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B. E. ELDRED & C. ELLIS.

APPARATUS FOR GENERATING GAS.

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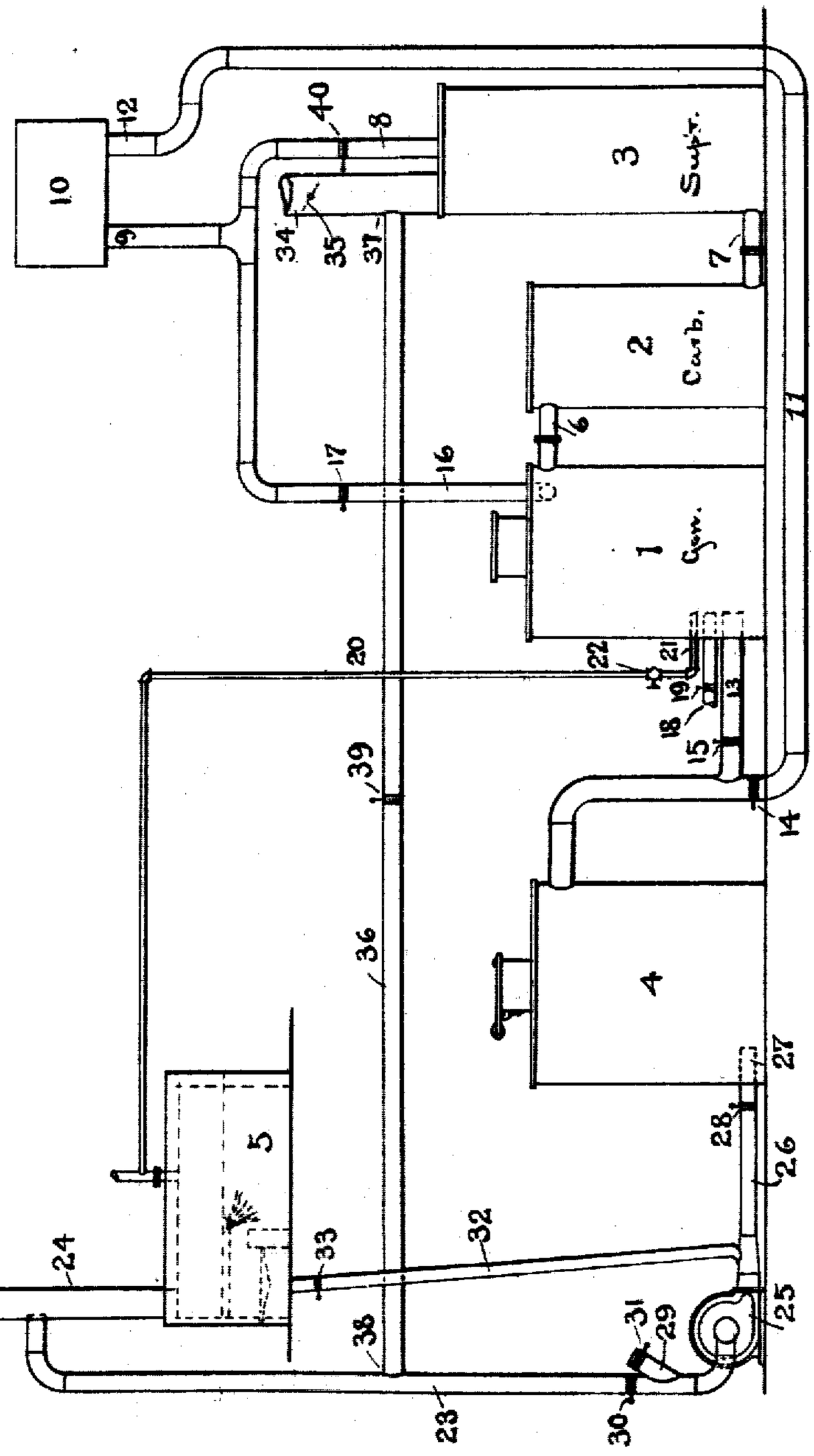

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APPARATUS FOR GENERATING GAS.

