(No Model.)

L. STEVENS.

APPARATUS FOR MANUFACTURING ILLUMINATING GAS.

No. 328,150. Patented Oct. 13, 1885.

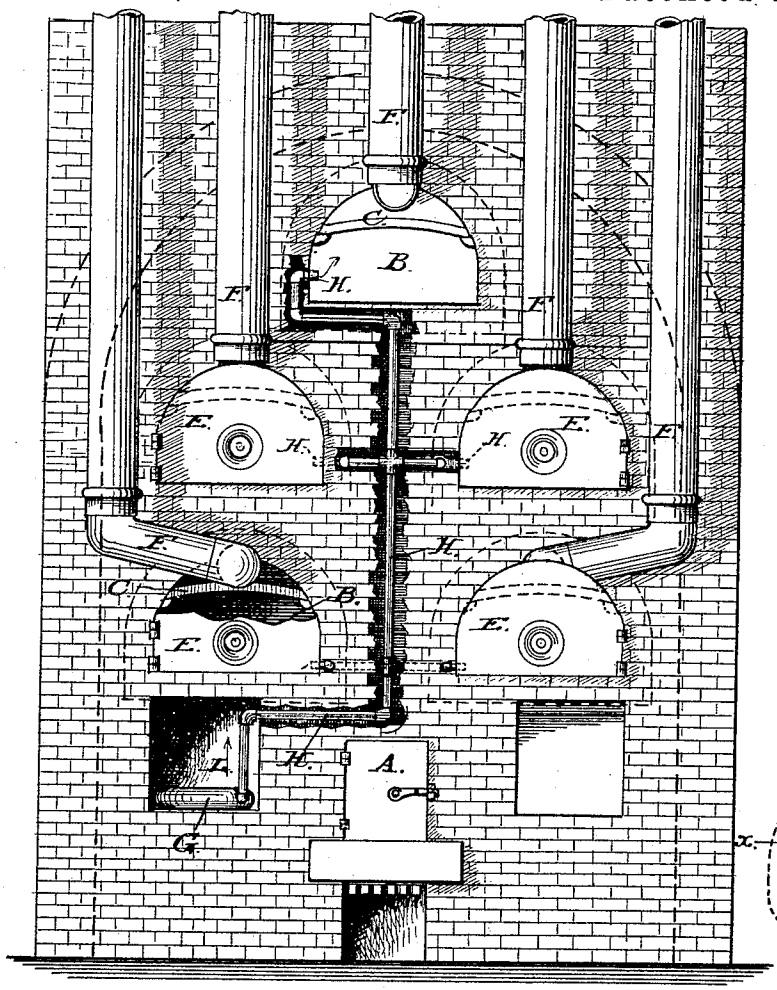


Fig. 1.

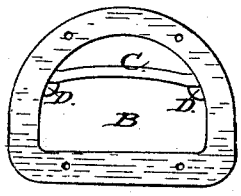


Fig. 3

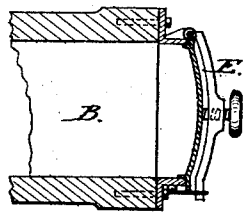


Fig. 5.

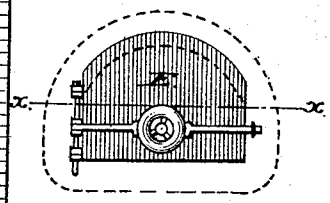


Fig. 4.

