

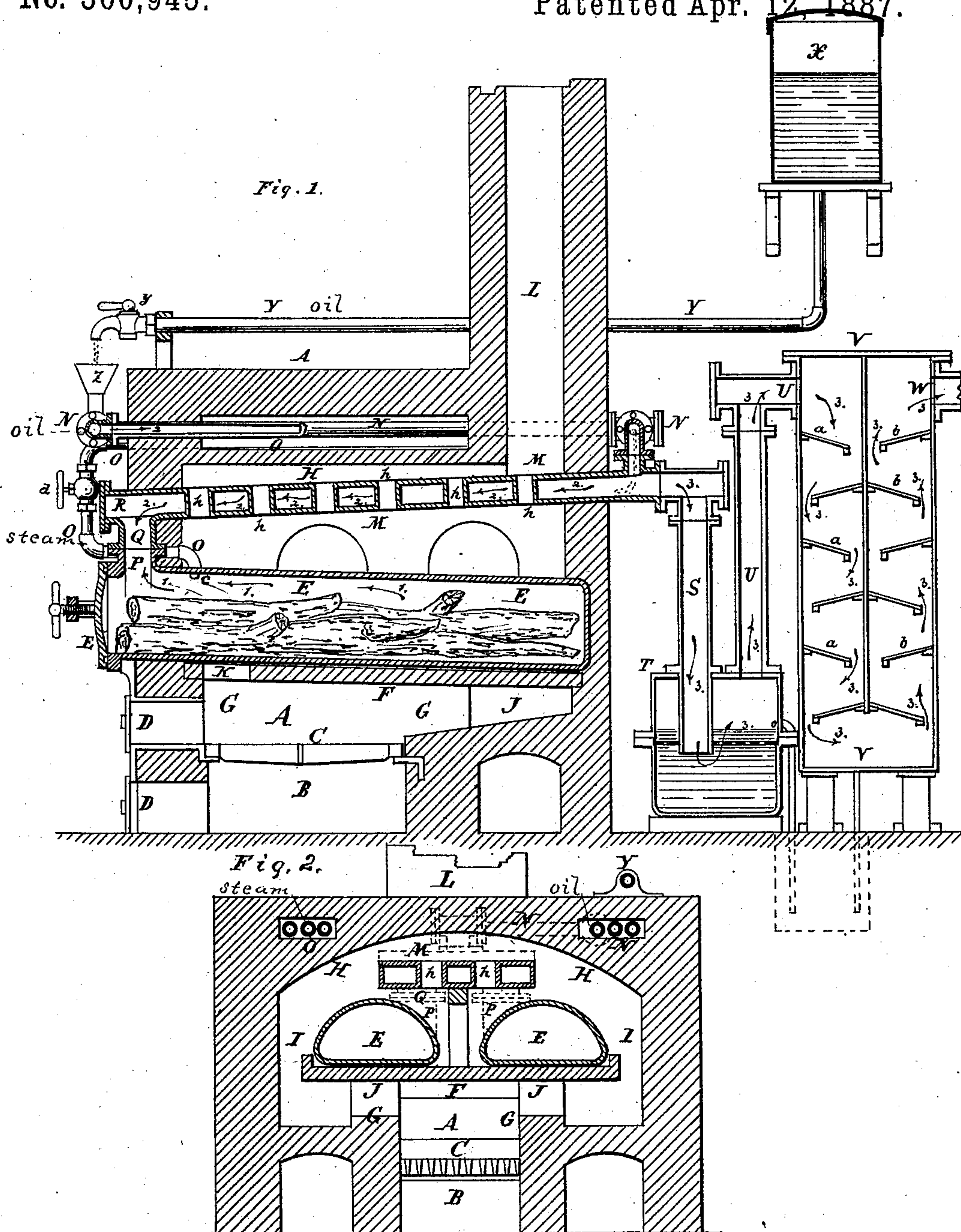
(No Model.)

J. D. AVERELL.

PROCESS OF AND APPARATUS FOR GENERATING WOOD GAS.

No. 360,945.

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WITNESSES:

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JOHN D. AVERELL, OF BROOKLYN, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF PART TO GEORGE F. SWIFT, OF SAME PLACE, WILLIAM H. PLATT, OF ALBANY, AND ARTHUR FITCH, OF NEW YORK, N. Y.

PROCESS OF AND APPARATUS FOR GENERATING WOOD-GAS.

SPECIFICATION forming part of Letters Patent No. 360,945, dated April 12, 1887.

Application filed April 24, 1886. Serial No. 200,037. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. AVERELL, a citizen of the United States of America, and a resident of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Process of and Apparatus for Generating Wood-Gas, of which the following is a specification.

