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J. S. SMITH.

METHOD OF PRODUCING GAS.

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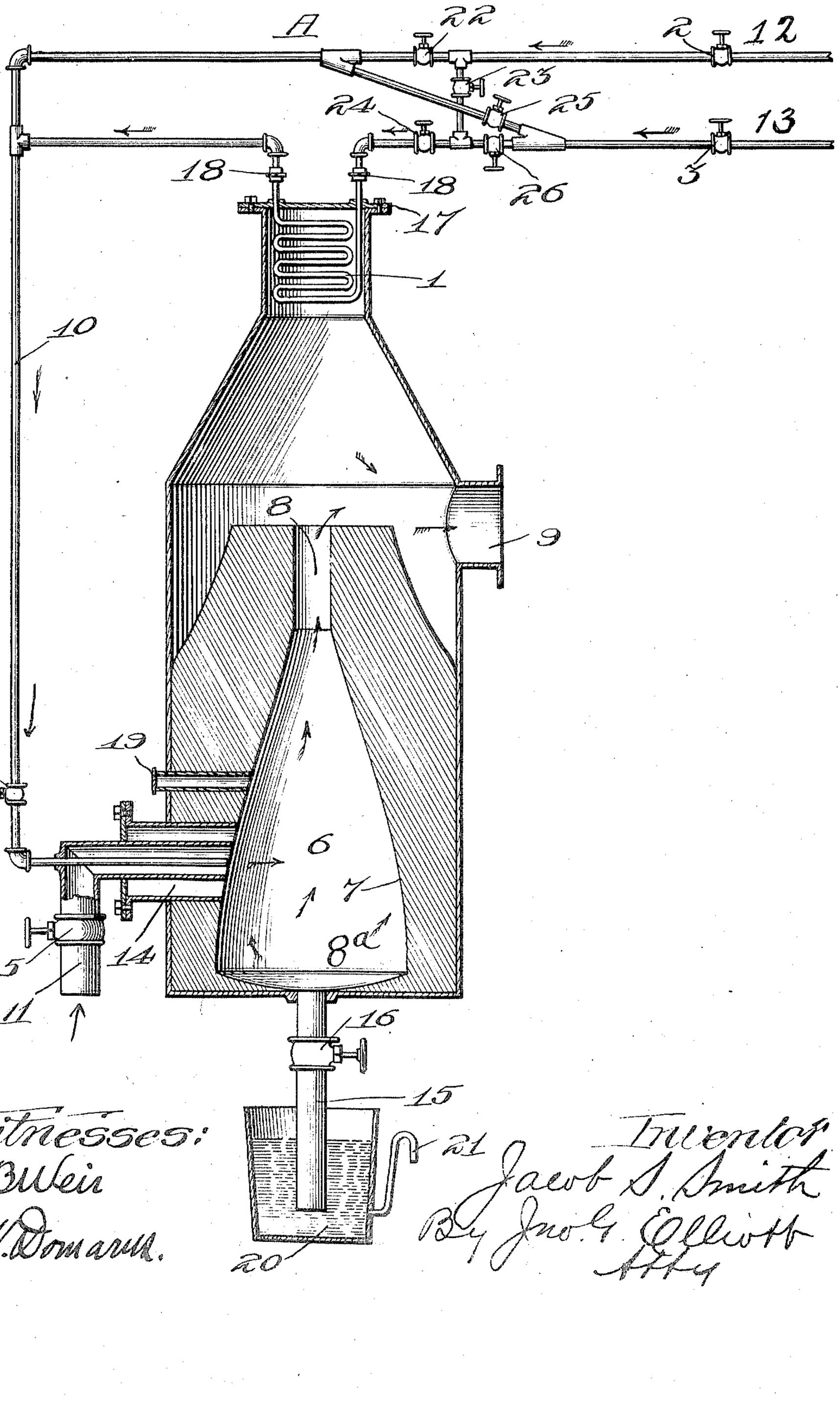

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METHOD OF PRODUCING GAS.

No. 817,280. Specification of Letters Patent. Patented April 10, 1906.

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To all whom it may concern:

Be it known that I, JACOB S. SMITH, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Methods of Producing Heating and Illuminating Gas and By-Products, of which the following is a specification.

This invention relates to improvements in methods for the continuous generation of gas from oil, steam, and air and the separation of the heavy hydrocarbons of the oil from its gaseous elements.

One of the objects of this invention is to reduce the unavoidable nitrogen to a minimum, and thereby improve the quality of the gas made from a given quantity of gas materials.

Another object is to discharge and secure the refractory hydrocarbons directly from the generating-chamber conveniently without interrupting or interfering with such precipitations or the continuous generation of gas.

