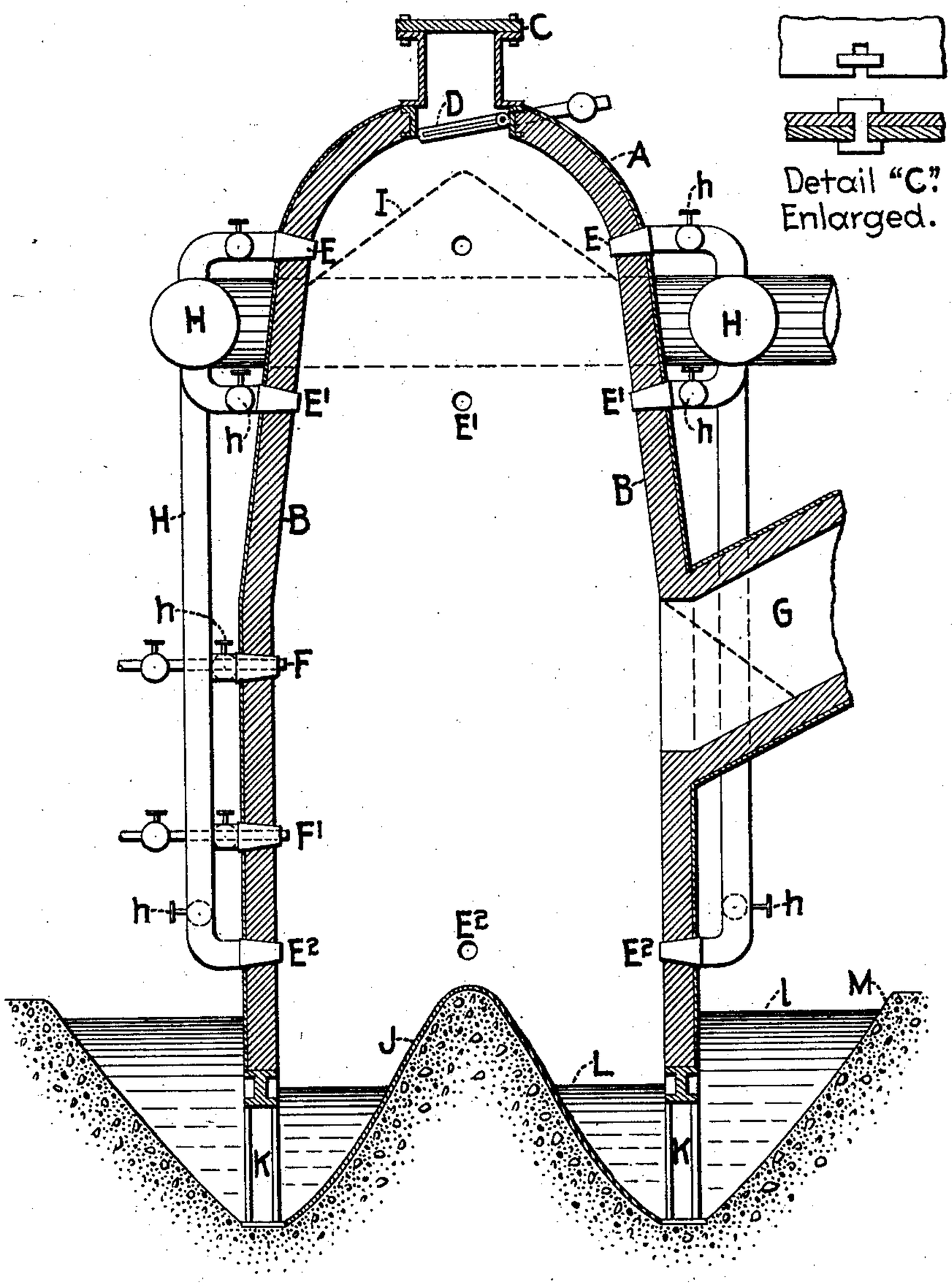
No. 735,272. PATENTED AUG. 4, 1903.

W. KENT.

PROCESS OF MAKING GAS.

APPLICATION FILED SEPT. 25, 1901.

NO MODEL.



Detail "C." Enlarged.

WITNESSES:

Jacob Wernli.

Geo. H. Bell.

INVENTOR

William Kent.

No. 735,272. Patented August 4, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM KENT, OF PASSAIC, NEW JERSEY.

PROCESS OF MAKING GAS.

SPECIFICATION forming part of Letters Patent No. 735,272, dated August 4, 1903.

Application filed September 25, 1901. Serial No. 76,442. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM KENT, a citizen of the United States, residing at Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Gas-Making Processes; 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.

The object of my invention is to produce a heating-gas from bituminous coal or other fuel which shall be free from condensable tarry vapors and from hydrocarbon gases, and which will therefore be suitable for use in gas-engines or in furnaces in which it is desirable to have a clear smokeless flame.

It is well known that producer-gas made from bituminous coal in any of the ordinary forms of producers is heavily charged with tarry vapors, which are apt to condense in the pipes and ports leading to the cylinders of gas-engines, and it is therefore unsuitable for use in such engines. Gas so made also contains a large percentage of hydrocarbon gases, which are apt to give a smoky flame when burned with an insufficient supply of air. In order to make a gas in any of the ordinary forms of producers which shall be free from tarry vapors and from hydrocarbon gas, it is necessary that the fuel be either anthracite coal or coke containing no bituminous matter.

