(No Model.)

V. L. ELBERT.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 386,458. Patented July 24, 1888.

Fig. 1.

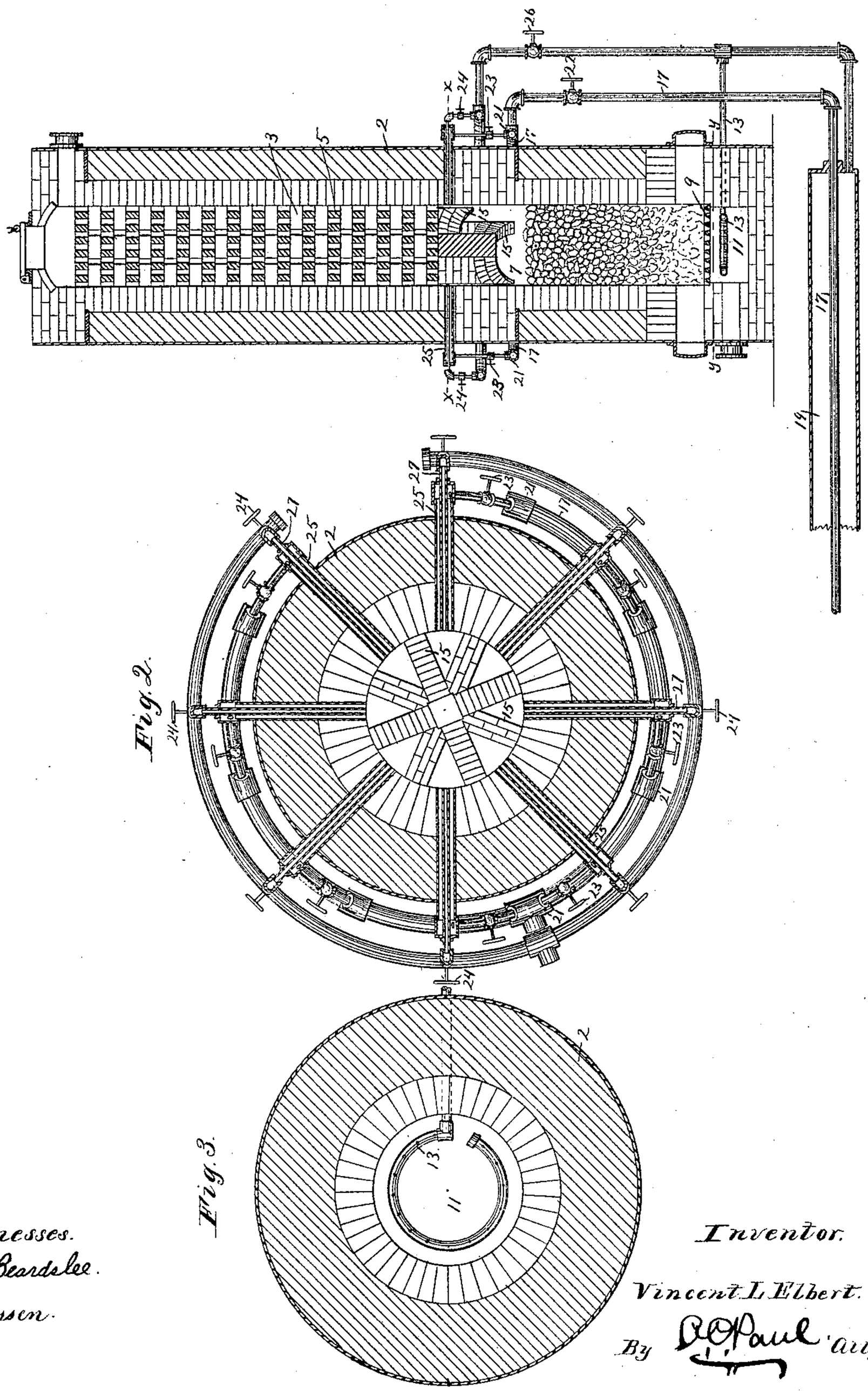

Fig. 2.

