

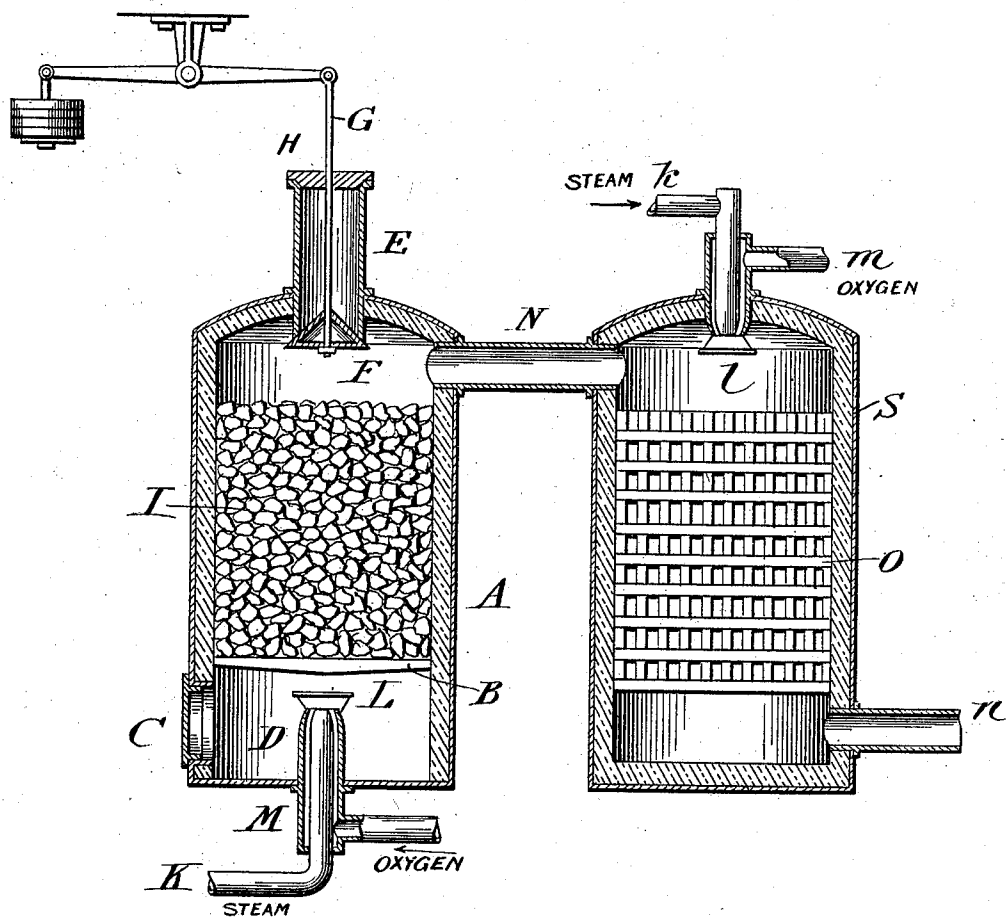
No. 746,452.

PATENTED DEC. 8, 1903.

C. F. BRUSH.
METHOD OF MANUFACTURING GAS.

APPLICATION FILED MAY 3, 1902.

NO MODEL.



WITNESSES
E. Nottingham
S. G. Nottingham

INVENTOR
Charles F. Brush
By H. A. Seymour
Attorney

UNITED STATES PATENT OFFICE.

CHARLES F. BRUSH, OF CLEVELAND, OHIO.

METHOD OF MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 746,452, dated December 8, 1903.

Application filed May 3, 1902. Serial No. 105,830. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES F. BRUSH, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in the Manufacture of Water-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.

My invention relates to the manufacture of water-gas; and it consists, broadly, in mixing with the steam customarily used for decomposition sufficient oxygen or air greatly enriched in oxygen to maintain the necessary temperature and make the process continuous, whereby a great economy of fuel is effected and the output of a gas-making plant largely increased.

