(No Model.)

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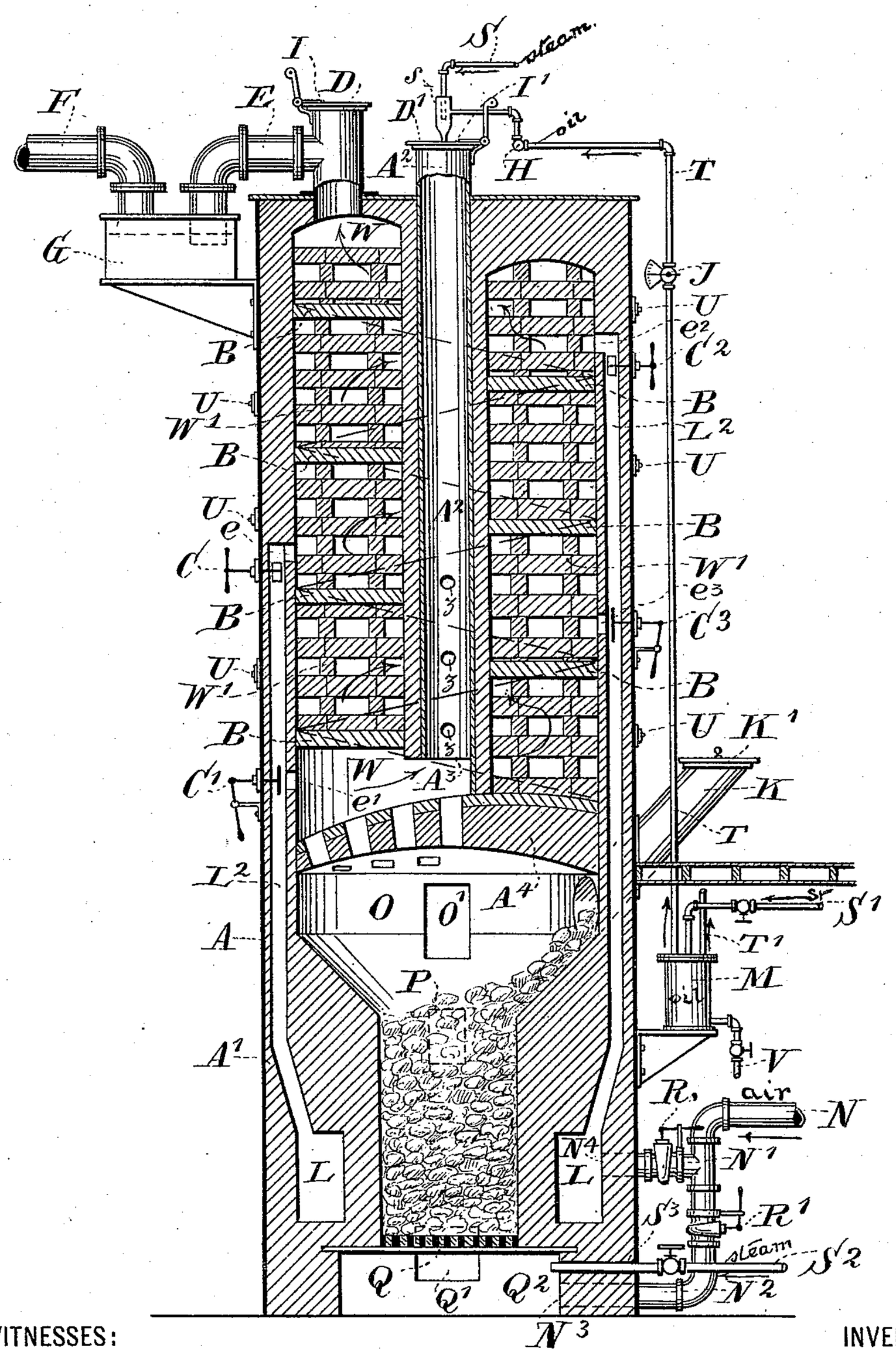
APPARATUS FOR MANUFACTURING GAS.

No. 532,451. Patented Jan. 15, 1895.



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APPARATUS FOR MANUFACTURING GAS.

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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 Manufacturing Gas; and I do hereby 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.

This invention relates to improvements in that class of gas making apparatus wherein a generator for crude water-gas is arranged directly beneath the superheating and carbureting chamber and wherein the liquid hydro-carbon is admitted at the top of the apparatus and descends through the superheating chamber. As commonly practiced in the manufacture of such gas, the decomposition of the hydrocarbon in connection with the water-gas has been effected in chambers filled with "checker-work" composed of fire-brick or other refractory material, heated to incandescence; generally by the combustion of coal or other solid hydro-carbon, which is subsequently utilized for the production of the water gas employed in the manufacture of the ultimate gas.

