

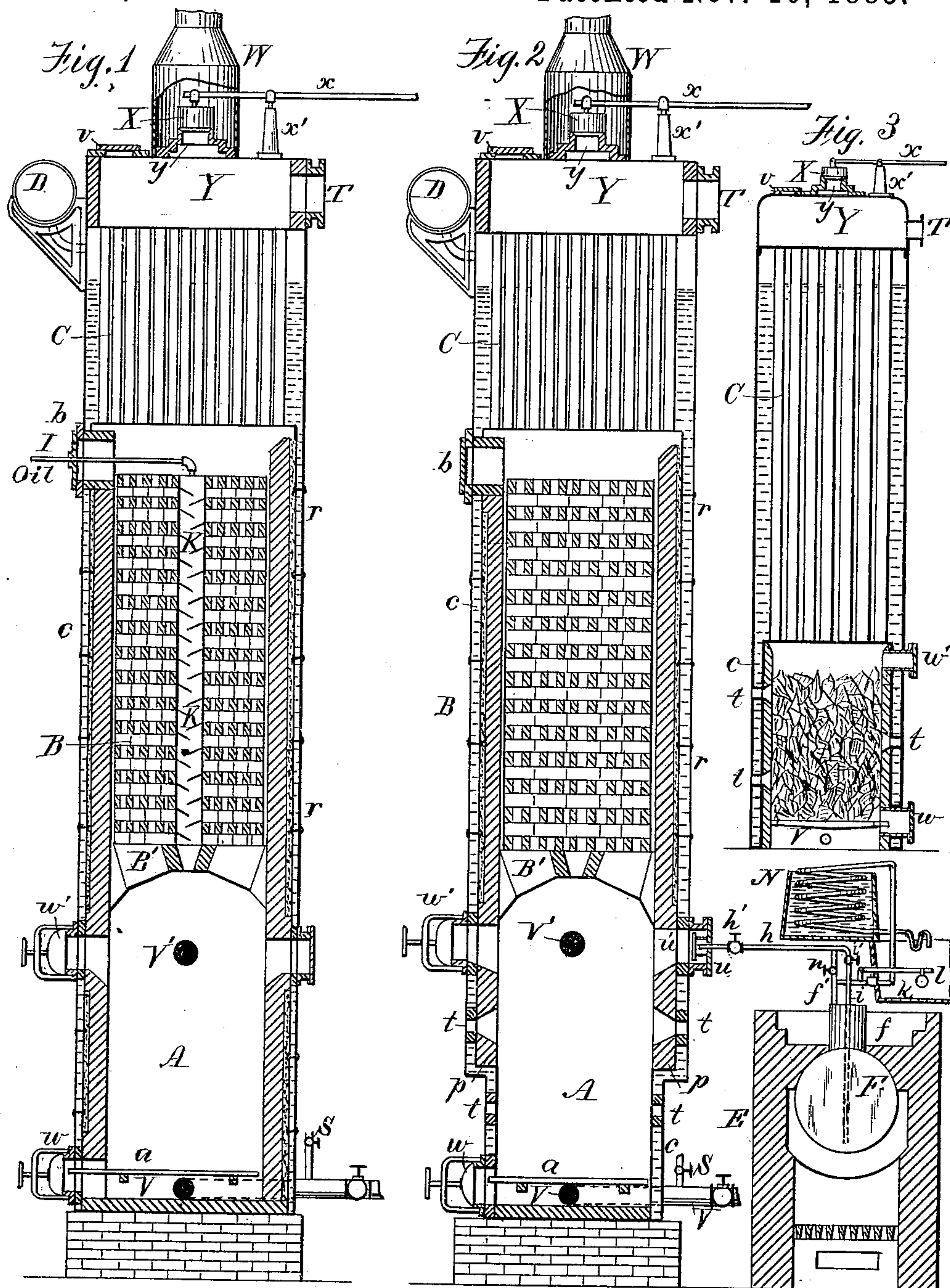
(No Model.)

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PROCESS OF MANUFACTURING GAS.

No. 329,967.

Patented Nov. 10, 1885.



Witnesses:

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PROCESS OF MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 329,967, dated November 10, 1885.

Application filed January 9, 1885. Serial No. 152,374. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. STEWART, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Manufacturing Gas, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to the process of manufacturing illuminating-gas in which steam is decomposed in contact with incandescent fuel, the resulting gases carbureted or enriched with hydrocarbons, and the mixed
15 gas and vapor fixed by contact with heated material; and the particular improvement in the process consists in the novel method of supplying heated oil vapor or oil, or both, to the generator under pressure and in suitable
20 volume to properly carburet the large quantity of gas generated at the very commencement of the run when steam is being decomposed most rapidly, whereby burning and waste of oil is prevented, and better results are secured.

