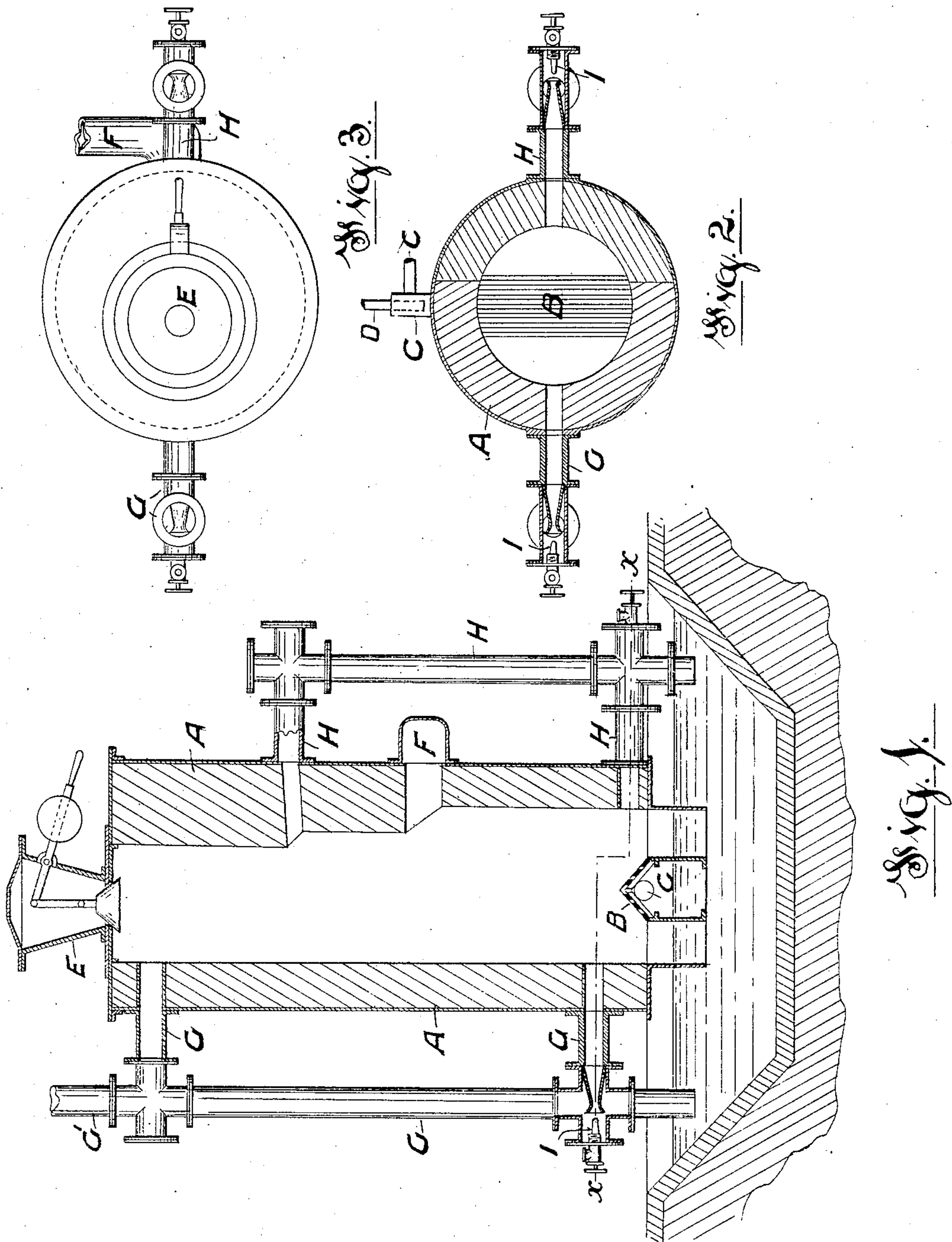


No. 786,474.

PATENTED APR. 4, 1905.

C. WHITFIELD.
GAS PRODUCER.

APPLICATION FILED MAY 25, 1903.



Witnesses

Pickles D. Bailey
John Camp

Inventor:

Charles Whitfield

By his Attorney: Walter Gunn.

UNITED STATES PATENT OFFICE.

CHARLES WHITFIELD, OF KETTERING, ENGLAND.

GAS-PRODUCER.

SPECIFICATION forming part of Letters Patent No. 786,474, dated April 4, 1905.

Application filed May 25, 1903. Serial No. 158,678.

To all whom it may concern:

Be it known that I, CHARLES WHITFIELD, engineer, a subject of the King of Great Britain, residing at Kettering, in the county of Northampton, England, have invented a new and useful Apparatus for Manufacturing Producer and Water Gas, (for which I have obtained provisional protection in Great Britain, No. 3,101, bearing date February 10, 1903,) of which the following is a specification.

This invention has for its object the construction of an apparatus for manufacturing producer and water gas and one which will effectually deal with a great range of fuels (practically all kinds) from anthracite coal or metallurgical coke to bagasse and without inconvenient deposits of tar. To attain this end, use is made of an ordinary producer-body to which is applied two circulating-pipes, one for drawing off the lighter hydrocarbon vapors and the other for drawing off the heavier or less volatile vapors, and said pipes reintroducing the said vapors into the producer at points where they require to pass through incandescent portions of the fuel, and thus become converted into a fixed gas before reaching the final gas-outlet. Heretofore one circulating-pipe only has been used; but in practice it is found that to insure the conversion of all the hydrocarbon vapors into a fixed combustible gas two pipes are absolutely necessary.

