

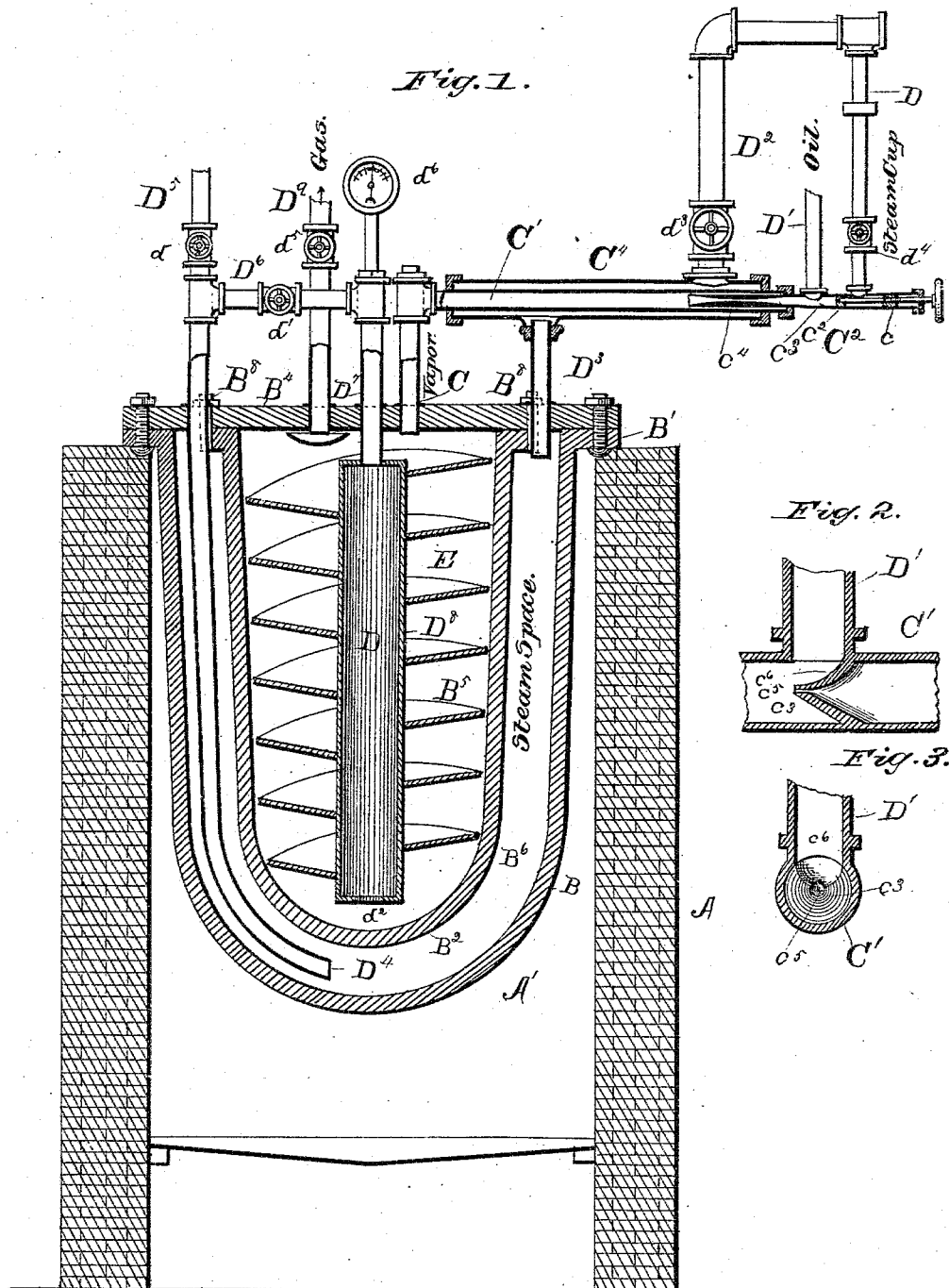
(No Model.)

G. JONES.

PROCESS OF GENERATING GAS.

No. 296,289.

Patented Apr. 1, 1884.



WITNESSES

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PROCESS OF GENERATING GAS.

SPECIFICATION forming part of Letters Patent No. 296,289, dated April 1, 1884.

Application filed January 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, GOMER JONES, a citizen of the United States, residing at Washington, in the District of Columbia, have invented
5 certain new and useful Improvements in Processes of Generating Gas; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as
10 it appertains to make and use the same.