25 My improved process may be conveniently carried out in the apparatus herein described, and illustrated in the drawings.

The improvements constituting my invention in such apparatus are made the subject
30 of claims in a separate application filed April 30, 1885.

In the drawings, Figure 1 represents a vertical section of the generating-cupola. Fig. 2 represents a vertical section of the generating-cupola slightly modified in construction, and
35 of the oil heating and vaporizing apparatus. Fig. 3 is a vertical section of the generator adapted to the manufacture of water-gas, in which the fixing-chamber is replaced by an
40 extended steam-boiler above the fuel-chamber.

The cupola gas-generator is mounted on a foundation of masonry, and is divided into a fuel-chamber, A, at the base, and a fixing-chamber, B, containing a filling of open-work
45 fire-brick located above and separated from the fuel-chamber by an open-work arch, B', which supports the brick checker-work, and above the fixing-chamber is placed the tubular steam-boiler C, with which is connected
50 at the top the steam-drum D. The fuel-chamber in Fig. 1 and fixing-chamber in Figs.

1 and 2 are lined up with fire-brick and covered with a tight iron jacket, which is riveted to the lower tube-sheet of the boiler and forms the inner wall of a water space or jacket, c, 55 extending from the base of the generator up to the boiler. The outer wall, r, of such water-space is composed of riveted iron boiler-plate of larger diameter than the inner wall, and extends from the base of the fuel-chamber 60 to the top of the boiler, forming the shell thereof. The fuel-chamber A is provided with grate a, ash-door w, and fuel-door w'. An air-blast pipe, V, from a blower, connects with the ash-pit, and an air-blast pipe, V', 65 connects with the top of the fuel-chamber. A steam-supply pipe, S, connects with blast-pipe V, or at other convenient place near the base of the fuel-chamber. The gas-outlet pipe T leads from the chamber Y at the top of the 70 boiler, and a passage, y, formed in the top of such chamber serves for the escape of waste products of combustion. Passage y is closed by a cap, X, to which is attached an operating-lever, x, pivotally connected to standard 75 x'. A smoke-stack, W, is provided for carrying off smoke when cap X is removed from passage y. A man-hole and cover, v, are also provided in the top of chamber Y.

The cupola represented in Fig. 1 is provided 80 with an oil-vaporizing cylinder, K, having inclined plates extending alternately from opposite sides, such cylinder being placed centrally in the fixing-chamber and resting on arch B'. The lower end is open and an 85 oil-supply pipe, I, connects with the upper end. Vaporizing-tube K is shown and described in one of my previous patents, and is therefore not claimed herein. A man-hole and cover, b, are provided at the top of the fixing- 90 chamber.

In the furnace shown in Fig. 2 the water-jacket is constructed to form the inner wall of the fuel-chamber for about half its height from the base upward, such lower portion 95 having no lining of fire-brick. An offset, p, is formed in the water-jacket at a point above the clinker-line, or above the line up to which clinker forms in a brick-lined furnace, and above the offset, which forms a support, the 100 fire-brick lining is placed. The iron water-jacket being placed next to the fuel, where it

is most highly heated, prevents the adhesion of clinker to the wall, as explained in patents previously granted to me.

A furnace, E, for the oil vaporizer or still, is placed adjacent to the cupola, and in such furnace is set the still F, having a vapor-dome, *f*. A vapor-pipe, *f'*, having a valve, *n*, connects with pipe *h*, having valve *h'*, leading into the top of the fuel-chamber through plate *u*. A perforated dead-plate, *u'*, is secured to plate *u*, just in front of the opening of pipe *h*, for the purpose of better distributing the hot oil or vapor supplied by pipe *h*. An escape-vapor pipe, *k*, connects with pipe *f'* and leads to a condensing-worm, N, which has a discharge-pipe at the lower end leading into a storing-tank. Pipe *k* is provided with a safety-valve and weighted lever, *l*. A pipe, *i*, having valve *i'*, passes down through the dome to near the bottom of the still, and also connects with pipe *h*, and is for the purpose of supplying hot oil to the generator by means of the pressure of vapor in the top of the still when valve *n* of the vapor-pipe is closed, or even when it is part open, provided the pressure of vapor in the still is sufficient.

