

(No Model.)

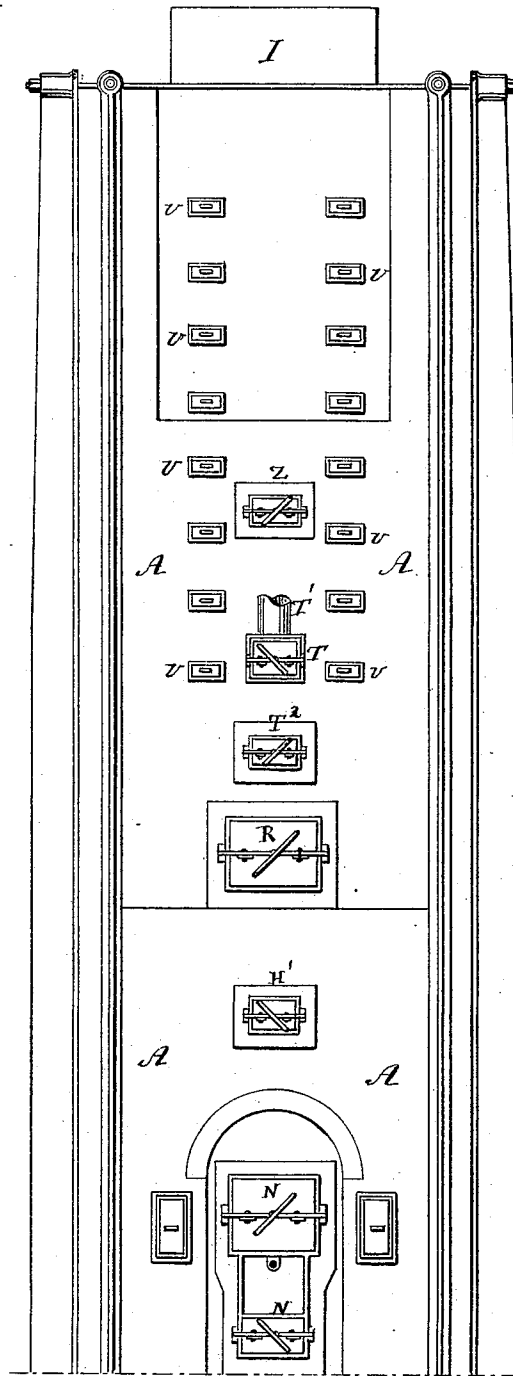
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H. Y. ATTRILL & W. FARMER.
APPARATUS FOR THE MANUFACTURE OF GAS.

No. 251,085.

Patented Dec. 20, 1881.

