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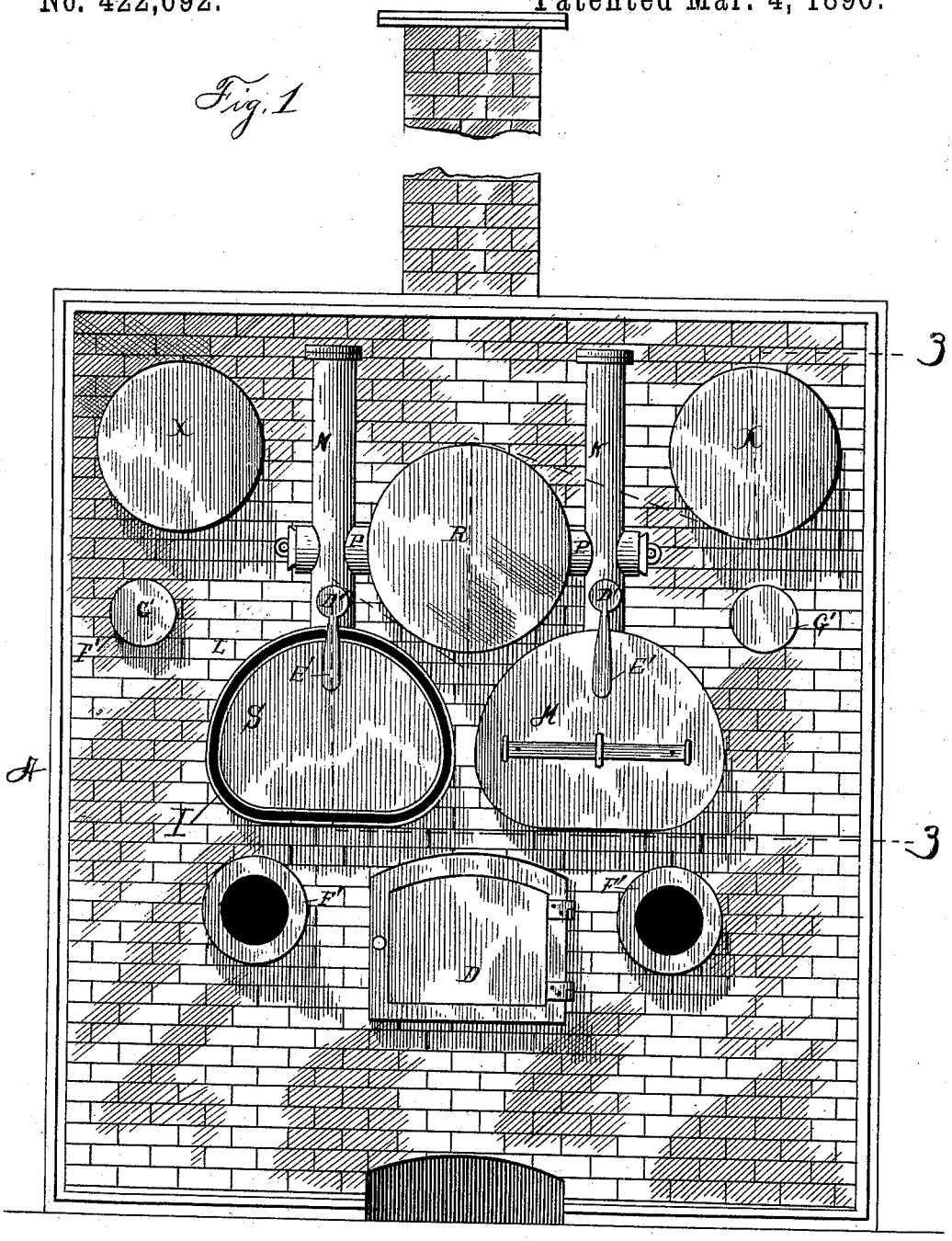
J. D. AVERELL.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 422,692. Patented Mar. 4, 1890.