In apparatus for the production of this gas, it is necessary to provide an extensive checker-work system to thoroughly decompose the fluid hydro-carbon, and the prime object of my invention is to provide an apparatus in which a much greater heating surface or series of surfaces may be obtained in the same space as usually employed, thus rendering the apparatus more compact than any heretofore in use, economizing fuel and making a better quality of gas.

My invention further has for its objects to provide an apparatus by means of which the fluid hydro-carbon may be so distributed that the elements thereof will pass off, successively, according to their densities, the lighter portions first, so as to meet the crude water gas at points of temperature of such a degree as to insure their conversion into fixed gas and at the same time of a degree insufficient to destroy their illuminating properties by the production of lamp-black or heavy hydrocarbons.

The above mentioned objects I attain by the means illustrated in the accompanying drawing, in which is represented a vertical, central sectional view of my improved apparatus.

Referring to the drawing, the letter A indicates the external casing of the apparatus, which consists of a vertically arranged cylinder of suitable dimensions. The interior of the apparatus is constructed of fire-brick or other refractory material as indicated by the letter A′. In the lower part of the apparatus is located a combustion and decomposing chamber O, the lower portion of which is contracted the upper portion being expanded or enlarged, as shown. Over the enlarged portion is located a crown or partition A^4, which is formed of fire-brick or other refractory material, and which is provided at one side of its center with apertures connecting the chamber O with the lower part of the chamber W. The said chamber occupies the upper part of the apparatus and is provided with a spiral partition or floor B, which forms a spiral chamber extending continuously from the top to the bottom of the portion of the apparatus above the crown, as indicated in dotted lines. Through the center of the chamber W and the spiral partition thereof, extends a vertical passage A^2 the walls of which are constructed of fire brick or other refractory material, which projects above the top of the outer casing, and communicates with the lower part of said chamber at the center of the crown or perforated arch, communicating with the combustion chamber, below, so that heavy products may pass directly into said combustion chamber.

The letter Q indicates a grate located in the lower part of the apparatus; Q^2, an ash pit below said grate, and Q′ the ash pit door.

The letter S^2 indicates a steam pipe leading into the ash pit from a suitable boiler or generator, and N^2 an air blast pipe connecting with a pipe N which leads from an air blast generator. The said pipe N^2 passes through an opening N^3 into the ash-pit before mentioned.

In the body of the lower part of the furnace is formed an annular air chamber or passage L from which extend, upwardly, vertical passages L^2, which are formed in the body of the

apparatus. One of these extends about half way up the chamber W and the others to near the top thereof and each communicates with said chamber by means of openings *e*, *e'* and e^2 e^3. The upper ends of said passages L^2 are provided with valves C and C^2, respectively, and the passages *e'* and e^3 have arranged opposite them valves C' and C^3 for the purpose hereinafter explained. Into the passage L extends through an opening N^4 a branch pipe N' from the blast pipe N before mentioned. The pipes N^2 and N' are provided with valves R and R' by means of which the passage of air through them may be regulated.

At the top of the central tube A^2 is located a cover D' connected to an arm I' which is hinged to the upper edge of said tube. The tube is provided with an atomizer *s* of the usual construction, which connects with a suitable steam generator by means of a pipe S. The atomizer also connects with an oil or fluid hydro-carbon supply pipe T which is provided with a hinge joint H to permit it to be turned back with the cover. The said pipe is provided with a graduated valve J by which the quantity of fluid admitted to the atomizer may be determined and regulated. The pipe T proceeds from a jacketed tank M which is provided with a steam supply pipe S' and escape pipe T' and also with a drip pipe V for the escape of water of condensation.

The letter E indicates a pipe leading from the upper part of the apparatus to a seal G; and F a pipe leading from said seal to a gas holder, or to the point of consumption of the gas. The upper end of the said pipe is provided with a cover D, secured to a hinged arm or lever I, by which it may be manipulated to open or close said pipe.

The chute K, extends obliquely into the upper part of the combustion and generating chamber O, and is provided with a tightly fitting cover K' by means of which it may be closed to prevent the escape of gas while the apparatus is in operation.

At suitable intervals the apparatus is provided with apertures closed by removable stoppers U, through which the interior of the spiral chamber may be viewed at different points to note its condition.

