner one with the oil induction pipe, b, having, respectively, branch conducting pipes, a' and b'.

The letter M indicates a pipe leading into the pipe, G, from a suitable air blast or generator. The said pipe, G, near its upper and lower ends is provided with valves, H and H', and at intermediate points with valves, H² H³, by means of which air may be admitted to either the upper or lower end of the generator, in order to reverse the operation of the apparatus.

At intervals the inner walls of the apparatus are provided with apertures, 8, which may be opened and closed by means of valves, L, L', L² L³ and L⁴, to admit heated air from the flues, P P' P² P³, to the interior of the generator.

The letters A² and A³ indicate two flaring openings which connect with the spaces, 6 and 7, in the spiral chamber. These openings also connect with a vertical pipe, N. The said pipe, N, connects or communicates with an air blast by means of a pipe, O, and is provided with valves, H⁴ and H⁵, by means of which air may be admitted into either of the chambers, 6 and 7, separately or conjointly. Into the flaring

openings, $A^2 A^3$, extend injectors, $I^2 I^3$, which connect with the steam pipe, c' , and the hydrocarbon pipe, d' .

J indicates a flue through which the products of combustion are passed off initially, which is provided with a cover operated by a compound lever, K.

The letter B indicates a flue leading from the lower combustion chamber to a chamber, C, having a conductor, D, leading to a proper escape flue through which the products of combustion are carried off in blowing up, from top to bottom, the tube, B, being provided with an air-tight cover, E, which is operated by an arm, E' , to open and close it.

The operation of my invention is as follows: The apparatus may be started, either at the top or bottom, by blowing air and hydrocarbon into either of the chambers, 4 or 5, and igniting the atomized hydrocarbon, precaution being taken to shut off the inlet to one, while the other is in operation.

To more fully illustrate the operation of the apparatus, it will be assumed that it is started from the bottom. Hydrocarbon is injected into the chamber, 5, through the injector, I' , by means of a steam jet, and the hydrocarbon is ignited. The steam, hydrocarbon and air are mutually decomposed and pass upward through the spiral flue, and checker-work therein, which absorbs the heat of the passing products on their way to the upper chamber, 4. On the course, liquid hydrocarbon and steam with air may be admitted through the pipes, A^2 and A^3 , into either, or both, of the chambers, 6 and 7, as required, so as to recuperate or supply additional heat to the spiral chamber, and insure a properly regulated temperature in the same.

The above mentioned operation heats up the generator so as to put it in condition for fixing the hydrocarbon for the manufacture of the gas.

In the production of the gas the apparatus is operated in a similar manner to the heating thereof—that is, the operation may be started either from the top or bottom of the apparatus. To generate the gas, after the checker-work is heated, it will be assumed that the operation is to be commenced at the upper part of the apparatus. Steam and hydrocarbon fluid will then be admitted through the flaring aperture, A, into the chamber, 4, and passing down through the checker-work will become mutually decomposed, forming a fixed gas which will pass out of the generator by the pipe, S' , to the seal, T' , and from thence through the pipe, U' , to a suitable gas holder or point of consumption, the flow being controlled by means of a valve, V' . In reversing the direction of the travel of the hydrocarbon, steam and oil are introduced through the atomizer, I' , and ascend through the spiral chamber, the resultant gases passing out through the pipe, S, seal, T, and pipe, U, the flow being controlled by the valve, V.

It will be seen that by this construction of

the apparatus an extensive heating and decomposing surface is provided in a comparatively small structure, rendering it possible to make the same very compact and effective, with the smallest cost of producing the required heat for fixing the said hydrocarbon vapors.

In passing through the spiral chamber, the products of combustion of the fuel pass back and forth in the process of reversal. By this reversal of the hot gases, first passing them in one direction through the spiral chamber and then, at the next blowing up operation, passing them in opposite direction, the heat will be stored up in the intermediate portion of the spiral chamber and economized for decomposition and the fixing of the gas. This manner of operating avoids the waste of heat due to carrying on the operation in one direction only as in some known apparatuses.

My process is designed for use in such an apparatus as is herein described where a single upright generator is employed having in it a long fixing and superheating chamber of spiral form. This spiral form is very important as it enables me to get the necessary length of travel of the gases within a very small compass. In a single generator apparatus with facilities for reversion of the current of heated gases, as described, this spiral construction lessens both the height and diameter of the apparatus as will be obvious. I am aware that generators have been superimposed one over another, and that a series of two or more of such have been placed side by side, and this I do not claim.

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

1. In an apparatus for the manufacture of gas, the combination with a single, upright casing having in it a continuous spiral, ascending chamber, a central column about which said chamber winds, and combustion chambers, one at each extremity of the said spiral chamber, of means for alternately admitting air, steam and hydrocarbons, and hydrocarbons and steam to said combustion chambers to heat the chambers in the casing and produce gas, substantially as set forth.

2. In an apparatus for the manufacture of gas, the combination with an upright casing having in it a continuous, ascending spiral chamber winding about a central column, and combustion chambers at the terminals of said spiral passage, of means for introducing air, liquid hydrocarbons and steam to said chambers, intermediate, supplementary combustion chambers along the spiral chamber, and means for introducing air, hydrocarbons and steam to said intermediate chambers, in order to intensify the combustion at the middle portion of the said chamber, substantially as set forth.

3. In an apparatus for the manufacture of gas, the combination with the generator, having a spiral passage, provided with "checker-

work" and having combustion chambers at its terminals, with means for introducing fluid-fuel and gas producing materials thereto of the annular space surrounding the spiral chamber, and the pipes leading to the combustion chambers, whereby hot air may be delivered to the same, substantially as and for the purpose specified.

4. In an apparatus for generating gas, the combination with the generator having a spiral passage extending through it, combustion chambers at its terminals, and means for admitting heat and gas producing materials thereto, of the intermediate chambers, and means for introducing heat and gas producing materials thereto, the annular space surrounding the spiral chamber communicating with the said space and chamber, the exit passages, and the respective valves whereby the gas is carried off, substantially as specified.

5. In an apparatus for generating gas, the combination with the generator having a spiral passage within it, with chambers at its terminals, and means for introducing fuel and gas producing materials thereto into the same,

of the annular space within the walls of the apparatus, openings communicating with the spiral chamber and the valves, whereby hot air may be admitted or cut off from the spiral chamber, substantially as and for the purpose specified.

6. In an apparatus for producing gas, the combination with a generator having a spiral chamber, and a surrounding air space communicating therewith at valve controlled points, of the air pipe leading from a suitable blast supply to the annular space, the flaring openings connecting said openings with the combustion chamber at the terminals of the spiral chamber, and the injectors whereby fuel and gas producing material with heated air may be introduced into the combustion chamber to heat the same and produce the gas, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN RUTHVEN ELLSWORTH.

Witnesses:

EDWARD EGENBERGER,
WM. H. DE LACY.