

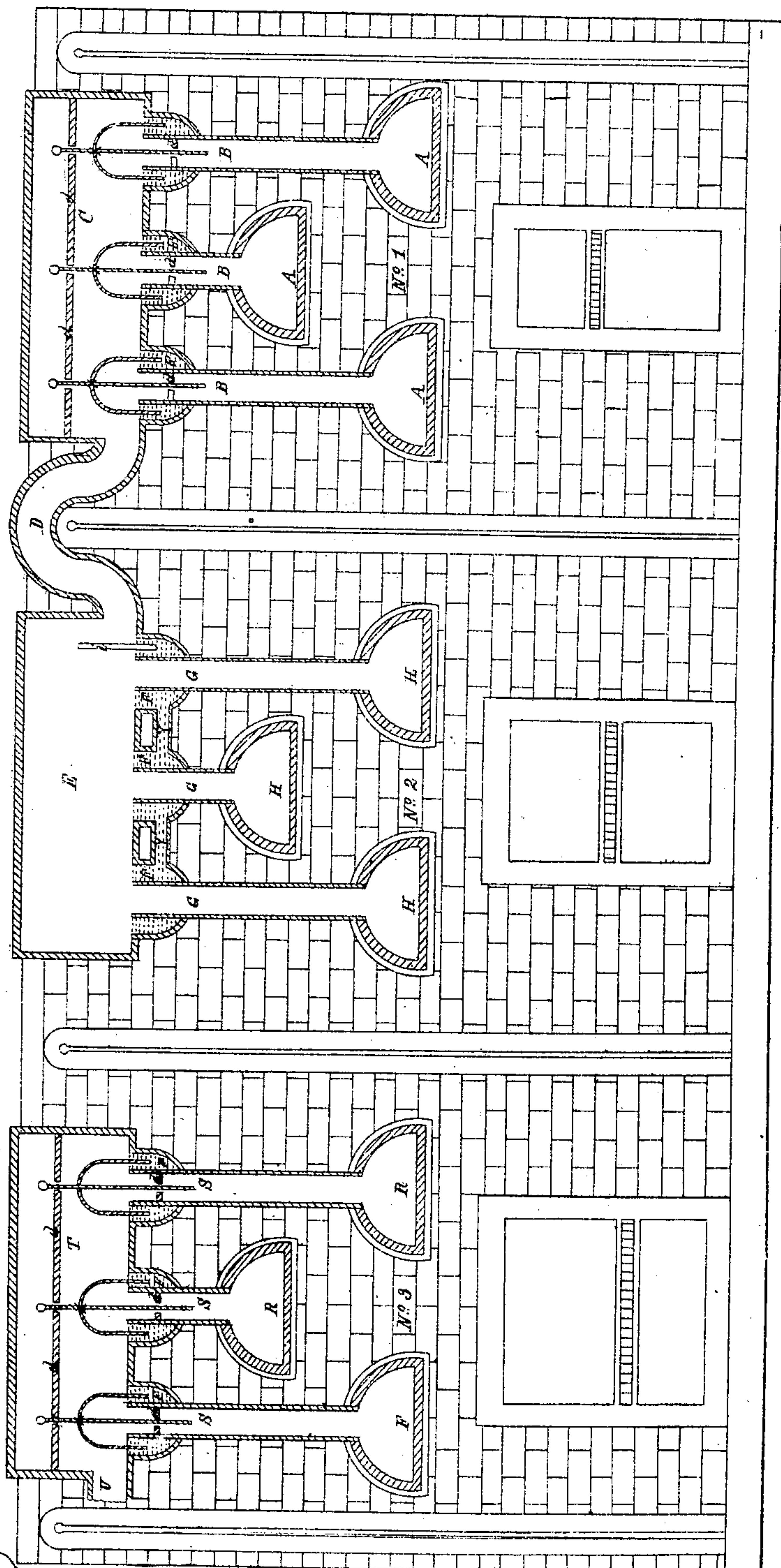
R. M & A. R Fryer.

Manufacture of Illuminating-Gas.

N^o 73521

Patented Jan. 21, 1868.

Fig. 1.



Witnesses.

Saml. Rogers
John B. Mallory

Inventors.