Fig. 1



WITNESSES

E. C. Duffy

H. E. Deck

INVENTOR

John D. Averell

E. C. Duffy Attorney

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J. D. AVERELL.

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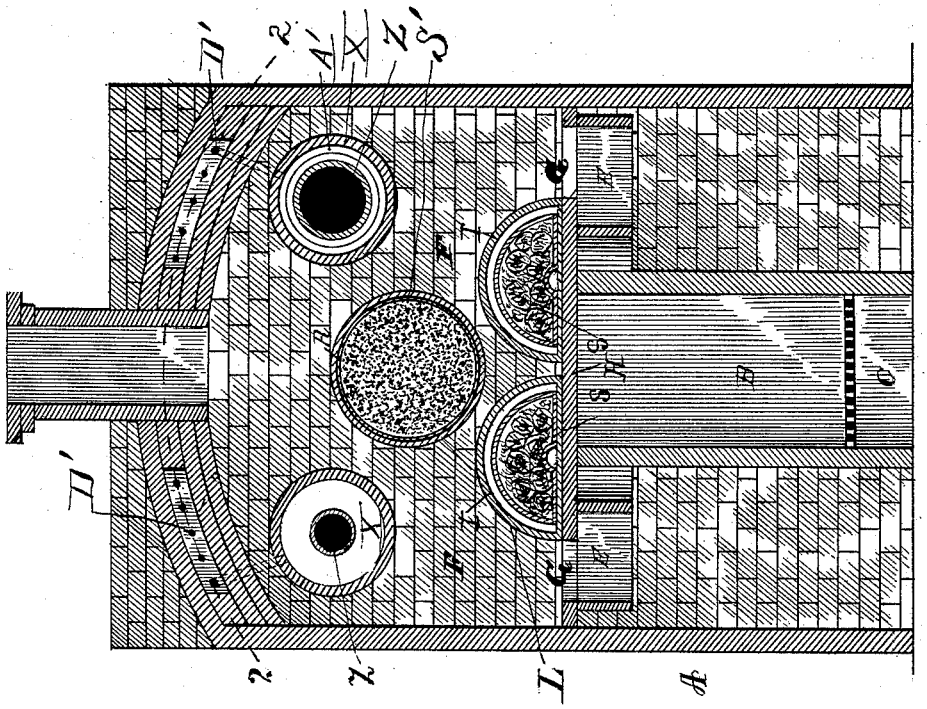

Fig. 2.

