(No Model.)

L. P. LOWE.

APPARATUS FOR THE MANUFACTURE OF HYDROCARBON GAS.

No. 405,426. Patented June 18, 1889.

Fig. 1.

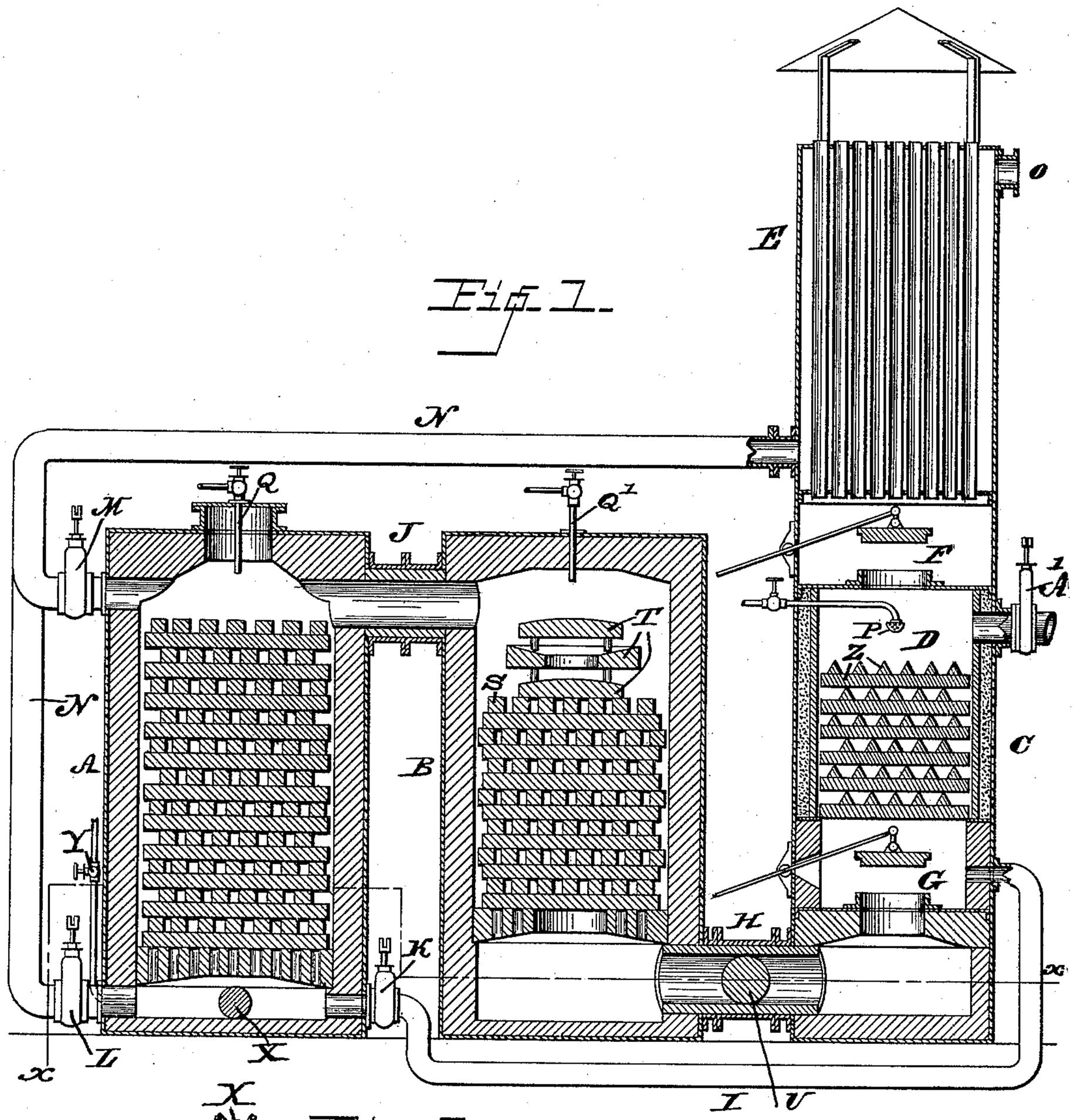
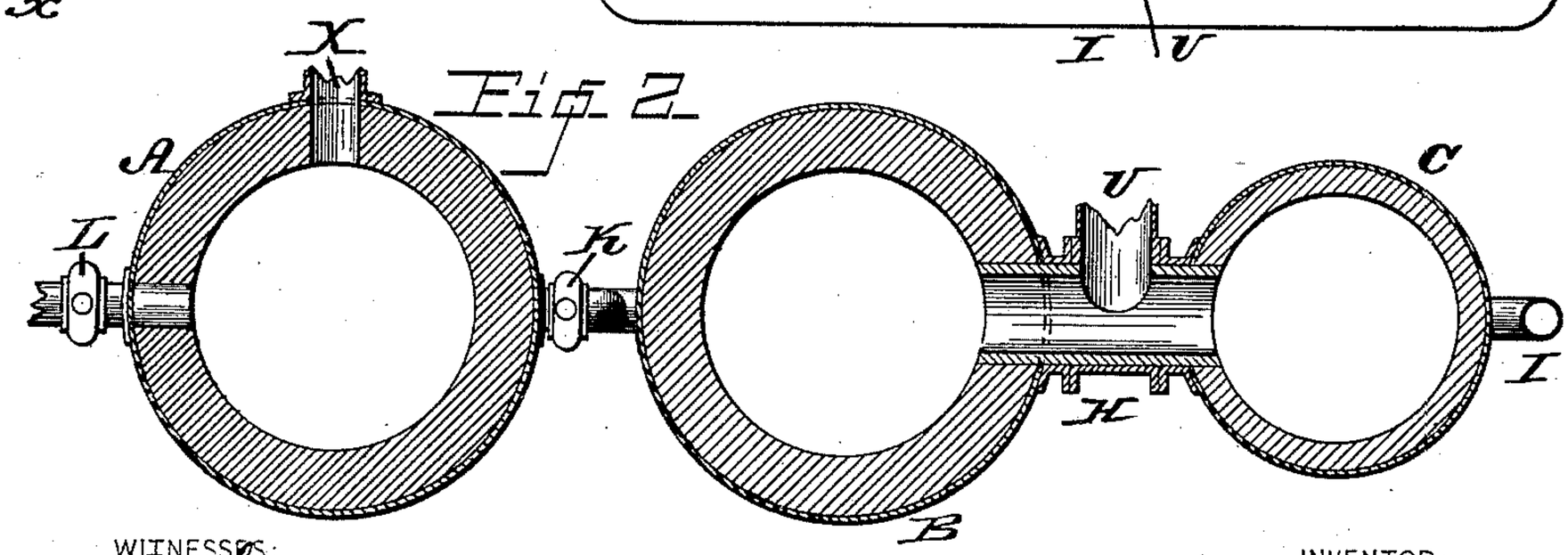