Robert M. Fryer
Andrew R. Fryer

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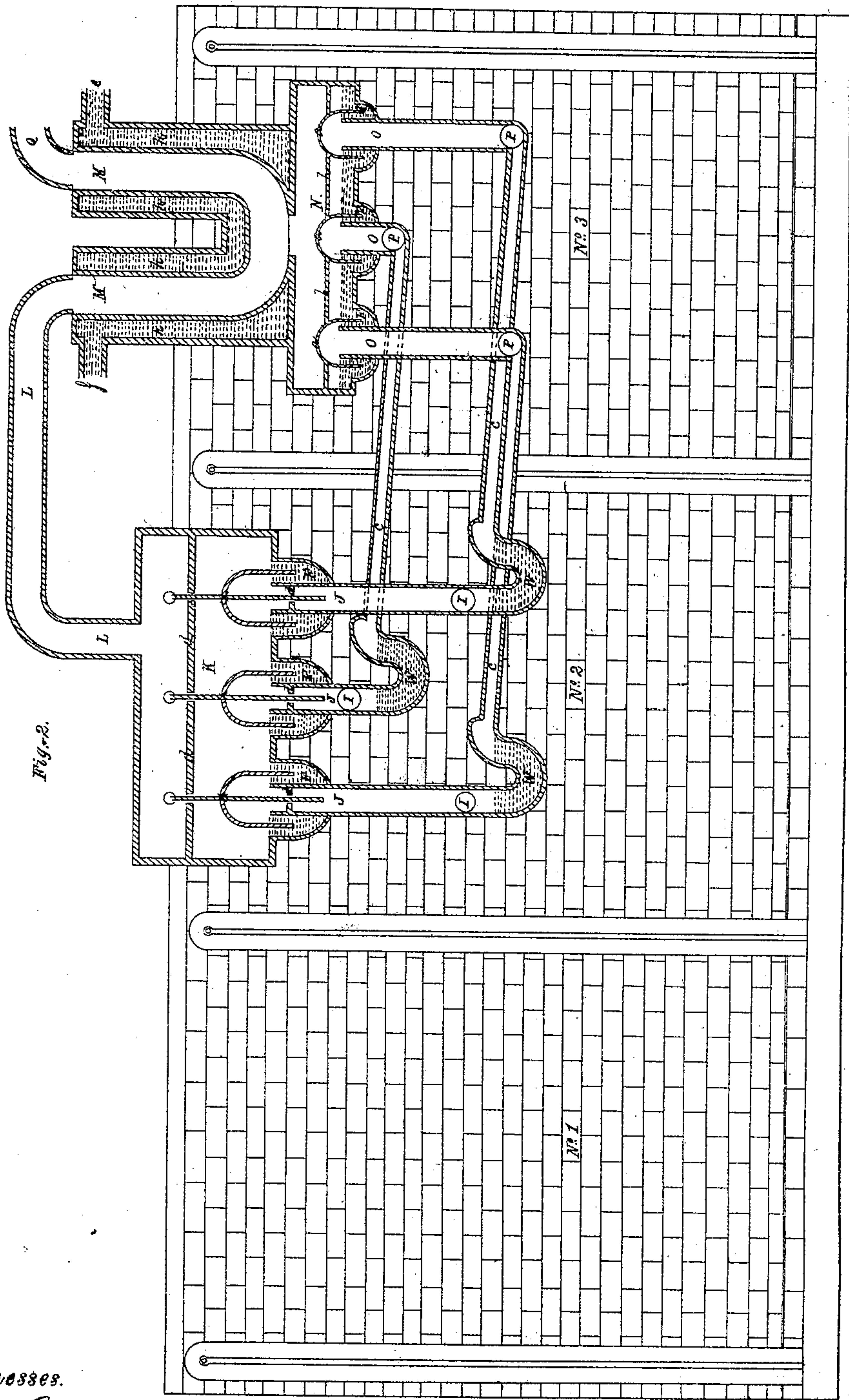


Fig. 2.

Witnesses.