—FIG. 1—



WITNESSES.
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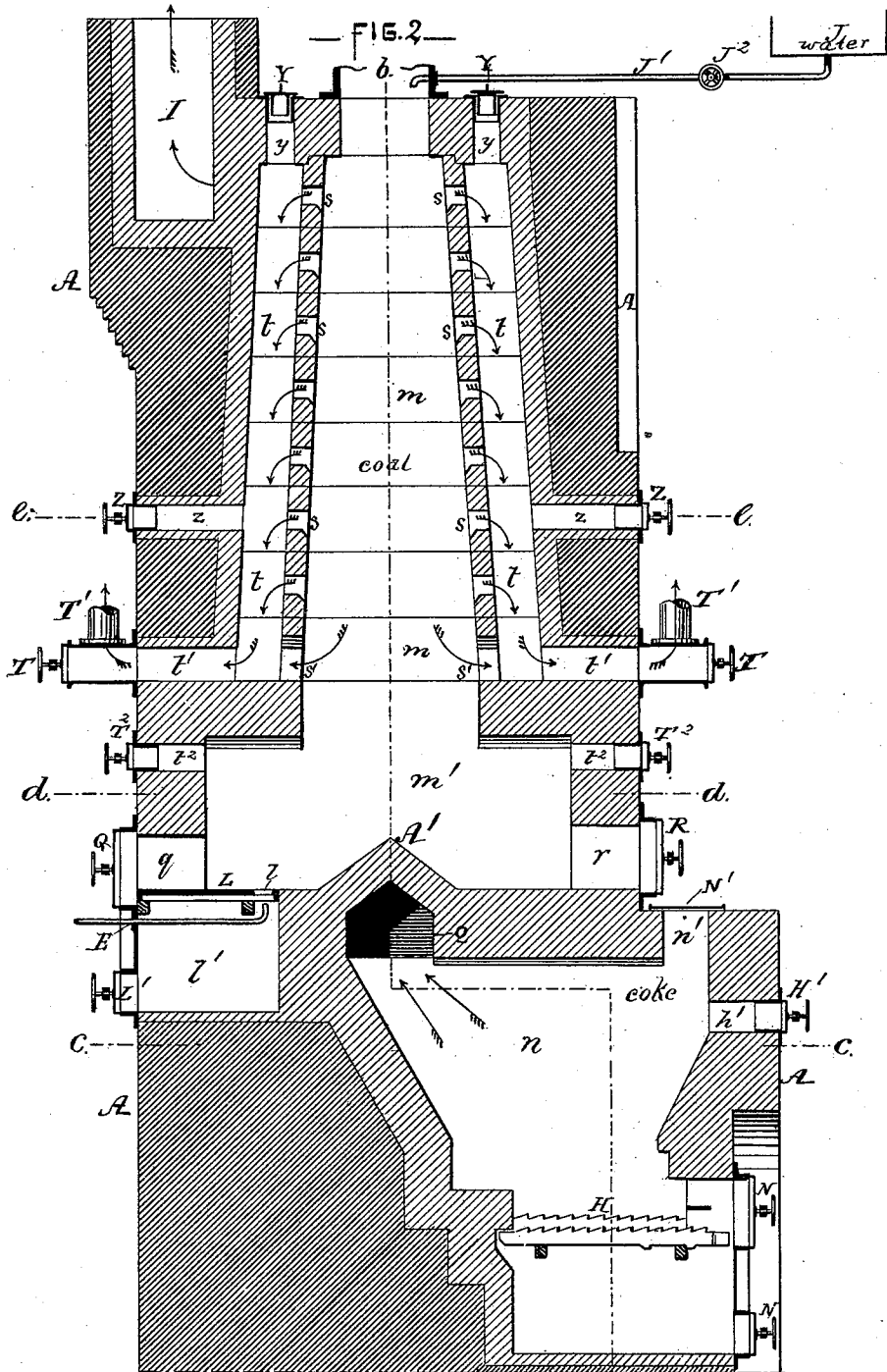
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