The operation of my invention will be readily understood in connection with the above description and is as follows: In starting the covers D and D' are opened or turned back. Suitable kindling material is placed in the lower part of the combustion chamber and the fire is kindled. When burning properly, coal or other fuel is supplied through the chute to the combustion chamber, and the cover D' is closed and the cover D opened. A blast of air is then forced through the pipe N^2, below the grate Q, which passing up through the burning fuel urges it to incandescence. The hot products pass up through the perforations in the crown and from thence to the checker-work in the spiral chamber W, in the upper part of the apparatus passing off through the upright portion of the pipe D leading from the top thereof. During this operation of "blowing up," as it is technically called, air is forced in at the points *e*, *e'*, e^2 and e^3, from the flues L and the pipes N, N', the quantity being regulated by the valve R and the valves C, C', C^2 and C^3 before mentioned, so as to meet the gaseous elements passing upward and supply the proper amount of oxygen to consume the same and uniformly and evenly heat the checker-work, at different points of its course. By this construction the heat which would be radiated from the interior of the apparatus is absorbed, carried back and utilized. The temperature of the checker-work is determined by looking through the peep holes U, and when said checker-work is in proper condition the valve D is closed down, and the air is cut off at the valves R and R' and steam is admitted through the pipe S^2 below the grate. Passing up through the incandescent fuel, above, it parts with its oxygen which combines with a part of the carbon of the incandescent fuel, liberating free hydrogen and forming water gas consisting of carbonic oxide and hydrogen, both inflammable gases, but both deficient in illuminating properties. During the generation of the water gas a suitable hydrocarbon is atomized or injected into the apparatus through the atomizer or injector *s* down and through the vertical passage A^2. Such hydrocarbons are complex compounds which distill and decompose at different densities. The lightest of the components thereof will pass through the upper apertures *z* into the checker-work chamber, where they will meet with the proper conditions of temperature and the water gas, and be converted into illuminating gas, without the deposition of carbon or heavy hydro-carbons. The heavier portions will pass farther down to the next lower apertures, where they will pass off into the checker-work chamber, and so on, the heaviest portions in the form of tar or solid carbon passing directly through the perforations in the crown of the combustion chamber, where the high temperature will convert any gas producing material into a fixed illuminating gas which will pass to the holder with the previously generated gases and the solid portions, if such should be left and which would consist of pure carbon, would pass into the combustion chamber, collect there and be utilized as fuel. The steam passed into the central passage A^2, through the atomizer is just sufficient to atomize and carry the fluid hydro-carbon with it, and as it never reaches a temperature at which it would be decomposed, is condensed in the seal and carried off.

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

1. The combination with the generating chamber and the spiral fixing chamber ar-

ranged above and over said generating chamber, of the central tube extending through the fixing chamber and provided with apertures at suitable intervals whereby the volatilized hydrocarbon may be led to the fixing chamber in the order of the volatilities of its components, so as to be decomposed at the proper temperature to form a fixed gas without deposition of carbon, substantially as set forth.

2. In a gas-generating apparatus, the combination with the combustion and generating chamber, of the apertured crown or partition, the spiral chamber above the latter, the checker-work therein, the air and steam blast-pipes, and the injector for liquid hydrocarbon, whereby the checker-work is heated and the water-gas and hydrocarbon mutually decomposed to form a fixed gas, substantially as specified.

3. An apparatus for the manufacture of gas, comprising an inclosing casing having in it a water-gas generating chamber, a spirally-formed superheating chamber above and over said generating chamber, an apertured partition between said chambers, and a passage, A^2, for liquid hydrocarbon extending down through the superheating chamber, an atomizer for liquid hydrocarbon at the upper outer end of said passage, A^2, and means for admitting steam and air under pressure to said chambers, substantially as set forth.

4. An apparatus for the manufacture of gas, comprising an inclosing casing, having in it a water-gas generating chamber O, a superheating chamber of spiral form arranged above and over the generating chamber, an apertured partition between said chambers, and an axially arranged, vertical passage, A^2, in the superheating chamber, having in its walls apertures *z*, communicating with the spiral chamber at different levels, an atomizer for liquid hydrocarbon at the outer, upper end of the passage A^2, and means for admitting air and steam under pressure to said chambers, substantially as set forth.

5. An apparatus for the manufacture of gas, comprising an inclosing casing, having in it a generating chamber, O, an apertured crown over said chamber, and a spirally-arranged superheating chamber above said partition and containing checker-work, a passage, A^2, extending down through the spiral chamber and provided with apertures *z* arranged at different levels in its walls, air passages L and L^2, formed in the walls of the casing, and a gas outlet at the top of the casing, an atomizer for liquid hydrocarbon situated at the upper, outer end of the passage A^2, and means for admitting air and steam under pressure to the generating and superheating chambers, substantially as set forth.

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

EDWIN RUTHVEN ELLSWORTH.

Witnesses:
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