10 This invention relates to a process for generating wood and oil gas by distilling and decomposing the wood in conjunction with superheated steam in a heated retort and simultaneously decomposing oil in a secondary heated
15 retort and passing the gases resulting from decomposition of wood and steam into such secondary retort and there combining and fixing them with the oil-gas. Both products are mixed under high heat and delivered from the
20 latter retort into a wash-box to dispose of their unfixed products, and the more fixed gases are passed through a scrubber for final disposal of the unfixed gases, and the fixed products are
25 purifying apparatus or directly stored in the gas-holder for consumption.

By means of the foregoing process, a high-candle-power fixed wood-gas is obtained at a comparatively small expense.

30 Said invention relates, also, to improvements in the construction of the apparatus for effecting successfully the process, hereinafter more fully set forth.

In the drawings hereto annexed, Figure 1 represents a longitudinal vertical section of an apparatus for carrying into effect my improvement. Fig. 2 is a transverse vertical section of the same.

A represents a suitable furnace with an ash-pit, B, and a grate, C, furnished with doors D, to remove the ashes and charge the coal. At a proper distance above the grate C are arranged the wood-retorts E, having their bottom sides protected by a tile floor, F, under them, and supported by a wall, G, along each
45 side of the grate, as shown in Fig. 2. Over the retorts E is made a large fire-proof arch, H, resting on the side walls, I, of the furnace.

Between the walls I and partition-walls G suitable flue-spaces are provided along the retorts, which spaces connect with the fire-box by
50 flue-openings J in the wall G, and connect between the wall I and retort with the space under the arch H and the top of the retorts. A small central opening, K, through the forward
55 part of the tile F, allows a portion of the draft from the fire-box to pass up between the retorts. The space under the arch H is connected with the chimney L at the rear end of the bench, and in said space is placed a central
60 flat oil-gas retort, M, arranged longitudinally in the furnace and passing through both of its ends above the retorts E. In the lining of the arch H are arranged several oil-heating pipes, N, and steam-superheating pipes O, both passing
65 longitudinally through and back and forward in the furnace, and are respectively connected at their outer ends—the oil-pipes with oil gas retort M and the steam-pipes with wood-distilling retort E—as shown in Fig. 1. The
70 wood-distilling retorts E are set lower at their rear ends, being thus inclined downward from front to rear, to facilitate the passage of their gaseous products to the forward ends, which have the throats P for delivery, and such
75 throats are connected with the throats Q, forming the inlets of the retort M. Said retorts E have each suitable lids to close their front ends after being charged with wood. The front opening of the retort M is also furnished with
80 a movable cover, R, and the rear end of this retort is connected with the discharge end of the oil-pipes N, and has attached, for delivery of the gaseous products, the vertical dip-pipe S, which conducts said products into the wa-
85 ter of the wash-box T, and said products pass from the gas-space of said box by means of the gas-main U into the left-hand gas-compartment of the vertical scrubber V, and over its shelves a to its bottom connecting-space, from
90 which said products rise from under the shelves b in the right-hand compartment of said scrubber and discharge through its delivery-opening W to the usual purifying apparatus or the gas-holder direct. (Not here shown.)

95 The delivery end of the steam-pipe O is con-

5 nected with the top of the forward parts of the
 retorts at *c*, and said pipe O is furnished with
 a suitable valve, *d*, for regulating the supply
 of steam to the retorts, which steam is suitably
 superheated in passing through the pipes in
 the top of the furnace. The rear end of the
 retort M is set considerably higher than its
 forward end, to facilitate the oil passing down
 in it and assist the gaseous products to pass up-
 10 ward. The oil for this retort is supplied from
 an elevated oil-tank, X, by means of the pipe
 Y, which has on its end the oil-cock *y*, by
 which its flow is suitably regulated. The inlet
 end of the oil-pipe N has a funnel, Z, into
 15 which the oil flows from the cock *y*. In pass-
 ing through the pipes N in the top of the fur-
 nace, forward and rearward, the oil becomes
 highly heated, and in that state passes into
 the retort M, in which it is decomposed. Its
 20 gaseous products mingle with and enrich the
 gaseous products from the wood, which pass
 up through them, and both are fixed together
 in said retort, and the resulting gas flows into
 the wash-box and scrubber, as before described,
 25 their unfixed parts being condensed and the
 resulting acid and tarry liquid overflow from
 the wash-box and scrubber for collection into
 a suitable cistern. The retort M is made with
 a number of vertical flues, *h*, passing through
 30 it, to obtain a large and powerful heating-sur-
 face.