Fig. 3.

Witnesses.
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VINCENT L. ELBERT, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 386,458, dated July 24, 1888.

Application filed November 2, 1887. Serial No. 254,048. (No model.)

To all whom it may concern:

Be it known that I, VINCENT L. ELBERT, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Apparatus for the Manufacture of Gas, of which the following is a specification.

My invention relates to improvements in the manufacture of water-gas from anthracite coal or coke; and the objects I have in view are to enrich this gas by a hydrocarbon vapor obtained from crude oil and to provide an apparatus by means of which this vapor may be advantageously used. In the manufacture of this kind of gas it is necessary to enrich it by mingling with it hydrocarbon vapor, which must be done before the gas is "fixed" in the superheater. The hydrocarbon used may be either naphtha or crude oil. The latter is much more preferable, because it is much less expensive, the difference in the use of the two being about seventeen cents on each thousand feet of gas in favor of crude oil. I find by actual experience that it is impossible to introduce the crude oil into the combustion-chamber, owing to the fact that it will not become properly disseminated among the gases obtained from the fuel and will run down through parts of the incandescent fuel and extinguish it. The steam that is passed up through the fuel will follow mainly this track of extinguishing-fuel, and will therefore not be decomposed. If the crude oil is thrown directly into the superheater, it fails to come in contact with the gas in all parts thereof, and no benefit would be obtained from parts of the superheater. If too much oil is thrown into any one part of the superheater, the bricks at that part will be cooled, and the oil will be deposited on them in the form of solid carbon. I obviate these objections and make a practical success in using crude oil for enriching the gas by introducing it in small quantities, and preferably in the form of vapor, into separate passages between the combustion-chamber and superheater. The hydrocarbon thus comes in contact with all of the gases after they leave the combustion-chamber and becomes intimately commingled therewith, and in this condition they pass into the superheater and then become a fixed gas.

In the accompanying drawings, forming a part of this specification, Figure 1 is a vertical section of a cupola constructed for use in carrying out my invention. Fig. 2 is a horizontal section (on a larger scale) on line *x x* of Fig. 1. Fig. 3 is a section on line *y y* of Fig. 1.

In the drawings, 2 represents the cupola, which is preferably provided in its upper portion with the fixing-chamber or superheater 3, which is filled with fire-brick, 5, in the usual way. The cupola is provided in its lower part with the combustion-chamber 7, preferably provided with a grate, 9, and ash-pit 11, into which extends a steam-pipe, 13.

The cupola is provided at a point a short distance above the combustion-chamber preferably with two double arches, 15, arranged with the legs of the upper arches midway over the spaces between the legs of the lower arch. One double arch may be used if preferred. The fire brick of the superheater rest upon these arches, and between their legs is a series of independent passages, through which the gas passes from the combustion-chamber to the superheater. The spaces between the legs of the arches form separate passages, connecting the combustion-chamber with the superheater.

17 represents a pipe through which crude oil may be passed, preferably with sufficient hydrostatic pressure to force it into the cupola. This pipe passes through a large steam-pipe, 19, through which a current of steam is passed around the pipe 17. By this means the crude oil passing through the pipe 17 is converted into vapor or heated to a high temperature. The pipe 17 thence extends up to and around outside of the cupola, preferably to the right and left, and is preferably provided with Y-fittings 21, which may have suitable valves, 23, and connect with pipes 25, that extend through the wall of the cupola, their inner ends being preferably flush with the inner surface of the cupola-wall. These pipes are just below the top of the upper arch or just below the lower brick of the superheater, and there is preferably one pipe for each space between the legs of the arches.

In order that the hydrocarbon may be maintained in the vapor state or high temperature until it enters the cupola, I prefer to provide the steam-pipes 27, that pass centrally through

the pipes 25, their inner ends being flush with the inner ends of the said pipes 25.