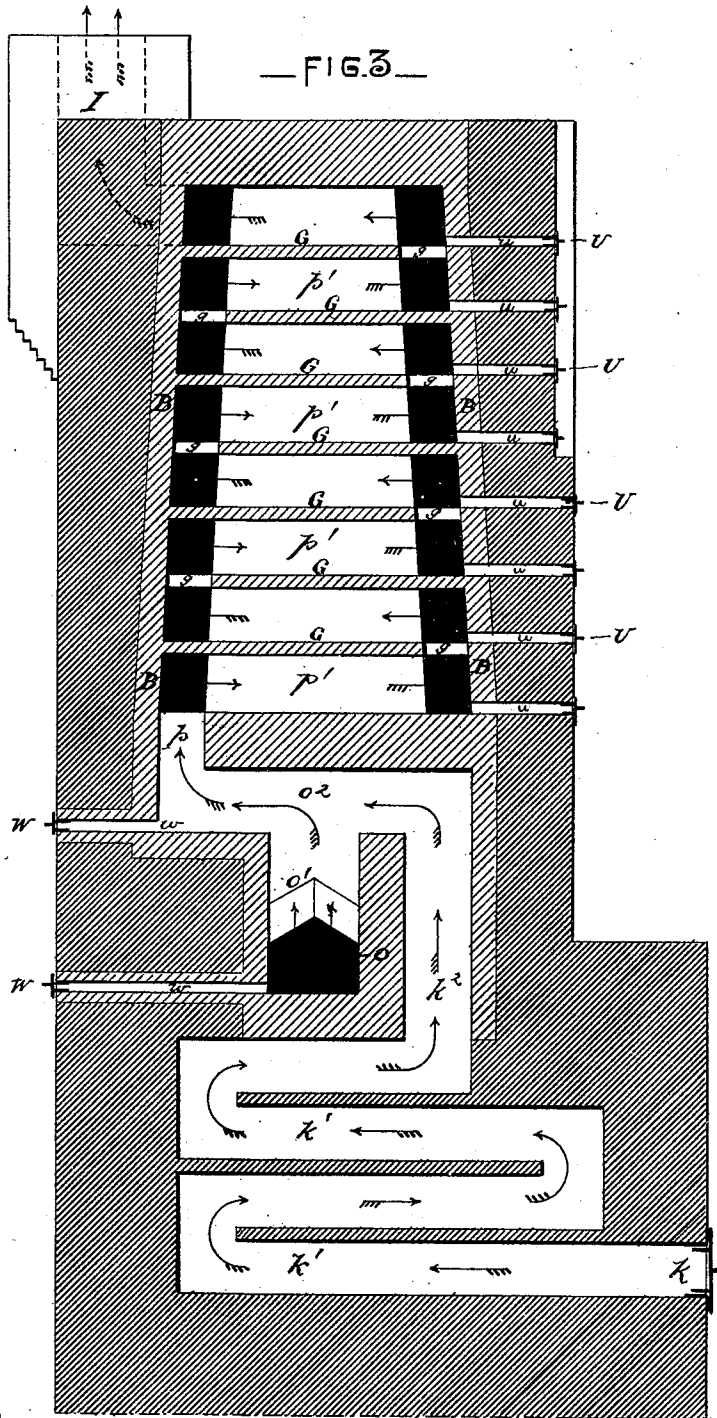
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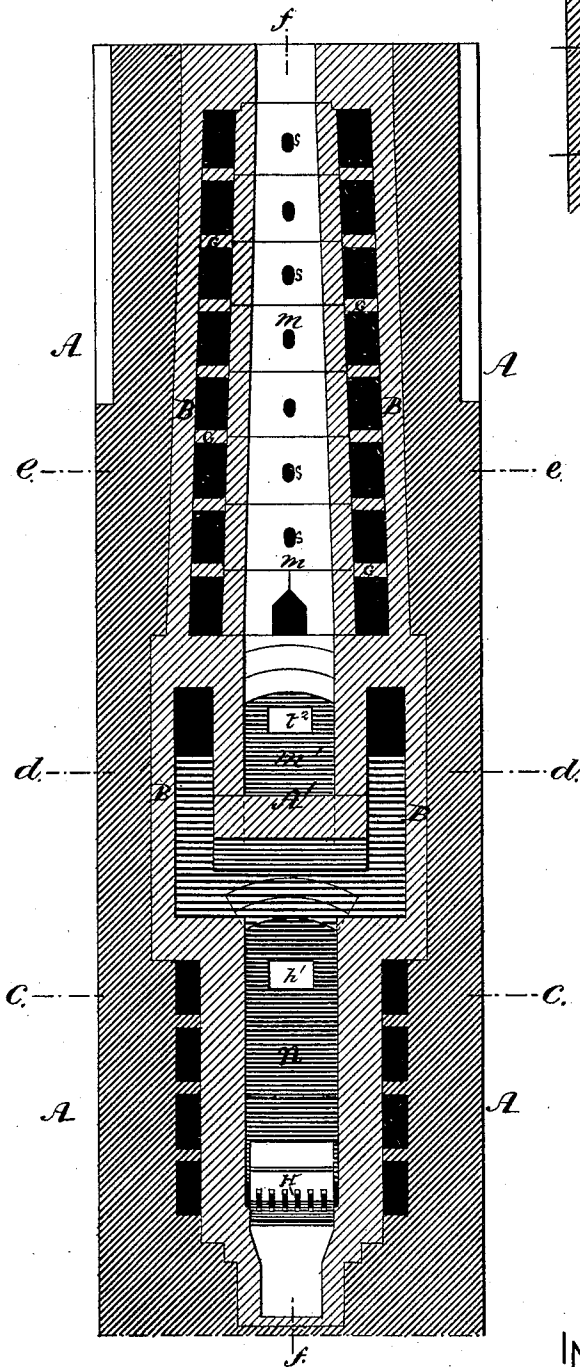
APPARATUS FOR THE MANUFACTURE OF GAS.