An ordinary steam boiler, adapted to stand a high pressure, may be used for the still, and it is to be heated by a fire on the grate or by coils of steam-pipe placed within it. An excessive pressure of vapor in the still is relieved by means of pipe *k* and condenser N, the pressure of vapor operating to open the safety-valve, and thus permit the vapor to escape into the condenser, where it is reduced to a liquid condition and allowed to flow to a storage-tank, from which it may again be supplied to the still.

As shown in Figs. 2 and 3, the walls of the fuel-chamber are provided with inwardly-flaring openings *t*, for the insertion of clinkering-bars, to break and stir up the fuel or detach clinker. These openings are to be closed by tight-fitting caps or plugs.

The generator shown in Fig. 3 is composed simply of a fuel and generating chamber, a steam-boiler, and a water-jacket, and is adapted for making water-gas. The fixing-chamber is omitted, as there is no oil-vapor to be fixed. The heat which is stored in the brick-work of the fixing-chamber in the form of furnace shown in Figs. 1 and 2 is in the form shown in Fig. 3 applied to the steam-boiler, and a proportionally higher steam-boiler is used, so that the heat of the products of combustion and of the water-gas may be properly utilized.

The operation of the apparatus represented in Fig. 2 is as follows: A fire is kindled in chamber A and supplied with fuel, and the air-blast is admitted through pipe V till a bed of incandescent fuel several feet thick is formed. As soon as combustible gas escapes from the fuel, the air-blast is admitted through pipe V' and the gas burned for heating up the fixing-chamber and the steam-boiler above. The hot products pass through the flues of the

boiler, and finally escape through passage *y* up the stack, the cap X being at that time open. While the generating-cupola is being heated up, the oil-still, which has been about half filled with water, is also heated up and vapor generated and allowed to accumulate under pressure, so that a suitably large volume of hot oil-vapor will be held in readiness to carburet to the desired candle-power the large volume of water-gas, which is rapidly generated when steam is first admitted to the incandescent fuel. Petroleum, benzine, or heavy hydrocarbon oils may be used in the still. The fuel in the generator and the brick-work in the fixing-chamber having been heated to the desired temperature, and a suitable volume of oil-vapor having been accumulated in the still under pressure, the air-blasts are shut off, passage *y* closed by cap X, and steam admitted through pipe S to the base of the fuel, by contact with which it is rapidly decomposed and large volumes of hydrogen and carbonic oxide produced. As these gases rise from the fuel, the hot oil-vapor is admitted by opening valves *n* and *h'*, and caused to mingle with and properly carburet them, and the gas and vapor are combined and fixed by passage through the heated fixing-chamber. The hot illuminating-gas passes through the tubular boiler, assisting in raising steam and escapes by pipe T to the wash-box, from which it is passed to the scrubber and holder. The manufacture of gas is thus continued till the temperature of the fuel and the fixing-chamber is reduced too low, when the steam and oil are shut off, and the apparatus reheated by the admission of the air-blasts in the usual way. After heating up the manufacture of gas is resumed, as above described.

Hot oil may be used for carbureting the gas by opening valve *i'* in pipe *i*, the pressure of vapor in the top of the still serving to force the oil up through pipe *i* into pipe *h*, where it is met by a stream of vapor from pipe *f'*, and thereby vaporized and forced into the generator. The hot oil may also be forced into the generator without the admixture of any vapor therewith, in which case valve *n* in the vapor-pipe is kept closed.

By carrying the water-jacket up the whole height of the cupola and placing the communicating boiler on top, the heat is better utilized, and loss by radiation prevented; the apparatus is made more compact and convenient, and can be more economically constructed and operated.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

The process of manufacturing illuminating-gas which consists in heating a body of fuel to incandescence by admission of an air-blast, and by means of the resulting hot gaseous products heating up a fixing-chamber, and at the same time generating a volume of oil-vapor and storing it under pressure in a separate still or vaporizer; then decomposing steam by pass-

ing it into the incandescent fuel, carbureting
or enriching the resulting water-gas by admit-
ting to it, above the fuel, the stored hot oil-
vapor in regulated quantity to produce a uni-
5 form high candle-power gas, and, finally, fixing
the carbureted water-gas by passing it through
the fixing-chamber previously heated by the
hot gaseous products, whereby the loss of oil
by burning and the deadening of the fuel by

admission of oil directly upon it are prevented, 10
and a better quality of gas is produced.

In testimony whereof I affix my signature in
presence of two witnesses.

JOHN L. STEWART.

Witnesses:

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