The operation is as follows: The fuel-gas formed by the passage of the steam from steam-pipe 13 through the incandescent fuel in the combustion-chamber passes through the openings between the arches and enters the superheater or fixing-chamber. As the gas passes through these narrow openings the hydrocarbon vapor from the crude oil which has previously been vaporized or raised to a high temperature, as described, enters the cupola through the pipes 25 and mingles with the gas as it passes into the fixing-chamber. The steam which here enters the cupola also passes into the superheater, being carried up by the current of gas, and the hydrogen unites with any carbon or lamp-black which may adhere to the superheater-brick, and, passing through the superheater, becomes a fixed gas. This action utilizes this waste steam by converting it into gas, and also keeps the superheater spaces and interstices clean and free from matter that heretofore has clogged it up and fouled it to an extent rendering frequent cleaning necessary. The introduction of the vapor or liquid oil at the highest part of the narrow spaces between the fuel-chamber and the superheater causes every portion of the superheater and fire-brick to be utilized.

The steam pipe 13 extends into the ash-pit beneath the grate, and is extended, preferably in a curved form, around the ash-pit and is provided with a series of small openings, permitting the steam to escape in small quantities beneath all parts of the grate. This causes the steam to be equally distributed and to pass equally through every part of the incandescent fuel, which causes the coal to be thoroughly and evenly decarbonized, whereas were the steam passed in altogether into the ash-box it would rise through only one part of the fuel and put out the fire in this part from top to bottom, and after this is done the steam will nearly all continue to pass through this part of the fuel. By this method of equally distributing the steam as it passes through the fuel I am enabled to produce much greater quantities of gas and at the same time to effect a large saving in fuel.

By means of the valves 23 the flow of oil or vapor through each pipe is regulated, while by a separate valve, 22, in the pipe 17 it may be cut off entirely and turned on as desired. In the same manner the supply of steam through each pipe is regulated by a valve, 24, and is cut off or turned on to all the pipes by a valve, 26, located in the main pipe.

Both the steam and oil pipes may be covered with a suitable non-conducting covering to retain the steam and oil at a high degree of temperature.

I claim as my invention—

1. The combination, in an apparatus for the manufacture of illuminating-gas, of a combustion-chamber, 7, a superheated chamber, an arch located between said combustion-chamber and said superheater-chamber and provided with a series of legs forming separate passages leading from said combustion-chamber into said superheater-chamber, and a series of oil-pipes opening through the outer wall of the cupola into said separate passages between the combustion-chamber and the superheater, substantially as described.

2. The combination, in an apparatus for the manufacture of illuminating-gas, of a combustion-chamber, 7, a superheater-chamber, a series of passages connecting said combustion-chamber with said superheater-chamber, and a series of oil-pipes opening through the outer wall of the cupola into said passages, with a series of steam-pipes extending through said oil-pipes, substantially as described, whereby a vaporized crude oil or liquid hydrocarbon may be thrown into the passages and mingled with the gases after they leave the combustion-chamber and before they reach the superheater, for the purpose set forth.

3. The combination, with the cupola 2, having the combustion-chamber 7, the superheater-chamber arranged above said combustion-chamber, and an arch located between said chambers, of an oil-pipe, 17, extending around said cupola and provided with a series of branch pipes, 25, opening through the wall of the cupola into the passages formed by the legs of said arch between said combustion-chamber and said superheater, substantially as described, and for the purpose set forth.

4. The combination, with the cupola 2, having the combustion-chamber 7, the superheater-chamber arranged above said combustion-chamber, and an arch located between said chambers, of an oil-pipe, 17, extending around said cupola and provided with a series of branch pipes, 25, opening through the wall of the cupola into the passages formed by the legs of said arch between said combustion-chamber and said superheater, and the series of steam-pipes 27, extending through said oil-pipes 25, all substantially as described.

In testimony whereof I have hereunto set my hand this 25th day of October, 1887.

VINCENT L. ELBERT.

In presence of—

A. C. PAUL,

R. H. SANFORD.