James H. Ferguson
John C. Mallory

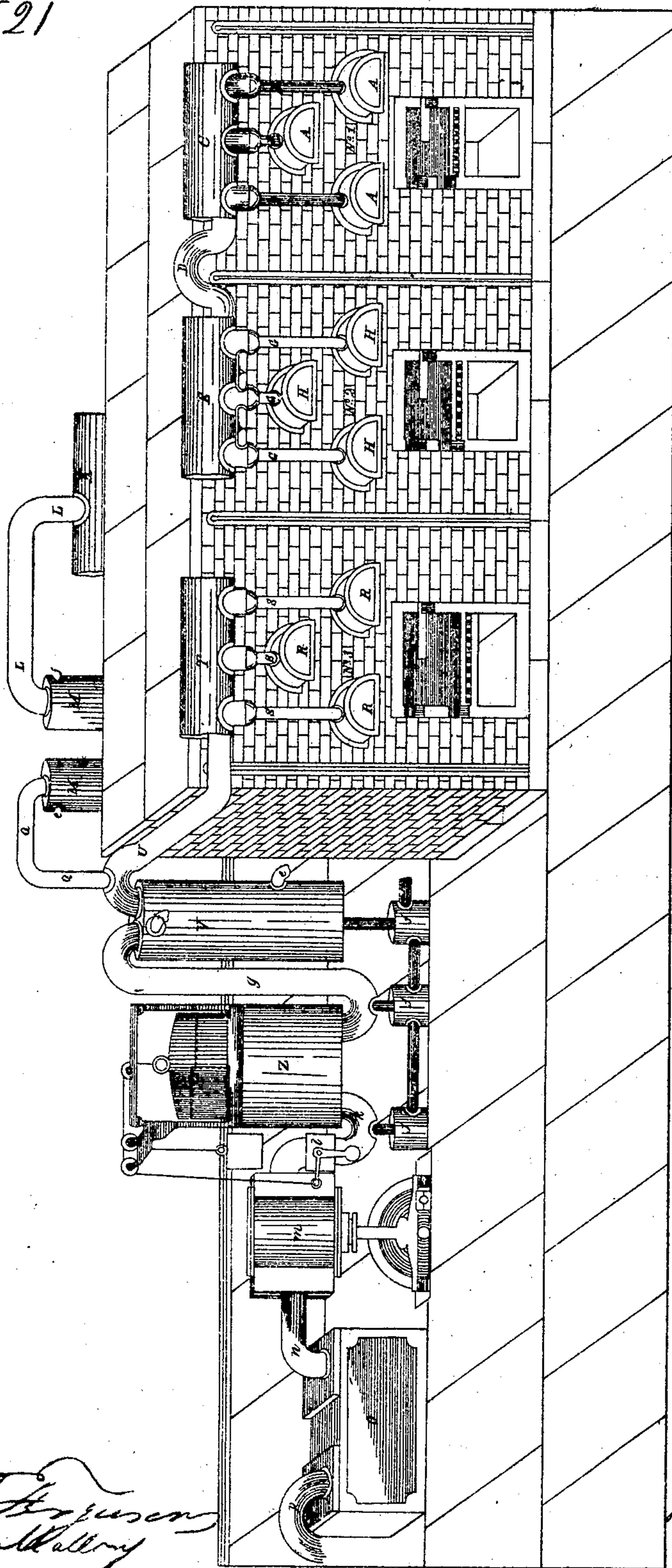
Inventors.

Robert M. Fryer
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Witnesses.

Prof. Ferguson,
John C. Mallory

Inventors.

Robert M. Feyer
Annam R Feyer

United States Patent Office.

ROBERT M. FRYER AND ANDREW R. FRYER, OF NEW YORK, N. Y.
ASSIGNORS TO NATIONAL GAS-LIGHT COMPANY, OF SAME PLACE.

Letters Patent No. 73,521, dated January 21, 1868.