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— FIG. 4 —

— FIG. 9 —



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(No Model.)

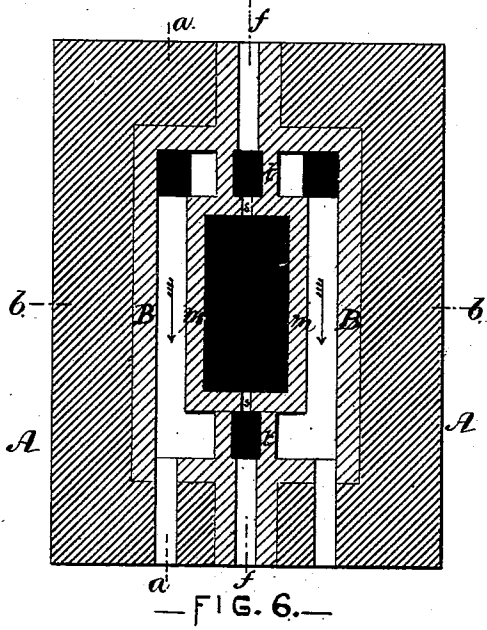
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H. Y. ATTRILL & W. FARMER.

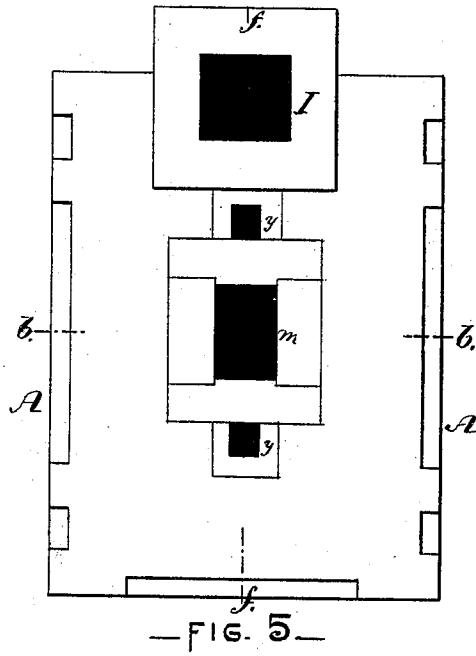
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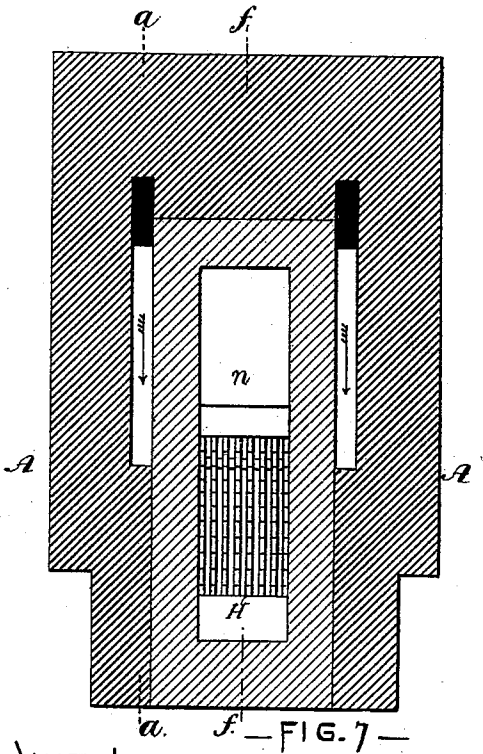
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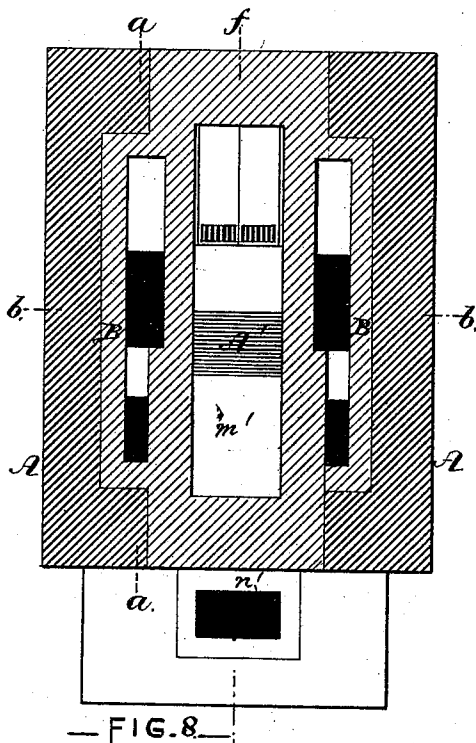
—FIG. 6.—



—FIG. 5.—



—FIG. 7.—



—FIG. 8.—

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UNITED STATES PATENT OFFICE.