My invention relates to that class of vapor-regenerators in which petroleum is vaporized by means of steam.

Prior to my invention oil has been heated
15 in a retort-chamber by means of steam, and the vapor therefrom mixed with steam projected into the retort. The steam and vapor are conveyed from said retort to another retort, in which they are heated, and passed to
20 a double retort having between its walls a spiral which practically forms a continuation of the pipe which connects this retort with the second one. Upon the side of the retort opposite to that at which the steam and vapor
25 enter, a supply of superheated steam is admitted, and passes with the steam and vapor into the mixing-chamber through an aperture in the inner wall of the double retort. Both the
30 superheated steam and the vapor are heated by practically the same means, and thus both have the same pressure but different densities, and when heated in the mixing-chamber stratify, the lighter one passing off first. This
35 method of generating the oil is defective, first, in vaporizing the petroleum in bulk, as the lighter vapors will pass off and leave a residuum of heavy oils which the heat will coke and render unfit for any purpose; second, in charging with steam the vaporized oil as it ascends
40 from the body of the oil in the chamber. This reduces the temperature of the vaporized oil, and forms water of condensation, which mixes with the body of the oil and renders the subsequent vaporization of the
45 oil more difficult; and, third, in mixing the vaporized oil and steam and superheated steam in a coil formed by the spiral between the walls of the double retort. The vapor and superheated steam do not mix into each other,
50 but merely pass as two currents having parallel paths into the retort-chamber and under the same pressure. The hydrocarbon vapor

and steam will form in strata in the mixing-chamber, as they are of different densities and their detention in the mixing-chamber is sufficiently long to permit them to stratify, and
55 the flow from the retort will sometimes be pure steam, and at other times be steam partly or greatly saturated with oil-vapor. I overcome these defects, first, by feeding the oil in
60 a thin stream against a blast of superheated steam moving in a small pipe inclosed in a jacket through which superheated steam is passing, so that the temperature of the vaporized oil will be raised to a higher temperature
65 at the moment of vaporization, and prevent the superheated steam used in the blast from becoming condensed by reason of the absorption of heat by the oil in vaporizing. By this means I am enabled to vaporize the heavy
70 grades of petroleum and force it into a mixing-chamber at one and the same operation, and dispense with vaporizing the oil in bulk and obviate the condensation of the steam; and, second, by forcing this vapor into a mixing-
75 chamber, where it is given a whirling motion against a whirling current of superheated steam coming from the opposite direction and under a different pressure. By this method
80 it will be seen that the oil is first vaporized by a blast of steam. Any tendency of the steam to lose its heat, and consequently its pressure, by reason of its contact with the cold oil and absorption of heat by the vaporization of the
85 oil is counteracted by the absorption of heat from the superheated steam-chamber surrounding the vaporizing-pipe. The superheated steam from said chamber is again reheated in the retort, but passes out into the
90 mixing-chamber under less pressure than the vaporized oil entering said mixing-chamber through the vapor-pipe. The specific gravity of the vaporized oil is greater than that of the superheated steam. The former, which enters
95 at the top of the mixing-chamber, will therefore pass toward the bottom of the latter and meet the ascending currents of superheated steam, which is under less pressure than the vapor. The result of this meeting will be to intimately mix the vapor and steam, and
100 the mixture will pass out at the top. By passing the mixture out at the top the tendency of the superheated steam to break up the current of vapor is enhanced, and by whirling the

two together the combination is almost perfect. One of the means by which I accomplish this result is shown in the accompanying drawings, in which—

5 Figure 1 represents a vertical transverse section of an apparatus with part of the connections in full lines, and Figs. 2 and 3 detail views of one of the parts.

A represents the brick-work, having a fire-chamber, A'. Seated upon its walls by means of a flange, B', is a pot-shaped jacket, B, which incloses a second pot, B², supported by any suitable means. In this device, however, it is shown attached to the cover B¹ by means of 10 bolts B³ passing through its flange. The cover B⁴ is attached to the outer jacket by means of bolts, and is provided with screw-threaded openings for the different pipes, which enter the spaces between the walls of the jackets. 15 The space within the walls of jacket B², I call the "mixing-chamber" B⁵, and that between jackets B and B² the "annular steam-space" B⁶.