WITNESSES

E. C. Duffy

C. M. Peele

INVENTOR

John D. Averell

E. C. Duffy Attorney

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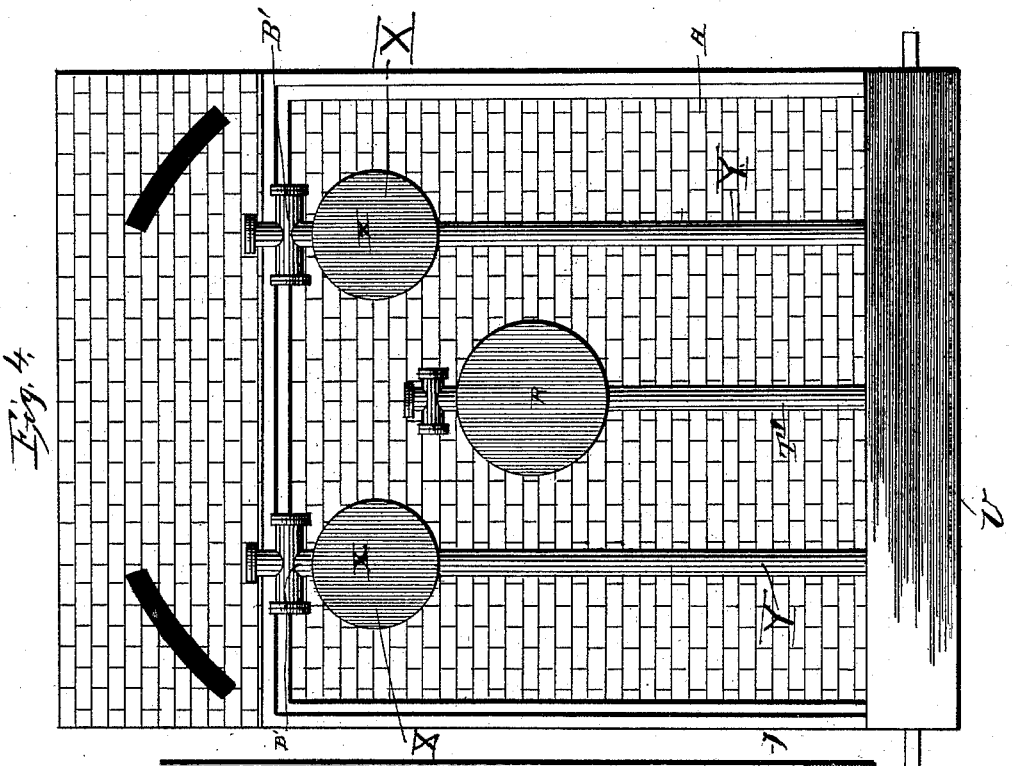

Fig. 4.

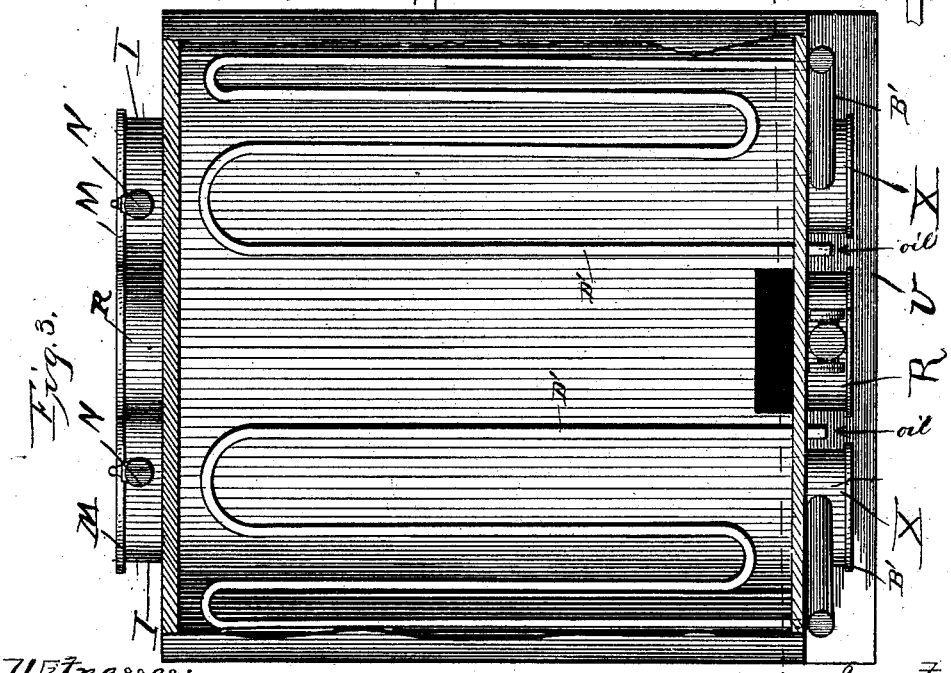

Fig. 3.

Witnesses:
E. C. Duffy
Chas. M. Merle

Inventor
John D. Averell
per
O. E. Duffy
Attorney

(No Model.) 4 Sheets—Sheet 4.