HENRY Y. ATTRILL, OF NEW YORK, N. Y., AND WILLIAM FARMER, OF ELIZABETH, NEW JERSEY; SAID FARMER ASSIGNOR TO SAID ATTRILL.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 251,085, dated December 20, 1881.

Application filed March 23, 1881. (No model.)

To all whom it may concern:

Be it known that we, HENRY Y. ATTRILL, residing in New York city, in the county and State of New York, and WILLIAM FARMER, residing at Elizabeth, in the county of Union and State of New Jersey, both subjects of the Kingdom of Great Britain, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas for Illuminating and other Purposes; and we do hereby declare that the following is a full and exact description thereof.

The improvements relate to that class of gas-manufacturing apparatus described in the patents issued to us dated February 10, 1880, in which the soft coal and other gas-producing material is supplied at the top of an upright retort and caused to move slowly downward therein.

According to this invention, instead of placing the furnace at the base of the retort, and in one therewith, we make it a separate chamber divided from the retort by a tight or approximately tight partition. The furnace receives the hot coke at intervals by a direct transfer from the mouth of an orifice at one side into a receiving-passage over the front of the furnace. Provision is made for operating by suitable tools to push back and level the fuel in the furnace.

For the manufacture of illuminating-gas in the retort the combustion in the furnace is so managed as to produce a highly-combustible gas, which is led up through zigzag passages along the sides of the upright retort. Air previously heated is supplied to the combustible gas, and imparts an intense heat at the base of the retort, which is communicated by the passages in a lesser degree to the several points above. The coal in the retort gives off its heaviest gases at the top and lighter gases at lower points as the distillation proceeds. It is allowed free escape from every point through a series of apertures in the side, which communicate with upright passages and conduct the gas freely down to suitable exit-passages near the hottest portions of the apparatus. The mixture of the rich and poor gases is in such proportion as produces the proper candle-power of illumination. We introduce water in a care-

fully-graduated quantity, with the gas-producing material at the top. It rapidly vaporizes, and without any expensive apparatus supplies the condition required for maintaining an approximate uniformity in the quality of the gas and avoiding the formation of soot.

The accompanying drawings form a part of this specification, and represent what we consider the best means for carrying out the invention.

Figure 1 is an external front view of our improved apparatus. Fig. 2 is a vertical central section at right angles to Fig. 1, taken on the line *ff* in Figs. 5, 6, 7, and 8. Fig. 3 is a similar section on the line *aa* of the same figures. Fig. 4 is a vertical section on the line *bb* in Fig. 2. Fig. 5 is a plan view; Fig. 6, a sectional plan on the line *ee* of Figs. 2 and 4. Fig. 7 is a sectional plan on the line *cc* in Figs. 2 and 4, and Fig. 8 is a sectional plan on the line *dd*, Figs. 2 and 4. Fig. 9 is a vertical sectional view of a portion of the retort and two of the horizontal partitions.

Similar letters of reference indicate like parts in all the figures.

A is a substantial masonry inclosing a central passage, *m*, which will be termed the "retort." The base of the retort *m* is widened, and constitutes a capacious chamber, *m'*. The coke, in descending, strikes a double-inclined ridge, *A'*, and separates into two streams. All the coke which goes one side of this ridge is taken out at intervals through a door, *Q*, and may be sold or utilized for any purpose. The coke which goes the other side of the dividing-ridge is discharged at intervals through a door, *R*, into the passage *n'*, which is then temporarily uncovered for the purpose, and thus into the furnace *n*, to be utilized in the production of heat, directly and indirectly, for treating the material in the retort above. The doors *Q* and *R* should be made gas-tight, and adapted, by hinges or otherwise, for easy opening and closing. On opening these and operating with any suitable instrument, the coke may be hauled out at short intervals through the respective orifices *qr*. By varying the quantity removed on either side the descending coke can be induced to flow in more or less liberal quantities on either side of the central ridge, *A'*.