In the accompanying diagram, illustrating my invention, A indicates an iron brick-lined cupola, within which, formed of fire-brick, is a cone-shaped generating-chamber 6, provided with an inlet 14 and at its upper end with an outlet 8 and having a concave bottom 8^a, drained by a pipe 15, in which is a gate 16 into a trap 20, which has a gooseneck outlet 21. In the top of the cupola is a coil 1, the pipe of which passes through and is movable with a cap 17 and is connected by unions 18 18 with a pipe 13, controlled by a gate 3, and adjacent the pipe 13 there is also a pipe 12, controlled by a gate 2, which, and also the coil, is connected with the pipe 10, discharging into the cone-shaped chamber 6 against the breaker-wall 7 and controlled by a gate 4. Entering the nozzle 14 is an air-supply pipe 11, controlled by a gate 5. The inlet-pipes of the coil 1 have the manipulating-gates 22, 23, 24, 25, and 26.

The operation of the apparatus illustrating the process is as follows: All gates being closed, gate 5 is opened to admit the air. Gate 4 is then opened, and gates 2, 23, and 24 are manipulated to admit oil to the coil 1, which oil passes through the coil and pipe 10 and into the generating-chamber 6, where it is ignited by applying a torch through the peep-hole 19. When the chamber 6 and coil 1 have become heated, gates 3 and 26 are opened to admit steam into the coil also and with the oil is discharged through pipe 10 into the chamber 6 with violence against the breaker-wall 7 at about a right angle thereto, and gate 5 is manipulated to admit the necessary quantity of air through pipe 11 to sustain a gasifying condition at a point against the opposing wall of the chamber 6. In the conversion of the lighter hydrocarbon oils into gas such as are volatilized at a low temperature, or when for any reason it is desired to preheat the oil or the steam only before discharging them into the generator, the steam only may be passed through the heated coil 1 by closing the gates 23 and 25 and opening the gates 22, 2, 3, 26, 24, and 4, when the steam will pass through the coil 1 and the oil through pipe 12 and both steam and oil through pipe 10 into the generator 6, and when the oil only is passed through the coil 1 gates 22 and 26 are closed and 2, 23, 24, and 4 are opened, admitting the oil to the coil from pipe 12, and when gates 3 and 25 are also opened the oil and steam unite in pipe 10 and together pass through gate 4 into the generator 6. The oil, steam, and air are continuously introduced into the generating-chamber in a steady never-varying stream, and the resultant gases and ash of combustion pass upward through the contracted neck 8 and out through the opening for discharge 9, and the refractory hydrocarbons pass downward when gate 16 is opened into the trap 20, and thus the operation may be continuous without interruption.

Suitable pipes for conducting the gases into receptacles for cooling and scrubbing may be attached by the ordinary means to the discharge-opening 9.

The coil 1 is heated by the generated gas, to which it is exposed, and the oil passing through the coil is heated, intimately mixed, and associated with the steam.

The oil and steam are under pressure, the means not shown. The air is supplied from an air-pump or blower attached to pipe 11, (not shown,) the oil, air, and steam admitted to chamber 6 being under pressure sufficient to force these materials violently against the resisting and highly-heated walls within the generating-chamber, the contracted neck of which holds the exploding and decomposing elements in such position as to contact them intimately.

I have found that the form of the generator has much to do with the proper decomposition of the oil, air, and steam and the reassociation of their elements, and I have dis-

covered by repeated experiments that a generator shaped as shown and operated as herein set forth confines the decomposition to a low degree of heat with a low consumption of air, and consequently a minimum of nitrogen in the gas product, and that the gaseous elements of the oil may be converted and combined with the hydrogen of the steam to a large extent and the heavy oil or hydrocarbons may be condensed and withdrawn without injury as a valuable lubricating-oil, while the gas produced is of an improved quality as compared with gas from generators not so equipped.

By first subjecting the oil, with the steam, to heat, and thereby expanding and volatilizing the oil, and while in this condition subjecting it to a violent agitation with steam in passage through the pipes and its discharge into a generator, in which the gases are held and united and the by-products are discharged therefrom, a perfect condition is maintained for the generation of the gases and a constant precipitation of the heavy hydrocarbons therefrom and in the presence of a heat precipitating the hydrocarbons in liquid form yielding an oil particularly adapted for use to lubricate in high temperatures, and therefore valuable commercially for lubricating cylinders in gas and steam engines, &c., and for the reason that it will not volatilize at a lower temperature than at which it was produced.