No. 811,706. Specification of Letters Patent. Patented Feb. 6, 1906.

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To all whom it may concern:

Be it known that we, BYRON E. ELDRED and CARLETON ELLIS, citizens of the United States, and residents of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas, of which the following is a specification.

Our invention relates to apparatus for the manufacture of illuminating-gas, and particularly to the kind known as "water-gas."

The large amount of carbon monoxid which ordinary carbureted water-gas contains has caused it to be objectionable for domestic purposes, owing to the poisonous character of the carbon monoxid, and many attempts have been made to change its constitution and reduce the content of carbon monoxid without seriously affecting its illuminating quality. Such efforts have not proved successful up to the present time, and as a solution of this problem methods are hereinafter set forth in this application for the production of a gas containing a less amount of carbon monoxid than that present in water-gas.

The apparatus constituting this invention involves a method of manufacturing gas for power or illuminating purposes which consists in the admixture of water-gas with producer-gas. If the gas is to be used for power purposes, enriching or carbureting is unnecessary. Producer-gas as ordinarily made by the injection of a mixture of air and steam into a deep mass of incandescent coal is quite unsatisfactory for use in this way for illuminating purposes. Owing to the high temperature, the volatile hydrocarbons of the coal are largely destroyed in the gas-producer, and the gas, as a consequence, has little or no illuminating power. For power purposes, especially where anthracite coal or coke is used, hydrogen is added to the gas. For this purpose we make use of apparatus for the generation of producer-gas in which we employ as the endothermic or cooling constituent in the air-blast supplied to the producer a regulated amount of carbon dioxid. The gas made in this manner is mixed with water-gas either before its passage into the carbureter or after its exit from the superheater or at any convenient point.

Our invention comprises apparatus for the generation of producer-gas by means of a draft-current supplied to the producer containing carbon dioxid derived from any suitable source.

It comprises a water-gas apparatus consisting of generator, carbureter, and superheater.

It also largely comprises mechanical draft appliances for impelling the various gaseous currents through the system, also various conduits, flues, dampers, and valves for the regulation and adjustment of the relative proportions of the gases entering into the reactions.

In the accompanying diagrammatic drawing, 1 is a water-gas generator connected by pipe 6 to carbureter 2, which in turn is connected by pipe 7 to superheater 3. 4 is a gas producer of the type above specified. At 5 is shown a steam-boiler. A pipe 8 leads from superheater 3 to the gas-main 10, which it enters at 9. The producer 4 is also connected with the gas-main 10 by pipe 11. A branch pipe 13 establishes connection between gas-producer 4 and water-gas generator 1. Valves 14 and 15 are used for adjustment of the flow of gases. The pipe 16 leads from generator 1 to gas-main 10. Valves 17 and 40 in pipes 16 and 8, respectively, are used for adjustment of the amounts of carbureted and uncarbureted water-gas entering 10.

18 is an air-pipe for admitting air to generator 1, 19 being a valve controlling this supply.

20 is a steam-pipe running from steam-boiler 5 to generator 1, entering at 21 and having the valve 22. A pipe 23 connects the stack of the steam-boiler 24 with the fan 25. The outlet or pressure side of the fan is connected with producer 4 at 27 by means of the pipe 26. On the inlet side of the fan is placed the air-inlet pipe 29. Valves 28, 30, and 31 control the volume of the gas and air passing through these different flues.

32 is a pipe connecting the ash-pit of steam-boiler 5 with the outlet-pipe of fan-blower 25. An adjusting-valve is shown at 33. An outlet-pipe 34 is shown on superheater 3, through which depart the products of the "blow." A damper is shown in this pipe at 35. A pipe 36 connects exit-pipe 34 with pipe 23 at points 37 and 38, respectively.

39 is a regulating-valve.

