

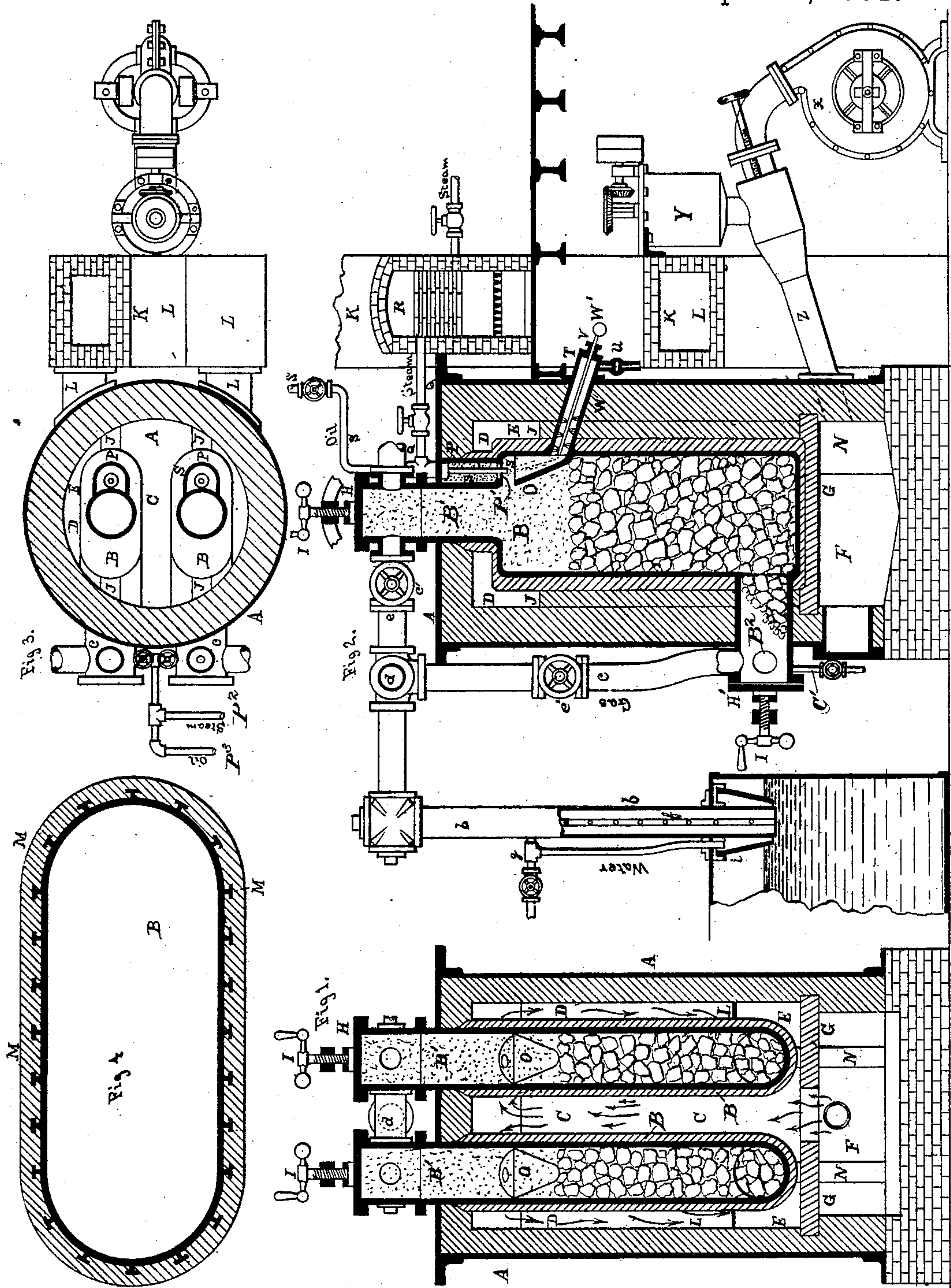
(No Model.)

J. D. AVERELL.

PROCESS OF AND APPARATUS FOR MANUFACTURING WATER GAS.

No. 246,998.

Patented Sept. 13, 1881.



Witnesses.

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UNITED STATES PATENT OFFICE.

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PROCESS OF AND APPARATUS FOR MANUFACTURING WATER-GAS.

SPECIFICATION forming part of Letters Patent No. 246,998, dated September 13, 1881.

Application filed January 17, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. AVERELL, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Process of and Apparatus for the Manufacture of Water-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, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in the process of manufacturing water-gas and in apparatus for carrying such process into effect.

Heretofore in the manufacture of water-gas it has been customary to pass steam, in conjunction with a hydrocarbon, through a body of incandescent carbon contained in a suitable retort, whereby the steam and hydrocarbon are decomposed and converted into fixed gases, which are collected for use. A serious objection has been encountered, however, in the fact that the steam and hydrocarbon rapidly reduce the temperature of the incandescent solid carbon, rendering it necessary to suspend the generation of the gas from time to time to permit the solid carbon to regain its temperature.