To preserve a suitably low temperature within the generating-chamber and to furnish volume for a desired current through the upward restricted opening, and thereby carry out the dry carbon of combustion as fast as created and while in an impalpable condition, an excess of steam is admitted with the oil, which fills the generating-chamber and mixes with the generated gases. The steam also serves another and important purpose, being highly heated but non-inflammable. The gas materials inclosed in the air-column may be passed through it, as hereinafter pointed out, practically without combustion.

I prefer to introduce the air under pressure and in a column surrounding the oil and steam with great velocity, so that the oil and steam within the center of the column may not be ignited until it has traversed the heated area of the generating-chamber and is stopped by the opposing inner wall, which impact explodes, dissociates, and reassociates the gaseous elements in the materials, as by explosion. The generated gases circulate within the chamber with the excess of steam, the heavy ungasified hydrocarbons precipitate, and the generated gases pass upwardly and out with the excess steam. The highest heats of combustion and points of generation are confined to the opposing wall of the generator, which is as near as may be within a volume of steam.

The agitating and volatilizing of the oil in the pipes with the superheated steam so finely divides the oil that the lighter elements quickly gasify when impacted on the walls of the generating-chamber and are converted into gases and are released upwardly with the excess of steam, carrying out the infinitesimal ash of combustion or other impurities so created with the current. The heavier elements of the oil precipitate downwardly by reason of their gravity, and thus the lighter and the heavier elements of the oil are released and separated. The resultant gases passing off with the steam may be introduced into a scrubber or other cooling-receptacle, the steam condensed, and the gas liberated for use.

The quality and the quantity of the lubricating-oil produced may be varied. For example, if the heavier grade is desired then the smaller quantity of steam is introduced to the coil and generator, which gasifies the greater amount of the oil by reason of the freer action of combustion and the increase of heat within the generator, and if the lighter oil or grade is desired then the greater quantity of steam is admitted, which restricts combustion and gasifies less of the elements of the oil, in which manner various grades of lubricating-oils may be produced and the quantity increased or diminished, while utilizing the resultant gases.

I have not claimed herein the preheating of the steam nor the mixing and heating of both the oil and steam, for the reason that they will be the subject-matter of further and separate applications.

What I claim, and desire to secure by Letters Patent, is—

1. The herein-described method of generating fixed gases from oil, steam and air for heating or illuminating purposes and separating the by-products therefrom, the same consisting in first heating the oil while in rapid circulation, then mixing the oil so heated with steam, discharging the oil and steam in the presence of air continuously into and through an area of sustained decomposing heat in a generator-chamber and with a resisted force finely dividing, atomizing, dissociating and reassociating the gaseous elements of said materials, and then simultaneously therewith conducting the gases so generated upwardly out of the generating-chamber and the ungasified heavy hydrocarbons downwardly therefrom by gravity into a receptacle external of the generator, whereby gas-producing materials are continuously converted into fixed gases and the heavy hydrocarbons removed therefrom and from a generating-chamber without interfering with the continuous production of gases and heavy hydrocarbons therefrom, substantially as described.

2. The herein-described method of gener-

ating fixed gases from oil, steam and air for heating or illuminating purposes, and securing the by-products of such generation, which consists in first heating the oil while in rapid circulation, then mixing the oil so heated with steam, discharging the oil and steam in the presence of air without interruption into a sustained decomposing degree of heat and with a resisted force, finely dividing, atomizing, dissociating and reassociating the gaseous elements thereof and concurrently therewith conducting the generated gases upwardly in a generating-chamber, while in an expanded condition and simultaneously therewith the ungasified hydrocarbons continuously downwardly and out of the generating-chamber into a suitable storage-receptacle and finally contracting the volume of the gases during their escape from the generating-chamber into a swiftly-moving upward current whereby fixed gases and heavy hydrocarbons are continuously produced and entirely discharged from a generator, substantially as described.

3. The herein-described method of concurrently producing fixed gas and lubricating-oils from crude petroleum and which consists in heating the oil, mixing the heated oil with steam, and an excess of steam, and in the presence of air igniting and discharging the oil and steam violently and continuously against resistance into a self-sustained decomposing degree of heat within a generating-chamber, then conducting the resultant gases, the ash of combustion and excess of steam in a swiftly-moving contracted current out of said chamber and discharging the precipitated hydrocarbons downwardly by their gravity into an external receptacle, whereby the volatile elements of the oil are released combined and discharged in fixed gases for use, and the heavy hydrocarbons are withdrawn in liquid form, and whereby the decomposition and heats of said generating-chamber are controlled by the supply of the steam and an excess of steam thereto, and whereby the withdrawal of liquid hydrocarbons and the generation of gas are constant and continuous, substantially as described.

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