R. M. POOLE.

APPARATUS FOR MANUFACTURING WOOD GAS.

APPLICATION FILED AUG. 26, 1912.

1,085,389.

Patented Jan. 27, 1914.

2 SHEETS—SHEET 1.

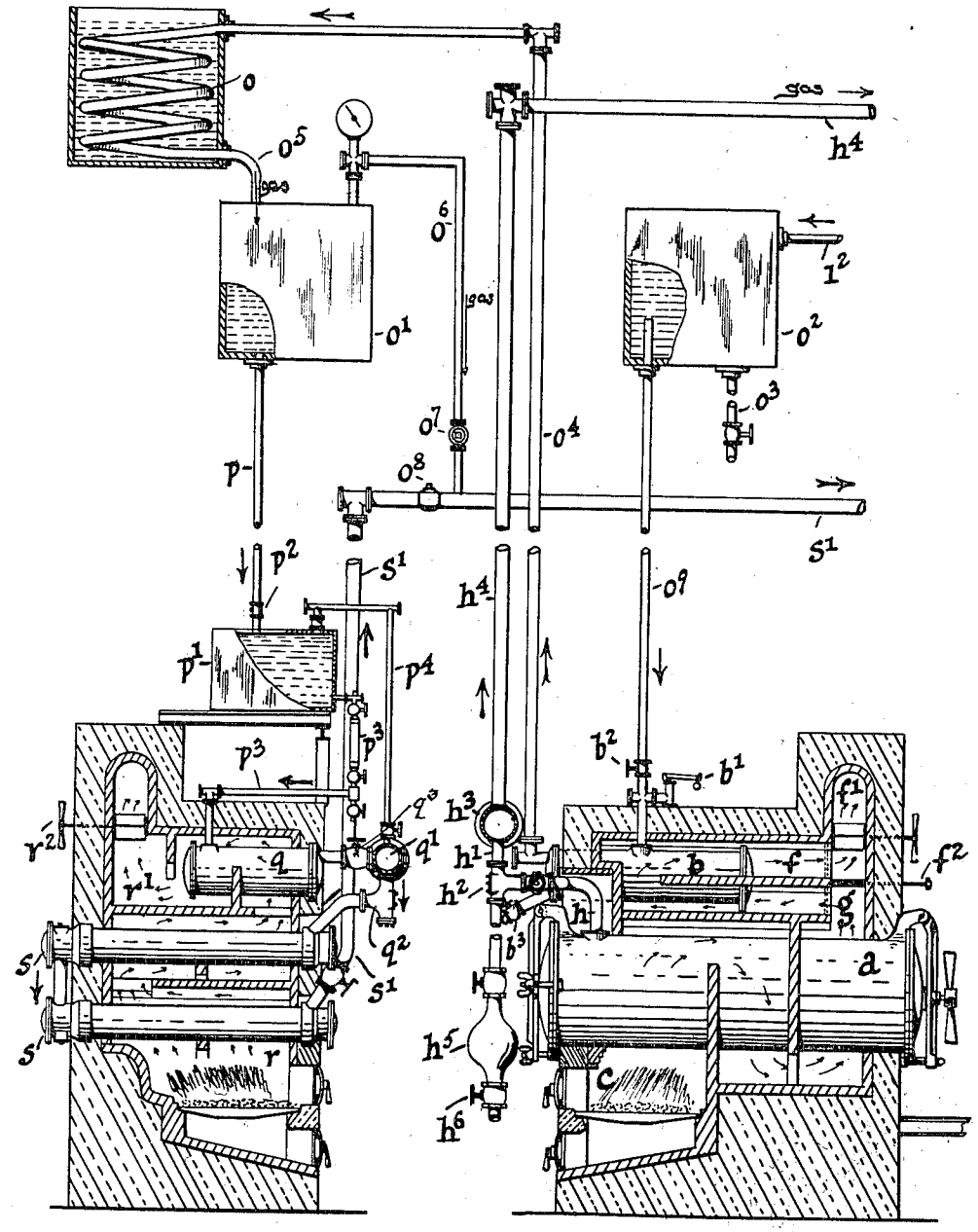

Fig. 1

Witnesses

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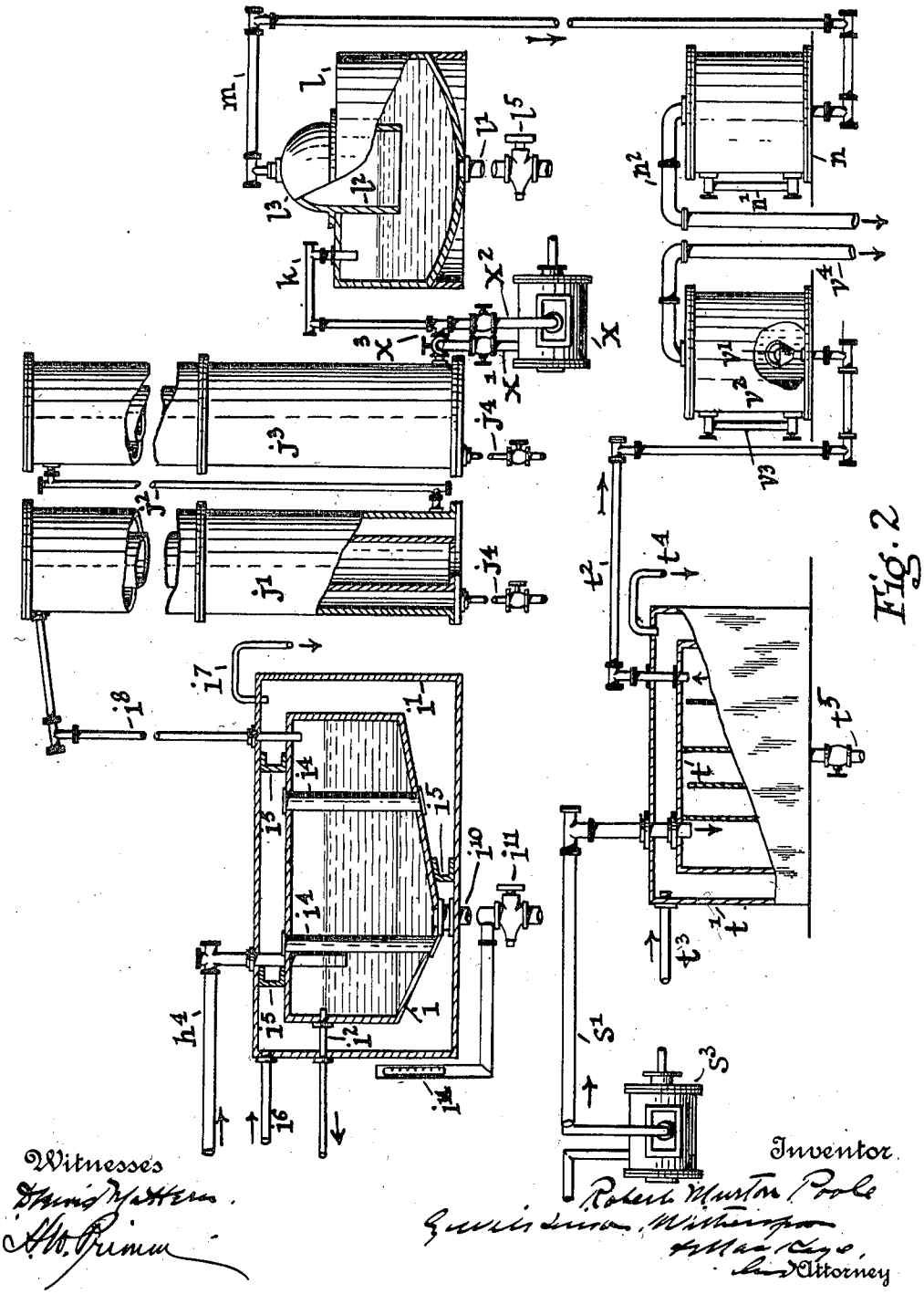

Fig. 2

Witnesses

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UNITED STATES PATENT OFFICE.

ROBERT MURTON POOLE, OF MOUNT GAMBIER, SOUTH AUSTRALIA, AUSTRALIA.

APPARATUS FOR MANUFACTURING WOOD-GAS.

1,085,389. Specification of Letters Patent. Patented Jan. 27, 1914.

Application filed August 26, 1912. Serial No. 717,200.