Attempts have been made to obviate this objection by using two retorts and passing the gas-producing material through the same alternately. This method has proved objectionable for the reason that when two retorts are thus employed the gas-producing material does not pass directly through the body of incandescent carbon, but is converted into gas in one retort, which gas passes into the other, and is subjected to an injurious heat.

My invention is designed to obviate this objection, and to provide a process that is virtually continuous and an apparatus that can be operated without material interruption.

To this end my invention consists, first, in an improved process of decomposing steam in

conjunction with hydrocarbon oil or vapor, for the manufacture of water-gas, by causing such liquid hydrocarbon oil or vapor to pass alternately in opposite directions through a body of incandescent solid carbon in a suitable retort, whereby the carbon at one side may be permitted to regain its temperature while the steam and hydrocarbon oil or vapor are entering at the other, without removing the solid carbon, and the gas can be continuously generated, as more fully hereinafter specified; second, in the combination, with a retort or retorts mounted in a cupola or furnace, of certain connections at the top and bottom, leading from a steam-generator and from a hydrocarbon tank or vessel or a vapor-generator to the retort or retorts, and certain eduction-pipes leading from opposite ends of the retorts, the connections and pipes being provided with valves, whereby the steam and hydrocarbon oil or vapor may be admitted and the gas drawn off alternately at opposite ends of the retort or retorts, as more fully hereinafter set forth; third, in the combination, with the steam-injecting pipe and the hydrocarbon oil or vapor induction pipe, of a drip-pocket located in the retort and drip-tube and valve, whereby the liquids resulting from any condensation of the steam and hydrocarbon vapor may escape, as and for the purposes more fully hereinafter specified.

In the drawings, Figure 1 represents a vertical sectional view of my improved apparatus; Fig. 2, a longitudinal vertical section of the same, showing the fuel-feeding devices; Fig. 3, a view of the gas-generator, partly in horizontal section and partly in plan; and Fig. 4, an enlarged horizontal sectional view of the retort.

The letter A indicates a cupola or furnace, in which the vertical retorts B are located in such manner as to leave spaces D at each side and a space, C, between said retorts. The said cupola or furnace may be constructed of any suitable material and of any desired shape; but it is preferably constructed of metal, of cylindrical shape, and provided with a lining, E, of fire-brick or clay or other refractory material.

The letter F indicates the fire box or chamber of the cupola or furnace, which is provided

at its top immediately with partitions G, formed of fire-tiles, to protect the bottoms of the retorts, the heat from the fire-box passing up into the cupola or furnace through a space between the tiles into the cupola and through the flues between and at the sides of the retorts.

The retorts may be constructed of any suitable material and shape; but they are preferably constructed of cast metal, of approximately elliptical shape in horizontal section, with open-ended cylindrical extensions B' passing through the top of the cupola or furnace, the extensions being provided with removable covers H, secured in place by the usual screw, I, and cross-bar, so that the retort may be readily charged with solid carbon.

The retorts, near the bottoms, are provided with cylindrical lateral extensions B², which are open at their ends and provided with covers H' and suitable means of attachment, to permit the retorts to be cleaned when required, the said extensions passing through the wall of the cupola or furnace at one side.

The letter J indicates a partition of fire-brick interposed between the walls of the retort and cupola, forming flues C and D. These partitions extend from the tiles G in the lower part of the cupola or furnace to near the top, where they terminate, leaving suitable passages to connect the said flues C and D.

The letter I indicates the passage leading from the flues D to the chimney K, through which the products of combustion escape.

The retorts are provided with flanged ribs or anchors M, cast or otherwise secured to the outside wall, and are provided with a covering of fire brick or clay, which is securely held in place by the ribs or anchors, the said ribs or anchors serving also as a means by which any injury to the coating may be readily repaired. In some instances, when the retorts are of more than ordinary dimensions, the tiles G may be supported by means of the tiles N, and thus insure the proper support of the retorts.

The letter O indicates a pocket cast or otherwise formed in the interior of the retorts, at one side of the same, for the purpose hereinafter explained.

The letter P indicates a steam-chamber cast or otherwise formed on the upper part of the retort, at one side of the extension B'. The said chamber connects by means of a pipe, Q, with a superheater, R, which is connected with a boiler or steam-generator, preferably with the boiler supplying the steam to the engine of the gas-works.

The letter S indicates a pipe leading from a reservoir containing hydrocarbon oil, or from a vaporizing-chamber containing such hydrocarbon. The said pipe extends through the steam-chamber to about a little below the mouth P', connecting said steam-chamber with the interior of the retorts, so that the superheated steam will inject the liquid hydrocarbon or the vapor thereof into the retort.