IMPROVEMENTS IN THE MANUFACTURE OF ILLUMINATING-GAS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, ROBERT M. FRYER and ANDREW R. FRYER, of the city of New York, in the county and State of New York, have invented a new and improved Method of Making Illuminating-Gas, which we have designated "Fryer's Gas-Apparatus;" and we do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

In the ordinary process of gas-manufacture, the three principal products of coal are gas, coke, and coal-tar. The amount of gas obtained from a ton of coal is, by the ordinary process, on an average less than ten thousand cubic feet, whereas the products of a ton of coal may be made to yield nearly double that amount. The small quantity of gas and the large quantity of other products by the ordinary process are due to the method usually employed in gas-making, of subjecting the coal and its products to but one process. The lower the heat to which coal is subjected, the less the coke left in the retorts, and the greater the heat, the greater also will be the weight of coke left in the retorts. The products by the low heat would be, for the most part, vapors, while the quantity of gas would be small, but of the very best illuminating power. Under a high heat, the quantity of gas would be much larger than under the low heat, but of a very poor illuminating quality. It is therefore evident, that in order to obtain a good illuminating-gas, and the full quantity that coal is capable of yielding, the process of subjecting the coal to distillation must be separated from the process of converting the products of distillation into illuminating-gas.

The nature of our invention consists in constructing a gas-apparatus in such a manner as will accomplish this result.

To enable others skilled in the art to make and use our invention, we will proceed to describe its construction and operation.

Figure 1 is a front sectional view.

Figure 2 is a rear sectional view.

Figure 3 is front perspective of the entire apparatus.

Nos. 1, 2, and 3 are benches constructed in the ordinary manner.

A A A are retorts placed in bench No. 1; B B B are pipes provided with seal-valves, hereafter described, leading from A A A to C; C is a horizontal connection; D is a pipe forming a return-bend from C to E; E is a horizontal connection; F F F are traps or cups, in combination with the seal-valves, for holding liquid; G G G are pipes leading from E to H H H; H H H are retorts placed in bench No. 2; I I I are outlet-pipes from H H H; J J J are pipes furnished with seal-valves leading from I I I to K; K is a horizontal connection; L is a pipe leading from K to M M; M M is a condenser; N is a horizontal connection; O O O are pipes connecting N with P P P; P P P are inlet-pipes to retorts R R R; Q is a pipe leading from M M to U; R R R are retorts placed in bench No. 3; S S S are pipes leading from R R R to T; T is a horizontal connection; U is a pipe leading from T to V; V is the main surface-condenser; W W W are bends, forming traps between pipes J J J and c c c; X X X are automatic seal-valves; Y Y are pipes connecting traps F F F, (No. 2 front;) Z is a governor; a a a are inverted cups, the mouths of which are below the liquid contained in trap F F F; b is a support, to which cups a a a are attached; c c c are pipes leading from W W W to P P P; d d d are guides or steadiments for the stems of valves X X X; e e are the water-inlets for the surface-condenser; f are outlets for the same; g is a pipe leading from V to Z; h is the water-space in condenser M M; i is a break, to prevent all the liquid from entering the first retort H; j j j are vessels containing water, or other liquid, for sealing drip-pipes; k is a pipe leading from Z to m; l is a balanced valve, in combination with the governor; m is an exhauster; n is a pipe leading from m to the purifier; o is a purifier; p is a pipe leading to the meter.

Construction of the Seal-Valves.

The upper ends of the pipes leading from the retorts are brought on a level with the bottom of the horizontal connections. The upper ends of these pipes are surrounded by cups or traps, F F F, which are made about six inches deep, and kept filled with liquid, which liquid is spontaneously supplied by the products from the coal in the process of distillation and gas-making. The valves are in the form of inverted cups, provided with stems both bottom and top, and which are guided by steadiments d d d. The bottom of these valves extends below the surface of the liquid contained in traps F F. The weight of these valves is nearly balanced by the force of the exhauster, while a slight pressure within the retorts is sufficient to operate the valves. As the traps F F, in combination with these valves, are supplied with the liquid that they require directly from the products of distillation and gas-making, it is evident that the valves of the first bench of retorts will be supplied with a

very light liquid, those of bench No. 2 with a heavier liquid and those of bench No. 3 with a liquid still heavier. Therefore the valves are sealed with a liquid having a density proportioned to the heat to which they are subjected.

Operation.