In carrying out the process of manufacturing
 fixed illuminating wood-gas, the furnace is
 fired and the retorts are heated in the usual
 35 manner, the wood-retorts E being preferably
 raised to or above a lively cherry-red—that is,
 from 800° to 1,000° Fahrenheit. When prop-
 erly heated, the retorts E are charged with
 dry wood, pine wood being preferred. Soon
 40 after the distillation commences, steam is
 passed through the superheating-coils O, and
 in the superheated state is admitted into the
 wood-retorts, where it aids in driving off the
 gas from the wood and combines with the tarry
 45 matter expelled from the wood, resulting in
 their mutual decomposition and the formation
 of carbonic oxide, hydrogen, and carbureted
 hydrogen. The tarry matter is thus utilized
 by being mostly converted into gas by com-
 50 bining with hydrogen and oxygen resulting
 from the decomposition of steam; and, further,
 the tarry matter is thus prevented from accu-
 mulating and baking upon the sides of the re-
 tort in the form of hard carbon, thereby caus-
 55 ing waste and obstructing the process of mak-
 ing gas. At about the time that the genera-
 tion of wood-gas is commenced, hydrocarbon
 oil is supplied from tank X and pipe Y to fun-
 nel *z* by opening valve *y*, and is passed through
 60 the heating-coil N, where it is raised to the
 vaporizing temperature. In this heated con-
 dition it flows into the upper end of the in-
 clined retort M, and is quickly converted into
 rich carbureted hydrogen gas as it flows down-
 65 ward toward the opening or throat Q, leading

into the wood-retorts. The hot gases resulting
 from the distillation and decomposition of the
 wood and steam pass up and combine or mingle
 with the oil-gas and carry it along out of the
 retort, resulting in a fixed and rich illumi- 70
 nating-gas of uniform high candle power.

By preheating the oil in the coils, as above
 described, it is more certain to be converted
 into fixed gas in retort M, and the formation
 of condensable tarry or oily vapor thereby 75
 avoided. The hydrogen and other light or
 poor gas from the wood-retort combines ad-
 vantageously with the rich oil-gas and pre-
 vents it from being decomposed and converted
 into lamp-black. 80

I am aware that heretofore it has been pro-
 posed to heat the oil previous to its admission
 to the decomposing-retort in the manufacture
 of oil and water gas with coal.

I am also aware that steam has been passed 85
 into the residual charcoal in the manufacture
 of wood-gas; but my invention is distinguished
 from such process by the fact that superheated
 steam is passed into the wood-retort and de-
 composed with it during its distillation, where- 90
 by the above-stated advantageous results are
 secured.

The preheating of the oil is also a new and
 advantageous step in connection with my pro-
 cess of distilling and decomposing wood and 95
 steam together and then mingling the result-
 ing gases with fixed oil-gas in the generating-
 retort M.

The apparatus, combined and arranged as
 shown and specifically claimed, is distinct 100
 from other wood-gas generators.

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

1. The process of generating fixed illumi- 105
 nating wood-gas, which consists in distilling
 the wood under the influence of steam in a
 heated retort and simultaneously generating
 oil-gas by first heating the oil and then passing
 it into a secondary heated commingling-retort, 110
 where it is converted into gas, and passing
 the gaseous products resulting from the wood
 and steam from the wood-retort into such sec-
 ondary retort, and combining and fixing them
 with the oil-gas, so as to form a gas of uniform 115
 high candle power, substantially as described.

2. In an apparatus for generating illumi-
 nating wood-gas, the combination, with the
 furnace, of the wood-distilling retort, the oil-
 gas-generating retort connected therewith, a 120
 steam-superheating coil, O, having a control-
 ling-valve and connecting with the wood-re-
 tort, and an oil-heating coil, N, located in the
 brick-work above the oil-gas retort and con-
 necting with the oil-gas retort, all connecting 125
 and operating as and for the purpose described.

3. In an apparatus for generating illumi-
 nating wood-gas, the combination, with the
 furnace and wood-distilling retort suitably set
 therein, of the connected oil-gas-generating 130

retort inclined from its rear end downward to
its connection with the wood-retort, a steam-
superheater connecting with the wood-retort,
and an oil-heater connecting with the rear and
5 upper end of the oil-gas retort, connecting and
operating as and for the purpose described.

In testimony that I claim the foregoing as

my invention I have signed my name, in pres-
ence of two witnesses, this 17th day of April,
1886.

JOHN D. AVERELL.

Witnesses:

REINHOLD BOCKLEN,
THEODORE FELDSTEIN.