In the process herein described all the bituminous or hydrogenous part of the fuel is first thoroughly burned into carbon dioxid and water-vapor, and these are afterward decomposed by passing them through a mass of incandescent coke, forming carbon monoxid and hydrogen, which are the constituents of water-gas.

Referring to the drawings, Figure 1 is a cross-section of the producer used in my process, and Fig. 2 shows a detail of the cover of the coal-charging hopper.

The producer consists of a furnace or shaft somewhat similar in shape to a blast-furnace. I prefer to build the lower part of it cylindrical and the upper part of it in the shape of a frustum of a cone, so that as the bituminous coal swells in the coking operation as it descends it will not jam on the sides of the shaft, but will be free to move downward.

A is the external sheet-metal casing of the producer, and B its fire-brick lining. The coal is fed in at the top through a hopper C, provided with a valve D at the bottom and with a tight cover on top. This hopper may have the form of the covered bell and hopper commonly used in blast-furnaces. When the producer is nearly full, the upper surface of the coal will take approximately the form of a cone, as shown in the dotted line I, leaving an open space between it and the top of the producer.

H is a blast-pipe receiving air from a blower, which is preferably a positive blower of either the rotating-drum or the piston type. By means of a series of branch pipes it delivers air into the producer at different points through the twyers E E′ E². Valves *h* are placed in the branch pipes, so that the air-pressure in front of the several twyers may be regulated as desired.

F F′ are steam or water pipes through which either steam or water may be delivered into the producer as desired.

The bottom of the furnace may conveniently be closed by the well-known water seal frequently used in other forms of producers consisting of a deep trough M around the cone J in the bottom of the producer containing water L *l;* but it is evident that a grate of either the stationary or the revolving form, such as is used in the Taylor producer, may be employed instead, or the bottom may be closed like the bottom of a blast-furnace, the ashes in this case being fused and run out in the form of liquid slag.

G is the gas-exit flue. There may be one or more of such flues, according to the size of the producer.

The operation of the process is as follows: Before starting the production of gas of the quality desired a fire of wood is first made in the shaft, to which coal is added gradually, air being supplied at the bottom, until the shaft is thus made nearly full of incandescent coke, or if a supply of coke is available it may be charged into the shaft and by means of fire and a blast of air applied at the bottom be brought into a highly-heated state.

The shaft being in this manner nearly filled with incandescent coke, the operation of gas-making will then be begun and continued regularly, as follows: A fresh supply of coal is delivered from the hopper C by opening the valve D, the cover being tightly closed. This fresh coal being heated by the hot coke lying below and being impinged upon by a blast of air under considerable pressure from the upper series of twyers, it rapidly distils off its volatile matter, which is immediately burned by the excessive supply of air, forming carbon-dioxid gas and superheated steam. These pass downward through the underlying mass of coke, which is kept in a state of incandescence by the burning of a portion of it by air admitted from other twyers and is decomposed by the hot coke forming carbon-monoxid gas and hydrogen. The carbon dioxid formed by the burning of a portion of the coke is also decomposed by passing through the body of coke, forming additional carbon monoxid. The gases thus formed, together with the nitrogen obtained from the air, escape into the exit-flue, which is preferably located at about the middle of the shaft. The coke in the bottom portion of the producer is completely burned to ashes by air admitted through the twyers near the bottom, and the carbon dioxid thus formed passing through the superjacent mass of hot coke is also converted into carbon monoxid, which finds its way to the exit-flue. The ashes accumulating in the bottom of the producer are removed through the water seal in the customary manner, or they may be removed through grates or fluxed into a slag and run out through a slag-block, as in the operation of blast-furnaces.

The gases formed as above described will pass into the exit-flue at a very high temperature, which is objectionable for most purposes unless the fuel used contains a large percentage of moisture, the decomposition of which into hydrogen gas will tend to cool the gas. In most cases it will be found desirable to cool the gas by means of either steam, or water which will flash into steam, injected by the pipes F F′, located at convenient places near the middle of the height of the producer. It is desirable to inject as large a quantity of steam as possible in order to increase the proportion of hydrogen, and thereby increase the heating value of the gas; but it is necessary not to increase the quantity to such a point as will cool the coke and the gas to a degree which will prevent the decomposition of the steam and the reaction by which carbon dioxid is decomposed into carbon monoxid.

An ideal gas formed by the process here described will contain no hydrocarbons or condensable tarry vapors and will be as high in hydrogen and as low in nitrogen as possible. The carbon in the fuel will be nearly all converted finally into carbon monoxid, leaving but little to escape as carbon dioxid. The nitrogen will be that derived from the air blown into the producer.

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

The process of making gas which consists in blasting a charge of coal to incandescence, then feeding a fresh supply of coal upon said charge and blowing air directly into the charge itself at points substantially at the top and bottom of the same, and at the same time feeding steam or water into the charge at or near the zone of greatest temperature and withdrawing the gas produced substantially at a point midway of said charge, substantially as set forth.

WILLIAM KENT.

Witnesses:
ALFRED E. KORNFELD,
F. W. FROST.