To all whom it may concern:

Be it known that I, ROBERT MURTON POOLE, a subject of the King of Great Britain and Ireland, &c., residing at Mount Gambier, in the State of South Australia, Commonwealth of Australia, have invented certain new and useful Improvements in Apparatus for Manufacturing Wood-Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to means for producing from wood illuminating and fuel gases, and valuable by-products. The illuminating gas can in known manner be strongly compressed, as for transport and storage, and can be expanded for consumption. It has special lighting power, and if burned on a Welsbach or like mantle produces a light sufficiently approaching daylight in quality to allow of excellent night photography including portraiture with apparatus ordinarily used with day photography. It allows of color work at night that is not now usual because of the difficulty of then distinguishing colors. It can be advantageously burned at lower pressure than suits coal gas—with under 2 inches of pressure excellent light is obtained. It is not adversely affected like air gas made with benzin by changes of temperature.

My gas yields a blue flame, almost invisible by day, which affords great heat and which is useful for cooking it being free from unpleasant odors or products of combustion. It is also valuable for internal combustion engines, as it deposits practically no carbon in the combustion chamber.

By retorting wood, and by the treatment of its gases, I obtain charcoal and many by-products the commercial value of which is much in excess of the cost of production. Some woods are of greater gas making value than others, and when hard and soft woods are available I mix them. *Pinus insignis* produces more gas of high lighting quality (by the aid of incandescent mantles) than does an equal weight of eucalyptus, but the latter and hard woods generally are nevertheless valuable.

The accompanying drawings are diagrammatic, and not to scale, nor do they show relative sizes or proportions of parts, nor all such obvious details as the dampers, valves, hand holes, and so on that are installed in practice, such minor points of engineering construction being already well understood.

Figure 1 is a diagrammatic view, with parts shown in section, of a portion of an apparatus constituting one embodiment of my invention; and Fig. 2 is a similar view of the remaining portion of the apparatus; the pipe connections between the two portions of the apparatus being indicated by similar reference symbols in both figures.

Referring to the drawings, a indicates one of a series of wood retorts connected by pipes h and h' with a header h^3 for receiving the gases and vapors distilled from the wood. The pipes h' are provided with downward extensions having one or more enlargements h^5 for the deposition of heavy substances, a valve h^6 being provided to permit ready removal of said deposits. The retorts a are heated by suitable furnaces c provided with chambers f containing auxiliary retorts b and communicating with the discharge flues f'; dampers f^2 being provided in said flues for controlling the flow of the hot products of combustion through said chambers f. As shown in the drawings, the wood retorts a are provided at both ends with discharging doors exterior to the furnace walls and the connections h and h' of said retorts are also positioned exteriorly of the furnace to prevent injurious overheating thereof and to permit ready access for repairs.

A pipe h^4 conducts the vapor and gases from the header h^3 to an elevated condenser i in which the different liquid products of condensation are partially separated by gravitation, said pipe h^4 discharging into the condenser i at a point below an outlet pipe i^2 for the lighter liquid condensations, such as pyroligneous acid. The heavy tarry condensations are withdrawn from the condenser from time to time by an outlet pipe i^{10} provided with a valve i^{11}; an overflow pipe provided with a gage i^{14} being connected with said pipe i^{10} for preventing the tarry condensations from rising in the condenser to the level of said outlet pipe i^2 of the latter. This improved construction eliminates all danger of the uncondensed gases remaining in contact with the tar during cooling, thereby preventing absorption of illuminants from the gases by said tar. I have shown the condenser provided with a water

jacket i' provided with baffles i^5, and with an inlet i^6, and an outlet pipe i^7 for the cooling water; cooling tubes i^4 extending through the condenser in communication with said water jacket. The hot retort gases delivered by the pipe h^4 to the condenser i are materially cooled by bubbling up through the cooled liquid condensations therein, and are conducted from the condenser by a pipe i^8 to the top of an annular condenser j' where their temperature is further reduced and impurities condensed; the liquid condensations being withdrawn from said annular condenser by a valved drain j^4. I have shown a pipe j^2 for conducting the gases from the bottom of the condenser j' to the top of a duplicate condenser j^3, and the gas can be thus circulated downwardly through any desired number of condensers. The annular condensers can be readily water cooled in hot weather by flowing water downward over their exterior surfaces.

An exhauster x is shown for withdrawing the gases through a pipe x' from the condenser j^3 and delivering it through a pipe x^2 to a washer and purifier l containing lime water, or other suitable purifying substance; the gas passing through the lime water into a bell l^2 l^3 provided with a discharge pipe m. The pipes x' and x^2 are provided with valves and connected by a valved by-pass x^3 to provide means for cutting out the exhauster x and directing the gas from the condenser j^3 to the purifier l. The purifier l is provided with a dished bottom having an outlet pipe l' controlled by a valve l^5 for drawing off the heavier substances deposited from the gas.