J. D. AVERELL.

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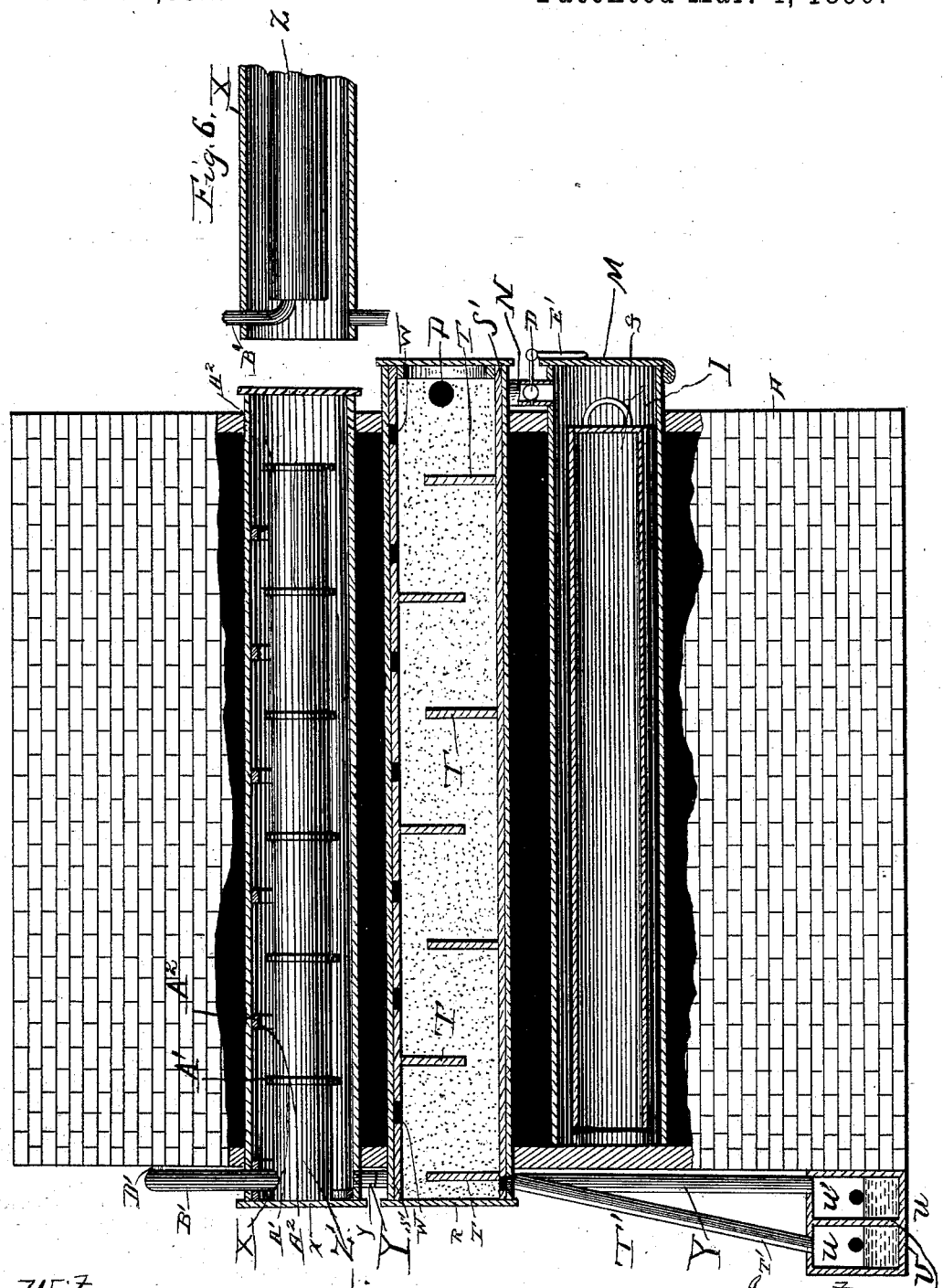

Witnesses:
E. C. Duffy
Chas. M. Wells

Inventor:
John D. Averell
per
Attorney

UNITED STATES PATENT OFFICE.