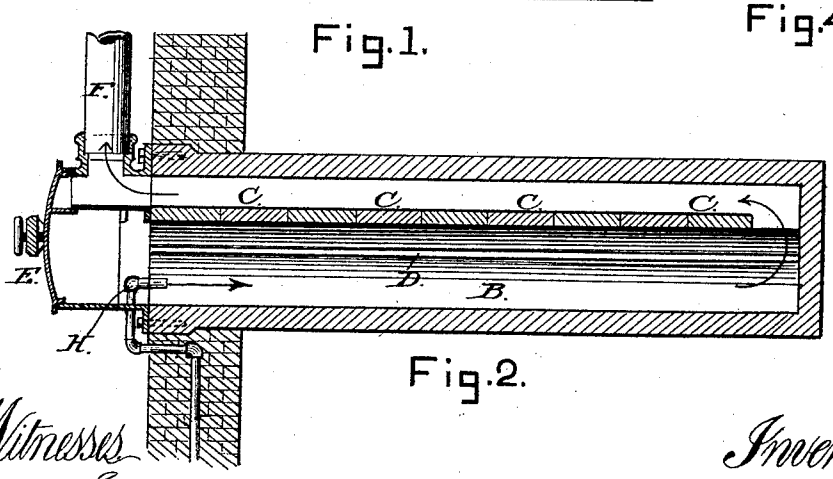


Fig. 2.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MANUFACTURING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 328,150, dated October 13, 1885.

Application filed June 12, 1885. Serial No. 168,458. (No model.)

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington city, in the District of Columbia, have invented a new and useful Improvement in Apparatus for the Manufacture of Illuminating-Gas; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My present invention is an improvement on my previous inventions described in Patent No. 86,187, dated June 26, 1869, and Reissue No. 3,338, dated March 23, 1869; and it consists in the novel construction and arrangement of the apparatus, as hereinafter described, whereby I am enabled to construct a bench of gas-retorts far more durable and operating with greater advantage than those heretofore in use.

In the present method of distilling coal in retorts for illuminating-gas the fresh coal, when charged, reduces the heat of the retort below the heat required to convert the first distillates from the coal into a fixed gas. The heat of the retort being reduced, the retort is filled with the heavy hydrocarbon vapors that are first distilled from the coal, and these vapors deposit on the inner surfaces of the retorts successive layers of solid carbon, filling up the retorts in about ninety days. In removing the deposits of carbon the retorts are damaged by uneven heat and breakage more than by ninety days of constant usage. The first distillate of the coal not deposited in the retort as fixed carbon is also apt to condense in the stand-pipes and main in the form of pitch and coal-tar.

The object of my invention is to prevent these deposits and to improve the apparatus for obtaining the conversion of the first distillates from the coal into a fixed gas.

In the accompanying drawings, Figure 1 is a front elevation of a bench—five retorts—partly broken out to illustrate the position of the superheater and steam-connections. Fig. 2 is a central longitudinal section of one of the double retorts constructed with adjustable partition-tiles, illustrating the connection therewith of its inlet steam-pipe and outlet gas-pipe. Fig. 3 is a transverse section through the double retort and its loose horizontal partition. Fig. 4 is a front view of the door closing the lower chamber of the retort; and Fig. 5 is a horizontal section in line *x x* of Fig. 4, illustrating the manner of securing the door.

In the construction of the bench the retorts B B are mounted in a suitable inclosure of masonry, so as to be each fully exposed to the heat from the furnace A, the gases and products of combustion from the furnace being led, in their passage to the chimney, under and around the retorts in the customary manner. Each retort B is constructed of an outer casing of clay, which is divided longitudinally into an upper and lower compartment by means of a series of transverse tiles C C, (see Figs. 2 and 3,) supported at each end upon longitudinal offsets D D, formed on the inner side of the casing. (See Fig. 3.) The lower compartment, which is larger than the upper one and receives the coal for distillation, serves also as a flue to conduct the gases evolved from the coal to the rear end of the retort, where they are permitted to pass up into the upper compartment, said compartment serving as a flue to conduct them back to the front end of the retort. (See Fig. 2.)

The door E of the retort permits of ready access to both compartments, and is fitted to cover and close the openings therein hermetically. The front end of the upper compartment is made to communicate with a suitable pipe, F, adapted to lead the gas generated in the retort to the main.