Retorts A A A are subjected to a heat of about 700° Fahrenheit. In these retorts the coal or other gas-materials are placed, and subjected to that heat, and distilled. The products at that heat would be, for the most part, vapors, and in that form passes off through pipes B B B, horizontal connection C, pipe D, connection F, and pipes C C C to retorts H H H. Any vapor that may have condensed in its passage through pipes B B B, connection C, and a part of pipe D, will flow back to retorts A A A, and there be re-distilled in retorts H H H. The products of the first bench are subjected to a heat of about 900° Fahrenheit, and partially converted into gas. These products pass off through outlet-pipes I I I, upright pipes J J J, connection K, pipe L, to the condenser M M. The gas passes on through Q to U, while the products that have not been converted into gas are condensed, part of which is conducted to pipes P P P, through pipes W W W, and the balance, which is condensed in condenser M M, falls to the bottom of horizontal connection N, thence, through pipes O O O and P P P, to the last retorts R R R, where these products, in the form of fluids, are subjected to a heat of about 1400° Fahrenheit, and converted into gas, which passes off through pipes S S S and connection T and pipe U to the main surface-condenser, and so on to the gas-holder.

The lower bends of the pipes forming the surface-condenser are provided with drip-pipes, through which any liquids may pass that are condensed therein, the lower ends being sealed to prevent the admission of air or the escape of gas.

In this process no hydraulic main is employed. To obviate the necessity of this, we employ seal-valves, above described. When a lid of a retort is removed, the pressure is of course removed, and the valve falls, of its own weight, closing the communication between that retort and the others, thereby obviating the danger of admitting atmospheric air into the several retorts, causing combustion within them.

In the ordinary process of gas-manufacture there is not only a great waste of heat by the necessary process of charging and discharging retorts, but also of the best products of coal. To charge the retorts, the lids must be removed, which not only cools the retorts, but a large quantity of gas is wasted. The retorts are kept up to a very high heat, and the moment coal is thrown in them it gives off gas, and continues to do so until the lids are replaced, which requires time.

In our process retorts A A A are the only ones charged, and they are kept at a low heat; therefore the following advantages: first, we will have a much smaller quantity of coke to remove than by the ordinary process, therefore will require less time; second, owing to the low heat, coal, when thrown in the retorts, does not immediately give off gas, hence there is time to close the lids without the waste of gas; third, the retorts of benches Nos. 2 and 3 need never be opened, except in case of damage or for repairs, therefore are not cooled, and a uniform heat may be maintained.

By first distilling the coal under a low heat, very little coke is left in the retorts, and by converting the products of distillation into gas by different heats, a full quantity of gas is obtained. The ammoniacal liquid is condensed, in the condenser, and may be saved, if desired, instead of being wasted by running off with the water of a hydraulic main, as is the case in the ordinary process.

Any number of retorts may be employed that may be desired, but we have described our invention by the use of three benches of retorts, each containing three retorts. It is obvious, however, that one retort in each bench would answer the same purpose. The retorts may be of iron or other material.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The process, above described, for manufacturing illuminating-gas, which consists in distilling the coal at a low heat, and converting the distillate and condensable products into gas, in separate benches or retorts, substantially as described.

2. The process of converting the volatile products or fluids, given off from the first bench of retorts, into gas, by subjecting the distilled products to the different temperatures required to convert the same into gas, substantially as set forth in the foregoing specification.

3. The construction and use of the automatic seal-valves, which are employed for the same purpose, and instead of the ordinary hydraulic main of gas-works, substantially as above set forth.

4. The manner of distributing the distilled products or fluids given off from the first bench of retorts, equally to the several gas-producing retorts, by means of the several traps and connections, substantially as above set forth.

5. The manner of separating the gas, generated in the second bench of retorts, from such fluids as escape conversion into gas in these retorts, and the method of passing the gas thus generated into pipes leading to the gas-holder, while the fluids are conveyed directly into the third bench of retorts, where they are subjected to a higher heat, necessary to convert the same into gas.

6. We finally claim the combination of the whole gas-generating apparatus, as described in the foregoing specification, and for the purpose therein named; and this we claim whether the constructed apparatus be precisely in the form described by us, or otherwise, if it produces substantially the same results.

ROBERT M. FRYER,
ANDREW R. FRYER.

Witnesses:

JAS. A. FERGUSON,
JOHN C. MALLORY.