At the top of the mixing-chamber is a vapor-pipe, C, which extends vertically through 25 the cover B⁴, and is connected with a horizontal pipe, C'. In the end of the pipe C' is a needle-valve, C², screw-threaded in an internal collar, c, and projecting into the conical 30 opening in the internal collar, c², having in front thereof a perforated diaphragm, c³. The upper part of this diaphragm is provided with an upwardly and rearwardly inclined fan-shaped groove, c⁴, the apex of which terminates at the perforation c⁵. The lower half 35 may be dished back, as shown in Fig. 2. In front of this diaphragm the tube is contracted, as at c⁴, for an obvious purpose. Entering into the space between the collar c² and c is a 40 superheated-steam-supply pipe, D, which furnishes the steam for vaporizing the oil admitted to pipe C' through pipe D', above the diaphragm c³. The oil passing through this 45 pipe passes down the fan-shaped groove to the perforation, where the current of steam from supply-pipe D strikes and vaporizes the oil. The force of the steam carries the vapor through pipes C' and C to the mixing-chamber B⁵.

Owing to the fact that the pipe C' is outside 50 the apparatus, the vapor passing through it would become chilled if some means were not provided for preventing radiation. I accomplish this by inclosing pipe C' in a steam-jacket, C⁴. This jacket is connected to the 55 main superheated-steam-supply pipe D², and the space between pipe C' and the inner wall of jacket C⁴ should be equal to or larger than the supply-pipe D², so that the steam will not become wire-drawn in passing from pipe D² to 60 pipe D³.

The pipe D³ is joined to a T-union forming part of the jacket C⁴. The lower end of this pipe projects through cover B⁴ into the annular steam-space B⁶. The steam which enters 65 this space envelops jacket B², and may be again heated by fire in furnace A, and is withdrawn by means of a pipe, D⁴, which extends

from the bottom of the chamber upwardly through the casing to an outlet-pipe, D⁵, having valve d, which is closed when it is desired 70 to force steam into the mixing-chamber. The object of this pipe is to withdraw any water that may have accumulated in the jacket, and to furnish a means for the steam to escape when in operation. 75

Below the valve d is a T-union, to which is connected a branch pipe, D⁶, provided with a valve, d', which is closed when it is desired to flush the chamber B⁵ through the outlet D⁵. 80 A pipe, D⁷, is connected to the inner end of pipe D⁶ by means of a union having a steam-gage, d⁶, upon its upper end. The pipe D⁷ passes through the cover B⁴, and may extend to near the bottom of the mixing-chamber B⁵; but I prefer to use an enlarged drum or cylinder, D⁸, having an opening, d⁷, at its bottom 85 to permit the steam to pass into the mixing-chamber. The steam passing through this opening passes upwardly and meets the vapor which is projected downwardly in said mixing-chamber from pipe C. The impact of the 90 two currents thoroughly mixes the vapor and steam, and the mixture passes through the vapor-exit pipe D⁵, which leads to the furnace, where it is burned. 95

Upon the drum D⁸ is arranged a spiral flange, E, having its outer edge just clear of the inside of the jacket B², to permit of its insertion. The flange is so constructed that at any given point its outer edge is higher than 100 the inner edge which is in contact with the drum. The object of this spiral is to give the contending vapor and superheated steam a whirling motion, so that they will readily commingle. Owing to the fact that the top of the 105 spiral is near the cover, and the vapor enters at a greater pressure than the steam, the vapor expands and forces itself toward the bottom through the spiral passage, whereby a whirling motion is given to it by the steam whirling 110 upwardly through said passage. The flange also serves occasionally—for instance, when starting the apparatus, and before all its parts have taken up the heat necessary for perfect action—to catch any oil that may drip 115 from pipe C. This is rarely the case; but if any should drip it would, owing to the inclined form of the spiral flange, rest against the drum, and the heat therefrom would vaporize the oil before it had traveled the whole length 120 of the flange, thus obviating the necessity for any drawing-off pipe at the bottom of the mixing-chamber.