JOHN D. AVERELL, OF BROOKLYN, NEW YORK, ASSIGNOR OF PART TO JOHN H. DOSCHER, OF SAME PLACE.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 422,692, dated March 4, 1890.

Application filed February 23, 1888. Serial No. 265,011. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. AVERELL, of 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 hereby declare that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in apparatus for the manufacture and treatment of gas by the distillation of wood and liquid hydrocarbons; and it has for its objects to provide an apparatus by means of which the carbonic-acid gas generated by the destructive distillation of the wood may be deoxidized and converted into inflammable carbonic oxide, the pyroligneous products separated from the gases, and also to simultaneously produce enriching hydrocarbon gases from which the tarry products are separated before passing from the apparatus.

With these ends in view my invention consists in certain novel features of construction and in combinations of parts, more fully described hereinafter, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a front end view of a gas-retort bench embodying my invention, showing the door of one of the wood-distilling retorts removed. Fig. 2 is a cross-section of the same on the line 1 1, Fig. 3. Fig. 3 is a top plan of the bench with the top portion of the roof of the same removed to the curved plane 2 2, Fig. 2, the hydraulic main being omitted. Fig. 4 is a rear end view. Fig. 5 is a longitudinal vertical section of the bench, taken in the plane of line 3 3, Fig. 1. Fig. 6 is a detail longitudinal section of a modified construction of hydrocarbon-distilling retort.

In the drawings, the reference-letter A indicates a furnace, constructed of masonry or other suitable material, having the usual fire-box B, ash-pit C, and doors D. Two flues E E extend backward on both sides of the furnace from the front to the rear thereof, and communicate by means of passage G with the combustion-chamber F of the bench in which the retorts are located, and said flues are also in communication with the fire-box by suitable passages (not shown) through the wall of said box. The combustion-chamber is separated from the flues and fire-box by means of a horizontal division-plate H.

The bench is shown provided with two lower wood-distilling retorts I I of the usual D shape, provided with the covers M, having suitable fastenings. The retorts project at the front of the furnace and are set directly on the division-plate. Pipes N extend upwardly from the projecting ends of the wood-distilling retorts, and are connected by means of the cross-pipes P with the front projecting end of a converter-retort R, extending horizontally through and projecting beyond each end of the bench.

The wood-distilling retorts are charged by and receive the cartridges or shells S, which are charged with the wood to be distilled and inserted at the front of said retorts. The burnt wood or charcoal can be thus readily removed when exhausted without injury and a fresh cartridge inserted, and the resulting charcoal will be saved in a commercial condition. The converter-retort R is also charged by means of a removable cartridge or shell S′ of peculiar construction. This shell has an induction opening or openings at its front end to receive the discharge from the pipes P P into the retort and an exit at its rear end, and is provided with a series of partitions or baffle-plates T, extending alternately from the bottom and the top of the shell, so as to form a tortuous or zigzag longitudinal passage through the shell for the gases from the wood-distilling retorts. This converter shell or cartridge S′ is filled with carbonaceous material, preferably granulated charcoal, which will deoxidize the carbonic-acid gas passing through the same and convert it into inflammable carbonic oxide, the oxygen eliminated uniting with the charcoal to form an additional volume of carbonic-oxide gas, and this carbonaceous reducing material is inserted and loosely packed when the shell is removed into the compartments of the shell S′, formed by the walls T, through openings W in the

top wall of the same and suitably arranged between the partitions.