The letters P² and P³ indicate similar steam

and hydrocarbon oil or vapor pipes leading from the superheater and hydrocarbon oil reservoir or vapor-generator to the extensions H' at the lower portions of the retorts. These respective pipes are provided with suitable valves, by means of which the steam or hydrocarbon oil or vapor may be injected into either end of the retort.

From the pocket O extends a drip-tube, T, which passes in an inclined direction through the partition J and the side of the cupola or furnace. The outer end of said drip-tube is provided with a drip-cock, u, extending downward, and with a stuffing-box, V, at its extremity. Within the said tube is located a brush or scraper, W, mounted upon a rod, W', provided with a suitable handle, and adapted to be reciprocated back and forth through the stuffing-box for the purpose of clearing the drip-tube readily if it should become clogged.

The letter X indicates a fan or blower, and Y a hopper containing coal-dust or other comminuted fuel, the said hopper being connected with the pipe Z, leading to the fire box or chamber F, so that the fuel may be carried by the blast into said fire box or chamber, where it is ignited and furnishes the heat for heating the retorts.

The letter c indicates two stand-pipes extending upward from the extensions at the lower parts of the retorts, and connecting with a horizontal pipe, d, leading to an eduction-pipe, e, which connects with the upper extensions, B', of the retorts and with the washer by means of a vertical pipe, b. The said stand-pipes c, as well as the eduction-pipes e, are provided with valves e', by means of which communication with the retorts can be opened or closed at will, to discharge the gas from the upper or lower parts of the retorts, as may be desired. The pipe b passes down into the washer and is sealed by the water therein, and through the said pipe b extends a perforated spray or jet tube, f, connected with a suitable water-supply pipe, g. The said water-supply pipe g also connects by means of a pipe, g', with the interior of a conic frustum located around the lower end of the pipe b, within the washer. These devices serve to supply the washer with the necessary water, and by the introduction of the water into the said pipe b and its discharge into the washer the gas is cooled and partly condensed, causing a partial vacuum in the pipes and retorts, whereby the generation of the gas in the retorts is materially promoted and its escape from the retorts greatly assisted.

The letter c' indicates an air-pipe connecting with a suitable blast-generator and with the lower extensions, H', by means of which air may be supplied to the solid carbon in the retorts to start the combustion of the same at the beginning of the operation, the said pipe being provided with a valve, by means of which the supply of air may be cut off at the proper stage.

The operation of my invention will be readily understood in connection with the above de-

scription, and is as follows: The retorts are first properly charged with solid carbon, preferably such as is deposited in gas-retorts, and the same ignited and brought to an incandescent heat. The steam and hydrocarbon oil or vapor are then admitted at one end of the retort and the connections with the other end of the retort opened, so as to establish communication with the washer, and through the washer with the gas-holder. The fire having been properly started in the fire-box and the fan and comminuted fuel devices put in operation to maintain the heat in the retorts, the decomposition of the steam and hydrocarbon oil or vapor, in conjunction with the solid hydrocarbon, commences, the oxygen of the steam uniting with the incandescent carbon, forming carbonic oxide—an inflammable gas—and liberating the hydrogen, while the hydrocarbon oil or vapor is decomposed, forming a rich fixed gas, which, uniting with the carbonic oxide and hydrogen, which possesses little illuminating qualities, brings the same up to the proper illuminating standard. When the operation has been continued for a certain period of time and the temperature of the incandescent carbon reduced so as to be no longer effective in decomposing the steam or hydrocarbon oil or vapor at the end at which they are introduced, the connections are changed so as to admit the steam and hydrocarbon oil or vapor at the opposite end of the retorts, where the temperature of the solid carbon is substantially unaffected, and to draw off the gas at the other end, giving the fuel at the first-mentioned end of the retort time to regain its incandescence, thus keeping up a continuous operation.

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

1. The process herein described of generating fixed gases by passing steam and liquid hydrocarbon alternately in opposite directions vertically directly through a body of incandescent carbon, whereby the heat of the same may be maintained in said body, substantially as and for the purpose specified.

2. In combination with a retort or retorts mounted in a cupola or furnace, the connecting-pipes at the top and bottom, leading from a suitable steam-generator, and hydrocarbon oil or vapor reservoirs or vapor-generators, and the gas-duction pipes leading to the washer or reservoir, whereby the hydrocarbon oil or vapor and the gas may be alternately admitted and drawn off from opposite sides of the body of incandescent solid carbon in the retort or retorts, substantially as and for the purposes specified.

3. In combination with the steam-injecting pipe and the hydrocarbon oil or vapor induction pipe, the drip-pocket and drip-tube and valve, whereby the liquids resulting from the condensation of the steam and hydrocarbon vapor may escape to prevent the cooling of the incandescent carbon, substantially as set forth.

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

JOHN D. AVERELL.

Witnesses:

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F. L. OURAND.