Upon each of the pipes D, D², D³, D⁵, and D⁶ are valves to control the flow through said 125 pipes. The pipes D and D² are each provided with a pressure-regulating valve, which may be set at a certain pressure, so that no matter what the pressure may be in the superheater the pressure in the mixing-chamber will be 130 uniform and unvarying. The oil-supply pipe D⁷ is also provided with a regulator-valve. This valve is provided with means by which any amount of oil may be supplied for va-

porization, and is so arranged that it will indicate what amount is passing through it, and the quantity may be regulated at pleasure. This or a similar valve is necessary to the proper operation of my machine, as the supply of oil passing to the vaporizer must be exactly known if the best result is to be produced. Furthermore, as I only use (compared with other devices) a small quantity of oil, some means for reducing the flow to the minimum must be used, and this valve accomplishes that result.

Suspended in any suitable manner from, and having its upper edge near the under side of, the cover is a cup-shaped deflector, D^{10} , which breaks the current and prevents the commingled vapors from passing directly to the pipe.

The operation of the device is as follows:

The parts being arranged as described, the superheated steam is admitted to the annular steam-space B^6 by opening cocks d^3 in pipe D^2 and d in pipe D^5 . The current of steam passing through the space B^6 flushes the latter of any water of condensation and relieves it of any dead air which may have accumulated since the last fire. After the jackets have become sufficiently heated, the cock d' is opened and the steam allowed to enter the mixing-chamber through pipes D^6 and D^7 and drum D^8 . Valve d' in steam-pipe D is now opened and a current of steam allowed to pass through the needle-valve chamber and force its way into chamber B^3 through pipes C' and C , and the cock d^3 in pipe D^9 opened to allow the current to pass out. As the steam-pipes D and D^2 are connected to the same superheater, the temperature of the steam in both pipes will be the same; but, owing to an arrangement of valves, the current through the needle-valve can be introduced under greater pressure than that through pipe D^2 and its connections. Therefore the currents entering the mixing-chamber through pipe C will be projected forcibly into said mixing-chamber and will become commingled with the superheated steam arising from the bottom of the drum. Oil is now admitted through pipe D' , and it trickles down the fan-shaped groove in the diaphragm c^3 to its perforation c^5 , where the blast of superheated steam will strike and vaporize it. Now, if no means were provided for keeping up the heat, the temperature of the vapor would become reduced and fall below the point of the steam passing through the needle-valve, and condense water and partially-vaporized oil would pass into the mixing-chamber; but by supplying heat at the point and moment of vaporization to replace the heat absorbed by the vaporization of oil, this result is obviated, and completely-vaporized oil is fed into the mixing-chamber. This is produced by inclosing the pipe C' in steam-jacket C^4 , formed by

enlarging the pipe D^2 . The heat from the superheated steam passing through this pipe is absorbed by the vapor, and the temperature in the two pipes equalized, and the vapor is forced in the mixing chamber under substantially the same pressure as the steam which vaporized the oil. The superheated steam passing through the space B^6 may lose some of its heat in its circuitous route to the mixing-chamber, and when such is the case it may be heated by a fire in the furnace. Superheated steam in the space B^6 is drawn from near the bottom by pipe D^4 , so that the steam forced into said space will diffuse itself over the whole outer surface of jacket B^2 . The steam conveyed through pipe D^4 is passed through the pipes D^6 and D^7 and drum D^8 , and out into the chamber B^5 , when it is whirled upwardly to meet the descending and whirling current of vapor forced through pipe E . The steam and vapor meeting in this manner will become thoroughly mixed, and produce a gas in which all the oil is thoroughly vaporized. This gas is then passed through pipe D^9 , which leads to the furnace, where it is burned.

If desired, tarantula-jets may be attached to the end of pipe C and bottom of drum D^8 , to whirl the currents of vapor and steam against each other. In such a case the spiral E can be dispensed with.

I make no claim in this application to the apparatus for accomplishing this result, as said apparatus forms the subject-matter of application No. 117,160, filed January 11, 1884.

What I claim as new is—

1. In the art of generating gas from petroleum, the method herein described, consisting, first, in feeding the oil in a small stream before a blast of superheated steam; second, applying heat at the moment of vaporization to prevent condensation; and, third, projecting said vapor against a current of superheated steam coming from the opposite direction and under less pressure than the vapor, substantially as described.

2. In the art of generating gas from petroleum, the method herein described, consisting, first, in feeding the oil in a small stream before a blast of superheated steam; second, applying heat at the moment of vaporization to prevent condensation; and, third, projecting and whirling said vapor against a whirling current of superheated steam coming from the opposite direction and under less pressure than the vapor, substantially as described.

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

GOMER JONES.

Witnesses:

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