Fig. 2.



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APPARATUS FOR THE MANUFACTURE OF HYDROCARBON GAS.

SPECIFICATION forming part of Letters Patent No. 405,426, dated June 18, 1889.

Application filed April 4, 1888. Serial No. 269,603. (No model.)

To all whom it may concern:

Be it known that I, LEON P. LOWE, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented a new and useful Improvement in Apparatus for the Manufacture of Hydrocarbon Gas, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of apparatus for manufacturing hydrocarbon gas embodying novel features, as will be hereinafter fully set forth and definitely claimed.

Figure 1 represents a vertical section of an apparatus for manufacturing hydrocarbon gas embodying my invention. Fig. 2 represents a horizontal section on line *x x*, Fig. 1.

Similar letters of reference indicate corresponding parts in the two figures.

Referring to the drawings, A and B represent two casings or chambers formed of metal and lined with fire-brick or other suitable refractory material.

C represents a stack, preferably of cylindrical form, for carrying off products of combustion and other purposes, the same being internally lined and forming a chamber D.

E represents an upward continuation of the stack C, and in the same are located tubes or flues similar to a tubular boiler. At the top of the chamber D is a valve F and at the bottom thereof is a valve G, the valve F being adapted to open and close communication between the chamber D and the tubes in the portion E of the stack, the valve G being adapted to open and close communication between the chamber D and the flue H, which latter is connected with the bottom of the stack C and that of the chamber B. Connected with the bottom of the stack C is a pipe I, which is also connected with the chamber A; and J represents a pipe connecting the two chambers A B.