The form of the horizontal section of the retort *m* is an elongated rectangle, as shown clearly in Fig. 4. The longer sides and portions of the shorter sides receive heat, and the remainder of the shorter sides deliver the gas. The upright retort *m* is formed of thin refractory material—as fire-brick—applied together in sections rabbeted to match to the horizontal partitions *G*, as shown in Fig. 9, and forming a tapering tube of rectangular section, with the large end downward. A space between the retort and the outer masonry is formed into zigzag passages *p'*, to conduct the burning gases from below and supply heat to the contents of the retort above. We propose by exhausters to maintain a uniform pressure on the interior of the retort *m* and of the furnace *n* below; but according to this invention it is not essential that this exact coincidence of pressure be maintained so long as the partition between the furnace and the retort is intact.

The furnace *n* is supplied with air through grate-bars *H*, which may be shaken by ordinary or suitable means, to maintain a clear fire and generate from the liberal supply of coke furnished at intervals through the door *N'* intense heat in liberal quantities. The supply of air is limited by suitable doors or valves, *N*, so as to utilize the coke by the imperfect combustion which results in the production of carbonic oxide. Large quantities of light combustible gas are also distilled off from the upper portion of the coke in the furnace. The gaseous products of this mixed distillation and imperfect combustion rise from the furnace into a transverse chamber, *o*. From the ends of this chamber vertical flues *o'* extend upward and open each into a horizontal passage, *o²*, where the gas meets the air and is burned. This chamber is lined with the most refractory fire-brick.

Zigzag flues *k'* are arranged on each side of the furnace *n*, and are supplied with pure air through apertures *k* at the front. The air, moving upward through these zigzag passages *k'* close to the furnace, is heated, and rises through passages *k²* into the chamber *o²*, where it meets the hot combustible gas from the furnace and induces complete combustion thereof. The heat resulting from this combustion of the gas may be much greater than that in the gas-generating furnace *n*. The furnace *n* performs the functions of generating the gas and heating the air. The heat generated in the chamber *o²* is imparted to the contents of the retort *m*. The hot gases rise from *o²* through apertures *p* into zigzag passages *p'* formed by the horizontal partial partition *G*, fitting in the rabbets described, and after thus flowing up the broad sides of the retort *m*, traversing right and left and imparting heat to the contents of the retort *m*, are discharged into the stack *I*. There are orifices *s s'* in the retort *m*, communicating with straight passages *t* extending up and down the whole length of the retort *m*. They allow the immediate escape of the gas from any level in the retort. Pro-

visions *T' t'* are made for conducting away the gas from the lower ends of these upright passages. It may be led away and subsequently treated in the ordinary or any suitable manner. The inner ends of these holes *s* are chamfered on the lower sides, as shown, to avoid offering any obstruction to the descent of the coke. The horizontal partial partitions *G* are formed of tiles of sufficient size to extend across between the walls of the retort *m* and the lining *B* of the masonry outside, and to engage in each. They thus are themselves supported, and aid to support and keep in proper line the tiles forming the walls of the retort. They are formed with apertures *g*, arranged as shown, to allow the intensely-heated gases from the chamber *o²* to move freely upward by traversing the zigzag route prescribed.

We provide holes *u*, covered by removable stoppers *U*, (see Fig. 3,) through which the interiors of the zigzag chambers may be examined and cleared at intervals of ashes which may accumulate there. The orifices *w* are similarly covered by stoppers *W*, which allow the inspection and cleaning of other portions of the apparatus. The apertures *y* at the top of the passages *t* are closed by removable stoppers *Y*.

An elevated reservoir, *J*, contains water, which is supplied through a pipe, *J'*, accurately controlled by a cock or valve, *J²*. The pipe is led into the upper portion of the retort, and is then bent squarely downward, and delivers the water there as required, to just sufficiently moisten the contents of the upper portion of the retort. The steam produced by the evaporation of this water performs an important function in preventing the coke from clogging and preventing the gas from depositing soot. Our provision for supplying the water in this manner avoids the necessity for steam-pipes or for steam-generating apparatus.