A superheater, G, is located in one of the main furnace-flues L (see Fig. 1) at a point where the flue returns to the chimney, after having passed under or around the several retorts, and where it is subjected to its full heat, and supply-pipes H H are led therefrom to the front end of the lower compartment of each retort, so as to provide for a constant delivery during the working of the bench of superheated steam at an exceedingly high temperature into each retort and over the coal contained therein.

In the operation of the bench thus simply constructed fire is started in the furnace, and a moderate heat maintained for two or three days until the bench will have become sufficiently heated to allow of crowding the fire with more draft and of heating the retorts to

about 2000° Fahrenheit. By this time the superheater in flue L will have become heated to about the same temperature, and the retorts can now be charged with coal and the steam turned on. With suitable adjustment the steam-supply will not require to be changed or shut off, either when charging the retorts with fresh coal or drawing the coke from a previous charge. All that is necessary is to charge the retorts at regular intervals, as is now practiced in gas-works.

In clay retorts which are constructed with an upper and lower chamber, in which the dividing-partition between the upper and lower chambers is made solid with the sides of the retort, the partition is liable to be broken by the expansion of the outer shell in heating before the partition gets hot and equally expanded. This difficulty is overcome in my invention by means of the detached tiles C C, forming the partition, and which rest loosely for support on the projections D D upon the inside of the retort, as shown in Fig. 3. This arrangement gives room for the independent expansion and contraction of the partition, and in case of breakage or damage thereto in charging the coal or drawing the coke from the retort the damage is easily repaired by putting in new tiles.

Under ordinary circumstances a retort so constructed would become inoperative by the deposit of solid carbon, which, filling up the rear end of the lower chamber, would choke the communicating passage to the upper chamber. This is overcome in my invention by placing one of my patented superheaters in the furnace-flue L, which conducts the waste heat from the bench to the chimney.

Steam from any suitable steam-generator is passed through the superheater, and is conducted by the steam-connections H H to the front end of each retort and injected into the lower chamber containing the coal.

The amount of steam is regulated by an inlet-valve and by the size of the aperture through which it is injected into the retort.

The steam is easily heated by this arrangement to from 1000° to 1500° Fahrenheit, and as it commingles with the hydrocarbons distilled from the coal the oxygen of the steam combines with the carbon as carbonic oxide, liberating the hydrogen, which also takes up the heavy carbons—as carbureted hydrogen—thus utilizing the carbons that otherwise would be deposited and fill up the retorts.

The upper chamber of the retort, not being materially affected by the charging of fresh coal into the lower chamber, is always in a condition of heat to convert the products of distillation in the lower chamber into a fixed gas, leaving no heavy hydrocarbons to condense—as pitch and tar—in the stand-pipes and main.

In the practical working of this process I have found it absolutely necessary that the steam be raised to a high temperature before its introduction into the retorts, otherwise it will absorb so much heat that the conditions necessary for the assimilation of the steam and hydrocarbon vapors are destroyed.

Good results have been attained with steam at 1000° Fahrenheit, but the most satisfactory results are obtained with steam at 1500° Fahrenheit, only sufficient steam being admitted to prevent a deposit of solid carbon in the retorts. The apparatus is best worked with a pressure of from fifty to sixty pounds in the superheater, and the steam, heated to 1500° Fahrenheit, injected into the retort at this pressure through an aperture five thirty-seconds of an inch in diameter. This amount of steam admitted under said conditions will prevent the deposits of carbon, and not increase the carbonic-oxide gas to an objectionable degree.

I claim as my invention—

The compound gas-retort constructed, substantially as described, of a lower distilling-compartment, an upper fixing-compartment separated from the lower by a horizontal partition of loose tiles and communicating therewith at its inner end, a mouth-piece covering the open front ends of both compartments and having a partition corresponding with that between the same, an outlet-pipe communicating with the front end of the upper compartment, and a cover closing the mouth-piece and open front ends of the two compartments.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEVI STEVENS.

Witnesses:
J. F. ACKER, JR.,
A. B. MOORE.