Our method of operation is as follows: The

water-gas system comprising the generator, carbureter, and superheater 1, 2, and 3, respectively, is operated in the usual well-known manner—that is to say, a deep bed of ignited fuel is blasted intermittently with air and then with steam, the air-blast and products of combustion therefrom being used to heat the carbureter and superheater while the gas produced in the steam-blast is carbureted by passage through the carbureter with the addition therein of oil or other illuminant, whereupon the gas enters the superheater and is subjected to a sufficiently high temperature to convert the illuminants into a permanent gaseous form. The gas so made is conducted to the gas-main 10. In the gas-producer 4 is carried a deep bed of fuel, preferably bituminous coal, and this mass of fuel having been brought to a state of ignition in any suitable way the fan-blower is operated so as to introduce into and pass through this mass of fuel a draft-current composed of air and products of combustion. The amount of air admitted is regulated by adjustment of valve 31. The amount of products of combustion or carbon dioxid is regulated by the adjustment of valves 30 and 39. The carbon dioxid and oxygen of this gaseous mixture in their passage through the mass of fuel in the producer are reduced to carbon monoxid. The carbon dioxid in splitting up into carbon monoxid absorbs heat and reduces the temperature of the producer. As carbon dioxid splits up easily at low temperatures and as this temperature of decomposition is much lower than that possible with steam, it is evident that the producer may be run on a much lower temperature plane than that possible with a steam-operated producer. This reduction in temperature prevents the decomposition of hydrocarbons and also their polymerization into tarry bodies, and thus delivers from the producer a gas rich in these illuminating constituents. This gas is preferably taken through pipe 11 to the gas-main 10, where it is subsequently scrubbed in the manner customary with water or retort gas. In some cases it is desirable to pass the gas through the mass of fuel in generator 1 and to carburet it and superheat it in the manner similar to the treatment resorted to with water-gas to improve its luminosity. An alternative is to pass the producer-gas through the generator 1 and out through pipe 16 to the gas-main 10. The products of combustion arising from generator 1 during the air-blowing period or blow prior to the admission of steam contain a considerable amount of carbon dioxid which may be used in the gas-producer. For this purpose the pipe 36 is shown allowing the passage of these products of combustion through pipe 23 and fan 25 into producer 4.

A connection is shown for the passage of stack-gas and air through pipe 32 to the steam-boiler 5 to operate this boiler under the process above mentioned.

The best mixture of producer-gas and water-gas we find to be in the proportions of one of the former to three of the latter. The introduction in this manner into the water-gas of a certain amount of nitrogen does not, as would be the case ordinarily, act deleteriously on the illuminating power of the gas. The richness of the producer-gas in hydrocarbons, provided a coal containing an abundance of volatile matter is used, largely compensates for the presence of nitrogen, the calorific and illuminating powers approximating closely to that of pure water-gas. From one ton of coal only about fifty thousand cubic feet of water-gas can be generated, while from our producer one ton of coal yields nearly one hundred and fifty thousand cubic feet of gas. We find that the mixture of one to three above mentioned to be suitable where the average run of soft coal is used; but the proportioning of the relative amounts of the two constituents is largely a matter of experiment, owing to the variations in the fuel used in each case. With the proportions above mentioned a saving of from twenty-five per cent. to thirty per cent. results in the cost of manufacture of illuminating-gas.

What we claim is—

1. Apparatus for generating illuminating-gas consisting of a water-gas generator and carbureter, a gas-producer, means for supplying carbon dioxid and air to said gas-producer, means for regulating the relative amounts of the carbon dioxid and air, and means for mixing the water-gas and producer-gas in predetermined amount.

2. Apparatus for generating illuminating-gas consisting of a water-gas generator and carbureter, a gas-producer, a steam-boiler furnace, means for supplying carbon dioxid from said steam-boiler, and air to said gas-producer, means for regulating the relative amounts of the carbon dioxid and air, and means for mixing the water-gas and producer-gas in predetermined amount.

3. Apparatus for generating illuminating-gas consisting of a water-gas generator and carbureter, a gas-producer, means for supplying the products of combustion to the air-blow and air to said gas-producer, means for regulating the relative amounts of the carbon dioxid and air, and means for mixing the water-gas and producer-gas in predetermined amount.

Signed at New York city, in the county of New York and State of New York, this 4th day of February, A. D. 1905.

BYRON E. ELDRED.
CARLETON ELLIS.

Witnesses:
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