The pipe m discharges the purified gas into a washer n provided with a gage glass n', and maintained partly full of water which is renewed or freshened from time to time; the gas entering through a submerged gravity-seated ball valve similar to the hereinafter described valve v'. The gas is conducted by a pipe n^2 from the top of the washer n to the gas holder, and is there termed "gas y".

The lighter liquid condensations are conducted by the pipe i^2 from the condenser to a receiver o^2 which has a valve-controlled drain o^3 and communicates with the heated auxiliary retort b by a feed pipe o^9 provided with a controlling valve b^2 and a safety valve b'; said valve b^2 being adjusted to maintain a drip or feed, proportionate to the rate of gasification in the retort b. The temperature of the retort b is regulated by the damper f^2 to drive off the gases and readily volatile matters, which are conducted by a pipe o^4 to a condenser coil o, from which the distillates are discharged into a tank o'; a residue of tarry matters, creosote, etc. being drained from the retort b by a drain pipe provided with a valve b^3. The tank o' is provided with a discharge pipe p controlled by a valve p^2 for conducting the liquid distillates to a feed reservoir p', which latter is shown provided with a sight feed device p^3 for furnishing a uniform supply of the liquid distillates to a vaporizer q within the heating chamber r' of a furnace provided with a damper r^2. The vaporizer q is heated to cause vaporization and partial gasification of the distillates supplied thereto, and the vapor is conducted therefrom through a valve-controlled pipe q^3 to a header q'; a valved by-pass p^4 connecting said header with the feed reservoir p' to equalize the pressure in the latter for regulating the flow through said sight feed p^3.

A pipe q^2 conducts the gases from the vaporizer q to one or more highly heated retorts s in the furnace chamber r, for "fixing" said gases. I have shown two retorts s connected at their rear ends to cause the gases to flow successively therethrough; gases of high quality being conducted from said retorts s by a pipe s' leading to a condenser t. Such gases as are not condensed in the coil o pass from the distillate tank o' through a pipe o^6 provided with a non-return check valve o^7 to said pipe s', where they intermix with the gases from the retorts s. The condenser t is provided with a water jacket t' having inlet and outlet pipes t^3 and t^4 for the cooling water, and with a valve-controlled drain pipe t^5 for removing the impurities condensed from the gas; an exhauster s^3 may be placed in the pipe s' if desired.

The cooled gases are conducted by a pipe t^2 from the condenser t to a washer v^2 provided with a gage glass v^3 and a submerged gravity-seated ball valve v', similar to the washer n previously described. The gas is conducted by a pipe v^4 from the top of the washer v^2 to a separate gas holder and is there termed "gas z."

The gases "y" and "z" are stored in separate tanks, from which they are conducted to a gasometer where they are mixed to produce a high quality gas.

The residues drawn off from the condensers i, j', j^3, and t, and also the residues from the tank o^2 and the retort b, constitute valuable by-products which can be utilized in the arts in the usual manner.

I have illustrated and described preferred and satisfactory constructions, but changes can be made within the spirit and scope of my invention.

I claim:—

1. In an apparatus for manufacturing wood gas, the combination of wood retorts, means for heating said retorts to produce a destructive distillation of the wood, means for condensing the crude products from the permanent gases in the volatile products from said retorts, means for distilling the

light distillates in such condensation, means for subjecting the gases of such last distillation to a high temperature for fixing said gases, and means for mixing such fixed gases with the permanent gases first produced by the destructive distillation of the wood.

2. In an apparatus for manufacturing wood gas, the combination of a furnace, wood retorts within said furnace for producing a rapid destructive distillation of the wood, a heating chamber in said furnace, an auxiliary retort in said chamber, a damper for regulating the passage of the hot furnace gases through said chamber, means for condensing the crude products from the permanent gases in the volatile products from said wood retorts, means for conducting the light distillates of such condensation to said auxiliary retort for partially gasifying such distillates, and means for subjecting the gas from said auxiliary retort to a high fixing temperature.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ROBERT MURTON POOLE.

Witnesses:
FREDERICK HENRY DANIEL,
JAMES ISAAC FAIRWEATHER.