A system of oil heating and vaporizing pipes D′ are located in and extend through and back and forth in a space in the top or roof of the bench, as shown particularly in Figs. 2 and 3, and connect at one end with a suitable hydrocarbon-fluid supply (not shown) and at their other ends with pipes B′, extending into the rear ends of the hydrocarbon vaporizing and superheating retorts X X, extending horizontally through the upper portion of the furnace and projecting at the rear. In order to subject the hydrocarbon vapor to a prolonged and effective heating operation, each retort X is provided with a longitudinal inner concentric chamber Z, forming a central longitudinal inner passage through the retort, and also an outer annular longitudinal passage in the same around and communicating at the front end of the inner chamber Z. In order to still further retard the passage of the hydrocarbon vapor and keep it longer in contact with heated metallic surfaces, the inner chambers Z of each hydrocarbon-retort are provided around their exteriors with annular deflecting-plates A′, and the top wall of each retort X is provided with downwardly-deflecting plates A^2, located between plates A′, thereby forming a tortuous passage for the vapors through the retort. Each pipe B′ from the oil-vaporizing pipes in the crown of the bench extends through the rear projecting end of a retort X into the inner concentric chambers Z. The vapors pass through chamber Z to the front end of the retort, and then into the outer annular chamber of the retort and back to the rear end thereof and through the escape stand-pipe Y.

A double horizontal hydraulic main U extends transversely across the lower part of the furnace at the rear thereof, and is provided with suitable water inlets and exits and with openings, (not shown,) so that the main can be cleared. The main is divided into two separate and non-communicating longitudinal chambers U u' by a longitudinal partition-wall u^2, as shown, and each chamber is provided with gas-exit pipes.

The rear end of the converter-retort R is connected with the chamber u of said main by means of a stand-pipe T′, and the rear ends of the hydrocarbon-retorts are connected with the other chamber u' of said main by means of the stand-pipes Y Y.

The stand-pipes N N, leading from the wood-distilling retorts to the converter-retort, are provided with stop-cocks D′, having lateral arms or handles E′ secured at their stems, so that when the valves are open the handles will extend down in front of the covers M M of the wood-distilling retorts and prevent the opening of said retorts until the handles are swung to one side and close the valves, thus preventing air from flowing into the converter when the wood-distilling retorts are open, which would result in an explosive mixture in said converter and consequent damage to the apparatus.

The front of the bench may be provided at suitable points with openings F′ for the entrance of tools to clean the interior of the furnace or flues E from deposits of soot, &c.

When the cartridge S′ of the converter-retort has been supplied with carbonaceous material and the cartridges of the wood-distilling retorts charged and inserted in their respective retorts, the furnace is charged with fuel and a fire started therein.

When the proper temperature is reached, distillation of the wood takes place, and the resulting gases flow from their generating-retorts through the pipes and connections into the converter-retort R and into and through the carbonaceous material therein, where the carbonic acid is deoxidized and converted into carbonic-oxide gas. The gas from the converter R then passes through the stand-pipes T′ into the chamber u of the hydraulic main, where all condensable products (such as pyroligneous acids, &c.) are condensed and separated from the non-condensable portion of the product of distillation, which gases can be drawn or allowed to flow into a suitable scrubber.

The liquid hydrocarbon is fed into the pipes D in the crown of the bench, where it is vaporized, the vapor passing into and through the retorts X X, where it is thoroughly superheated and converted into a fixed gas, which passes from said retorts through the stand-pipes Y Y into the other and separate chamber u' of the hydraulic main, where the tar, heavy petroleum, and other condensable products are separated from the gas and deposited.

The non-condensable and fixed wood and hydrocarbon gases are drawn from their separate chambers and united in a suitable manner, not here necessary to show or describe. It will thus be seen that condensable portions of the wood and hydrocarbon gases are separated from the gases and remain in their respective and separate chambers of the main, from which these condensable products can be independently removed, as desired, and afterward utilized for commercial uses.

The object of dividing the hydraulic main into separate non-communicating chambers and passing the different gases into said separate chambers, and thus independently separating the condensable products, is to keep the gases separate until the condensable products thereof are removed, and thereby preserve for commercial uses the valuable pyroligneous acid, the chemical nature of which is destroyed by union with the hydrocarbon gas.