Upon the accompanying drawings, Figure 1 represents a vertical section of a generator or producer arranged in accordance with my improvements and shown fitted over a water-sealed ash-pit, while Fig. 2 represents a sectional plan of the producer on line *x x*. Fig. 3 represents an exterior plan.

A is the body of the producer, fitted upon any suitable foundation and preferably over a water-sealed ash-pit, as shown.

B is the fire-grate, which may be of any convenient form, but is preferably of inverted-V or ridge formation, as shown. Into the space below the grate is delivered the air for combustion through pipe C, and, if desired, a supply of steam through pipe D for keeping the grate-bars cool.

E is the charging-hopper, and F the final gas-outlet.

G is the circulating-pipe heretofore used, and H is the extra pipe, forming the chief feature of this invention. The pipe H at its upper end lies between the upper end of the pipe G and the final gas-outlet F. The pipe G at its lower end opens into the producer at a point slightly above the zone of combustion, and the pipe H at its lower end opens into the producer at a point opposite the zone of combustion. Both pipes are fitted with a jet I supplied with steam under pressure.

To insure the obtaining of uniform results, the producer should be kept charged with fuel to a fairly constant level.

When ordinary bituminous coal is used, the lower portions thereof in the producer are raised in temperature to incandescence by ordinary combustion, assisted by a supply of air through pipe C under pressure from below the grate. When so raised in temperature, the fuel then gives off the hydrocarbon vapors, the more volatile portions of which rise to the top of the producer and are drawn off through the pipe G and injected, by means of its jet I, into the incandescent portions of the fuel. The less volatile portions of the hydrocarbon vapors which rise to the upper part of the producer, but fail to reach the outlet leading to the pipe G, are drawn off through the pipe H and injected, by means of its jet I, into the hot portions of fuel on the opposite side of the producer. These latter products in the absence of the pipe H are largely carried off at the final outlet F without having been properly decomposed.

By the use of the two pipes the apparatus produces a more rapid circulation of the gases than heretofore, and the final outlet is maintained at a more equable temperature. The pipes and other portions of the apparatus are also greatly freed from tar accumulations due to condensed vapors in transit, since a greater proportion of the tar-vapors are decomposed by the intervention of the pipe F.

The action of the improved apparatus is as follows: The fixed carbon of the fuel is turned on the fire-grate to CO₂. The tar-vapors, both light and heavy, and some steam are injected into the incandescent fuel above or about the zone of combustion, where they are decom-

posed. The hydrogen passes off free, and the carbon combines with the dissociated oxygen, forming CO. Hence the whole or nearly the whole of the volatile portions of the fuel goes to the formation of a pure combustible gas, and only a portion of the carbon is burned by air. Consequently the amount of diluent nitrogen is reduced to a minimum.

With some forms of fuel it may be advisable in order to keep up the temperature of the apparatus to allow the less volatile portions of the gas which are drawn off by the pipe F to pass into the combustion zone of the furnace, and thus help in promoting the combustion and in maintaining the temperature necessary for fixing the lighter vapors. When what are known as "caking coals" are used, a supply of chalk, limestone, or the like is added, which tends to keep the fuel free and open without deteriorating the value of the gas-producer. The residual clinker in such cases when ground provides a useful mortar or cement.

The pipe G may have a branch G' at the top for the purpose of periodical blowing through, the outlet of such branch being fitted with a valve (not shown) for closing the branch when the producer is at work.

The lower end of each pipe G H is open and dips into the water seal of the ash-pit, so that any tar deposit carried over by the vapors fall into the ash-pit. This latter is formed in the earth and lined with concrete. The producer and grate are supported over it by suitable iron supports, and when at work the water seal serves to prevent the gas escaping, while it allows the clinkers, &c., to fall into the ash-pit, from whence it may be removed without

stopping the producer. Ash-pits of this kind are well known and form no part of my present invention.

What I claim is—

1. The combination in a producer of the character indicated of a vapor-circulating pipe and an injector therefor worked by steam for drawing off the lighter hydrocarbon vapors from the upper part of the producer and introducing the same into the incandescent fuel above the zone of combustion, and another vapor-circulating pipe and an injector therefor worked by steam for drawing off the less volatile or heavier hydrocarbon vapors and reintroducing the same into the incandescent portion of the fuel at the zone of combustion, substantially as herein set forth.

2. In combination, a producer with fuel-feed hopper and final gas-outlet, an inverted-V-shaped grate therefor, air and steam supply pipes for delivering air and steam below the said grate, an ash-pit over which the producer is placed and which is filled with water into which the lower part of the producer dips, a circulating-pipe opening into the producer at a point at the top of the generating-chamber and at a point slightly above the grate, and a further pipe opening into the producer at a point between the upper end of the other pipe and the final gas-outlet and at a point directly opposite the grate, both of the said circulating-pipes being open at their lower ends and dipping into the water in the ash-pit, substantially as set forth.

CHARLES WHITFIELD.

Witnesses:

ARTHUR GADD,

GEORGE FREDERICK GADD.