The pipe I is provided with a valve K, for regulating the flow of steam and air through said pipe. The chamber A is provided with valves L M, for regulating air-blasts to said chamber.

The upper portion E of the stack C is provided with an opening O, for the entrance of the cold blast to the said portion E.

Within the chamber D is a perforated head P, which is connected with a suitable pipe leading from the water-supply, whereby water may be sprayed into said chamber.

Q Q′ represent pipes which are connected with a hydrocarbon-oil supply and enter the chambers A B, respectively, and are provided with suitable valves whereby oil or vapor may be sprayed or otherwise admitted into said chambers.

Within the chambers A B are open-work fire-brick or other suitable refractory substances. Surmounted on the fire-brick S are concave and convex blocks T of fire-brick or other suitable refractory material.

In the pipe H is an opening U, for directing gases to the hydraulic main or other place for use or consumption, and at the bottom of the chamber A is a pipe Y, which is connected with an oil-supply and adapted for spraying or admitting hydrocarbon oil or vapor into said chamber.

Within the chamber D are loosely piled bars Z, of metal or other suitable refractory material, and said chamber D is provided with a valve A′ for admitting air thereinto.

The operation is as follows: I start a light fire in the lower part of chamber A and simultaneously admit air through valve L with a spray of oil, regulated by valve Y, which creates a combustion of intense heating-power in the lower part of the chamber A, and passing up through the loosely-piled brick-work has the effect to intensely heat the same. After a time these hot products of combustion will leave chamber A at a high degree of heat, and passing through flue J enter the chamber B and heat the contents thereof to a high degree, and leaving this chamber through flue H pass up through and heat the metal bars contained in chamber D. From thence the products of combustion pass through valve F and enter the tubes contained in the upper part of the stack E. Thus while heating the contents of the chambers A B a moderate amount of heat will escape, the same being absorbed by the metal bars Z, and to a less extent by the tubes in the portion E of the stack. Simultaneously atmospheric air at ordinary temperature is forced in and around the tubes at the upper end of the stack through inlet O, which air becomes considerably heated on its way to the hottest ends of

these tubes, where it leaves the stack and passes through hot-blast pipe N, and is admitted in regulated quantities through valve L, and where necessary through valve M. When the contents of the chambers A B have become sufficiently heated, the valves L, M, and F are closed, and oil or hydrocarbon fluid is then admitted, preferably through spraying-pipe Q, and coming in contact with the highly-heated brick-work becomes converted into a rich hydrocarbon gas. Simultaneously with the admission of this oil I admit a spray of water in limited quantities through nozzle P, and this water-spray is immediately converted into vapor or steam when coming in contact with the metal bars Z. This steam passes through valve G and through H, up through the open brick-work in chamber B, and coming in contact with the hydrocarbon vapors the two pass together through flue J into chamber A, thence down through the more highly-heated brick-work contained in this chamber, where the steam becomes decomposed, forming a mixture of carbonic oxide, hydrogen, and hydrocarbon gases, after which the same pass out through flue X, either directly to a hydraulic seal or first through some suitable heat-absorbing apparatus, neither of which is shown. The quantity of water sprayed over these bars will be governed by the amount of carbonic oxide and hydrogen desired in the mixture of gases produced, and a much greater amount of water being used in producing gas of low candle-power than when gas of high candle-power is desired.

For producing certain kinds of gases it will sometimes be found advantageous to admit air in regulated quantities through valve A′ to mix with the steam and hydrocarbon gases. After a time the brick-work in the apparatus will become so much cooled as to not properly decompose the vapors of water, when it will be found necessary to shut off the oil from the chambers A and B and water and air from chamber D, and to again restore the heats in chambers A and B and D, which is accomplished as before described. Should it become desirable to moderately heat the brick-work in chamber A and more intensely heat the brick-work in chamber B, a slightly proportionate blast may be put on through valve L, and a second blast through valve M will serve to lessen the unconsumed gases, together with any additional oil which may be admitted through either of the pipes Q or Q′. After the chambers have been heated in this way, the valves L, M, F, and G may be closed and valve K opened. Water is then sprayed over the metal bars as before, and the steam resulting from its rapid evaporation will pass in a highly-heated condition through pipe I and valve K, and become still further heated while passing up through the open brick-work in chamber A, and meets a spray of oil coming through the pipe Q or Q′, or both, the mixture becoming converted into a fixed gas while passing through the open-brick-work in chamber B, from whence it passes out through opening U either directly to a hydraulic seal or after having first passed through some heat-absorbing device. (Not shown.)