On the back side of the apparatus, under the passage *g*, is a platform, *L*, which affords a smooth and durable bottom on which to rake out the coke when the door *Q* is opened. An orifice, *l*, near the inner edge of this plate receives a jet of steam through the pipe *E* supplied from a suitable boiler or generator and controlled by a suitable cock. The plate *L* may be removed when desired. An aperture, *l'*, having a removable cover, *L'*, allows access to the space under the plate *L* without disturbing the other work.

The lowermost of the holes is marked *s'*, and is considerably larger than the others. Its larger size allows for the exit of a larger proportion of the gas at that point, and also allows the introduction of any suitable instrument at intervals to clear the apparatus. *T T* are covers, which may be removed for the purpose.

Above the ordinary gas-exit *t' T'* are passages *z*, nearly as large, provided with removable covers *Z*. These may be utilized by applying suitable connections for taking away a portion of the gas. In such case, care being taken to draw uniformly on these several orifices,

the gas from the upper orifices, z , will be of a richer character than that from the lower, and may be stored in different reservoirs and utilized for different purposes. The gas from the upper orifices, z , will be best adapted for illumination, while the gas from the pipes T' will be better adapted for heating.

Orifices t^2 , provided with removable stoppers T^2 , are arranged in line with the upper portion of the chamber m' . These orifices may be utilized to take away gas. The gas from these orifices will be still lighter and less adapted for illumination; but it may be utilized with advantage to heat the retort, or for other heating purposes.

A considerable space, h' , immediately over the grate-bars H , controlled by a removable cover, H' , allows the removal of any cinder which will not readily pass down through the grates.

Modifications may be made in many of the details. The upright retort m may be lengthened or shortened as required. The taper may be increased or diminished. The water-supply pipe J' may coil around or be otherwise arranged to receive sufficient of the spare heat in that part of the apparatus to partly or entirely vaporize the water before its actual delivery into the retort. The soft coal or other gas-yielding material may be fed at the top of the apparatus through a revolving or partially-revolving valve, as described in our Patent No. 224,320, February 10, 1880.

We are aware that vertical retorts having outlets at different levels have been used in the manufacture of gas, and also that they have been combined with vertical passages for conducting away the gas produced; but the gas has in every case been carried toward the cooler end of the retort. The object of our construction is to subject the distillates produced at different levels of the retort, and consequently at different temperatures, to an increasingly higher temperature by causing them to pass out at the bottom of the outside vertical passage, t , Fig. 2, from which they are drawn off through a connecting horizontal passage, as t' , Fig. 2, extending through the outer wall of the surrounding furnace; or if it be desirable to subject the products of distillation to a temperature lower than that of the lower extremity of the vertical passage t , Fig. 2, then they may

be drawn off at the horizontal passages, as at z , Fig. 2, connected at different levels with the said vertical passage t and extending through the outer wall of the furnace, as before.

We claim as our invention—

1. The upright retort m , in combination with the chamber or enlargement m' , and with the furnace n , air-heating flues k' , and zigzag passages p' , as herein specified.

2. An upright retort having a series of orifices, s , with a larger orifice, s' , arranged at a lower level, as herein specified.

3. An upright gas-retort having a series of apertures at different levels opening into a vertical passage extending up and down outside the same, the said vertical passage having also at different levels eduction-openings extending through the wall of the surrounding furnace, whereby the distillates produced at different temperatures corresponding with the construction may at will be subjected to the higher temperatures of the lower part, substantially as described.

4. The vertical retort m , having openings s' , in combination with the gas-passage t' and the removable lid T at its outer end, substantially as set forth.

5. The metal plate L in the base of the chamber m' , in combination with the door or cover Q controlling the discharge-orifice, as herein specified.

6. In a gas-making apparatus, a retort extending up and down, having openings at different levels for discharging gas into a passage connected therewith extending up and down outside of the retort, and having its eduction-opening at the bottom, whereby all the products of distillation may be subjected to a uniform higher temperature at will, and for conducting away the gas, in combination with a heating-furnace and with a zigzag passage, as p' , adapted to present the hot products of combustion to the retort, all substantially as herein specified.

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WILLIAM FARMER.

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