What I claim is—

1. In a gas apparatus, the combination of a normally-closed wood-distilling retort having a charging-opening, a charging-cartridge in said retort, a normally-closed converter-retort having a gas-exit, a pipe connecting

said distilling and converting retorts, and a charging-cartridge for the converter-retort adapted to contain carbonaceous material having deflecting-plates therein, for the purpose set forth.

2. In a gas apparatus, the combination, with a wood-distilling retort, of a normally-closed converter-retort having a gas-exit, a pipe from the distilling-retort to the converter-retort, a charging-cartridge for the converter-retort, through which the gas is passed, deflecting-plates forming a tortuous passage therethrough, and a series of filling-openings in the top wall of said cartridge for the insertion of carbonaceous material, substantially as described.

3. In a gas apparatus, the combination of a horizontal wood-distilling retort having a charging-opening, a normally-closed converter-retort having a charging-opening, a charging-cartridge for the converter-retort, a hydraulic main, pipes connecting the front ends of said distilling and converter retorts and opening into said cartridge, and a pipe opening into the rear end of said cartridge and extending into the said main, substantially as described.

4. In a gas apparatus, the combination, with a wood-distilling retort having a charging-opening at its front end and a removable charging-cartridge for the same, of a normally-closed converter-retort having a charging-opening, a charging-cartridge removably located in the said converter and adapted to be filled with carbonaceous material, a pipe connecting the front end of the distilling-retort and the converter and opening into the cartridge therein, and the exit-pipe from the rear end of said converter-cartridge, substantially as described.

5. A gas apparatus consisting, essentially, of the retort-bench, a horizontal wood-distilling retort located therein and having a charging-cartridge, a converter-retort in said bench above the wood-distilling retort, having a charging-cartridge adapted to contain carbonaceous material, pipes connecting the front ends of said retorts, a series of oil-vaporizing pipes in the crown of the furnace, a horizontal hydrocarbon-superheating retort in the upper portion of the bench, into which said pipes open, and a hydraulic main for said converter and hydrocarbon retorts, substantially as described.

6. In a gas apparatus, the combination of a retort-bench having a hollow crown, a system of oil-vaporizing pipes therein, a closed horizontal hydrocarbon-vapor-fixing retort in said bench, consisting of two inner and outer concentric chambers communicating at one end, deflectors in the outer chamber, said oil-pipes opening into the inner chamber at the closed end thereof, a hydraulic main, and a pipe extending from the closed end of the outer chamber into said main, substantially as described.

7. In a gas apparatus, the combination, with a wood-distilling retort having a charging-opening and a door for said opening, of an exit-pipe extending from said open end of the retort, a cut-off valve in said pipe above the retort, and a lateral handle extending from the stem of said valve down in front of said door when the valve is open, whereby the handle must be swung laterally to open the door, substantially as described.

8. A gas apparatus consisting of a retort-bench, a wood-distilling retort therein, having a charging-opening, a converter-retort connected with said distilling-retort, a hydrocarbon-vapor-fixing retort, a single hydraulic main at the rear end of said bench, consisting of two entirely non-communicating chambers having separate gas-exits and cleaning-openings, a pipe extending from the rear ends of the converter-retort into one of the said chambers, and another pipe extending from the rear end of the hydrocarbon-retort into the other chamber, as set forth.

9. In a gas apparatus, a closed horizontal hydrocarbon-vapor superheating and fixing retort having an inner concentric chamber forming an outer annular chamber around itself within the retort, said two chambers communicating at one end, deflecting-plates in the upper portion of the annular chamber alternately extending outwardly and inwardly, and a vapor-inlet into the closed end of the inner chamber and an exit from the corresponding end of the annular chamber, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN D. AVERELL.

Witnesses:
O. E. DUFFY,
HUBERT E. PECK.