When gas rich in carbon is desired, with little or no carbonic oxide, I omit the water and air and generate the gas by contact with the highly-heated brick-work.

When it is desired to heat the brick-work in chambers A B with gas, I employ a special gas-producer for that purpose instead of oil, or they may be heated by natural gas; also, when it is desired to reduce the candle-power of gas produced by the oil, natural or other gases may be admitted through A′ instead of air, as heretofore described.

When it is desired to decompose the vapors of water by the use of masses of coal or other solid carbonaceous substances, as well as to heat a mass of open brick-work by the use of coal, it can be best accomplished with this apparatus by the omission of the open brick-work in chamber A, depositing therein a mass of coal instead of brick. When operated in this way, the oil heretofore admitted through valve Y may be omitted, and while the coal is being heated to incandescence by an air-blast through valve L the produced gas arising from the top of this mass of coal is burned by the admission of air through valve M, thereby heating the open brick-work in chamber B, as before.

When both the coal and brick-work have become sufficiently heated, I close the air-valves L and M, valves F and G, and open steam-valve K. I then simultaneously admit oil into chamber B and water through spraying device P, the result of which is to produce a highly-heated steam, which is decomposed by passing up through the mass of coal in chamber A, producing the usual mixture of carbonic oxide and hydrogen, which in a highly-heated condition enters chamber B and there mingles with the hydrocarbon gas therein generated and together pass through the highly-heated brick-work, when the mixture is converted into a fixed gas, after which the same passes out through opening U, as before described.

These operations of alternately heating the apparatus and producing gas can be continued indefinitely.

When desired, air may be admitted through valve A′ and mixed with the vapors of water, or separately, and pass up through the mass of coal instead of brick-work in chamber A, as previously described.

Instead of metal bars in chamber D, other suitable heat-absorbing materials may be used; but I prefer the metal.

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

1. In an apparatus for manufacturing hydrocarbon gas, the combination of the cham-

bers A B, lined with refractory material, each having a filling of open-work refractory material and the chamber A having an outlet *x* in its base, the flue J, connecting said chambers above said refractory filling, the air-blast pipe L, with an injected oil-pipe having the valve Y, said pipe L entering the base of the chamber A, the stack C, with upward continuation E, with interior tubes and an air-opening O, the said stack C connected to chamber B by the tube H below the refractory filling of said stack and chamber, the spray water-pipe P, leading into stack C above the bars Z therein, and the hydrocarbon-pipe Q′, leading into chamber B at the top thereof, substantially as and for the purpose set forth.

2. In an apparatus for manufacturing hydrocarbon gas, the combination of the chambers A B, lined with refractory material and each having an open-work filling of refractory material, the tube J, connecting said chambers above said filling, the stack C, with top and bottom valves F and G and filling-bars Z, the tube H, connecting chamber B and stack C below said fillings and having side outlet U, the water-spray pipe P, leading in stack C above said bars Z, the pipe I, leading from the stack C below said bars Z to the base of said chamber A, and the hydrocarbon-pipes Q′, leading into top of said chamber B′, substantially as and for the purpose set forth.

3. In an apparatus for manufacturing hydrocarbon gas, the combination of the chambers A and B with refractory linings, coal filling in chamber A, and refractory open filling in chamber B, the connecting-tube J, the stack C, with continuation E, having air-opening O, the hot-air-blast pipe N, with valve M, leading into top of chamber A, the air-blast pipe L, with valve at base of chamber A, the tube H, connecting the chamber B and the stack C below their fillings of open-work refractory material and having the outlet U, and the pipe I, leading from stack C to base of chamber A, substantially as and for the purpose set forth.

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