In my improved process bituminous fuel is first heated by blowing with air or oxygen. Then steam mixed with oxygen or air greatly enriched in oxygen is passed through it. The steam is decomposed by the hot carbon, while the cooling effect of the reaction is counteracted by the combination of more carbon with the free oxygen. With the large excess of carbon always present this combination produces carbon monoxid only. The necessary temperature being maintained, the "run" is continuous, resulting in a greatly-increased output from a given generator in a given time as compared with the old process. The supply of oxygen mixed with the steam is preferably so regulated as to be just sufficient to maintain the necessary temperature in the generator. The temperature in the generator may be noted from time to time by observation through a peep-hole in its side or by means of a pyrometer and the relative proportions of steam and oxygen regulated accordingly. The regulation of the steam-supply and the oxygen-supply and of their relative proportions may be made manually or automatically. Automatic regulation of both steam and oxygen supply may be effected by means of a water-pump and an oxygen-pump driven by the same shaft or motor, the water passing through a heated coil of pipe and being converted into steam on its way to the generator, and automatic relative regulation of steam and

oxygen may be effected by varying the stroke of either pump through electrical agency controlled by a pyrometer located in the generator. This mechanism for the automatic control and regulation of steam and oxygen will form the subject of one or more future applications for Letters Patent and is hereby specifically reserved for that purpose.

The drawing herewith represents simple forms of apparatus for carrying on the process embodying my invention.

The primary generator A consists of a vertical iron cylinder of suitable dimensions—say eight feet in diameter and fifteen feet high—lined with fire-bricks and provided with a grate B, preferably adapted to be shaken by external means.

C is a gas-tight door for affording access to the ash-pit D and for the removal of ashes.

E is the feeding-neck of the generator, through which the supply of fuel is maintained. This neck is normally closed at its lower end by the hollow iron cone F, which, with its supporting-rod G, is counterpoised, as shown. The neck is also closed at the top by the loose cover H, through which the rod G passes freely.

In feeding the generator the cover H is raised, the neck E filled with fuel, the cover dropped, and the cone F lowered, whereby the neck full of fuel is dropped into the generator without any considerable ingress of air or escape of gas.

I represents the normal mass of fuel resting on the grate B to the depth of eight or ten feet. Steam is supplied from any suitable source through the pipe K and enters the ash-pit D in the form of a strong jet under the mixing-plate L. The necessary oxygen is supplied through the pipe M, which is concentric with the steam-pipe at its end. The concentric jets of steam and oxygen (a low velocity is sufficient for the latter) impinging on the plate L are effectively mixed and diffused in the ash-pit, whence they pass up through the incandescent fuel. Any other suitable device may be employed to effect the mixing of the steam and oxygen.

The water-gas formed by the action of the steam and oxygen on the incandescent fuel, as heretofore described, mixed with gaseous hydrocarbon, vaporized solid and liquid hy-

drocarbon, and ammoniacal products escapes through the outlet N into the secondary generator S. This consists of a vertical iron cylinder lined with fire-bricks, as before, and filled, except at its ends, with fire-brick "checker-work" O or with loosely-piled broken fire-bricks supported by a grate. The steam-inlet *k* and oxygen-inlet *m* are similar to those already described and are preferably placed at the top of the generator. The checker-work is first heated to a high temperature by the combustion of products from the primary generator in an abnormally large supply of oxygen. The products of combustion pass out of the generator through the gas-outlet *n* and may be diverted into a chimney during the preliminary heating period. The oxygen-supply is now reduced to its normal amount and thereafter so regulated that the proper temperature is maintained in the generator. In continued operation the normal and relative supply of steam and oxygen may be regulated manually or automatically by means of pumps, as hereinbefore indicated. During the normal operation of this generator the vaporized solid and liquid hydrocarbons while passing through the hot checker-work are thoroughly mixed with the steam. At the high temperature prevailing the chemical reaction necessary for their permanent gasification ensues. This reaction consists in the union of a portion of their carbon with the oxygen of the steam, resulting in carbon monoxid and hydrogen, the same as when solid fuel is used. The hydrocarbons thus robbed of a portion of their carbon are made permanently gaseous by this change of composition. They may be so far robbed of carbon by the use of sufficient steam that the resulting gas will consist almost wholly of carbon monoxid and free hydrogen, the hydrogen being derived from both the steam and the fuel. The

supply of steam may be regulated according to the character of gaseous product desired. The water-gas leaves the generator through the pipe *n* and passes thence to such apparatus as may be necessary for its cooling and purification and the recovery of ammoniacal products.

In the foregoing specification I have used the expression "oxygen or air greatly enriched in oxygen." In the following claims I will use the word "oxygen" as the equivalent of this expression.

The term "bituminous coal" is intended to include as equivalents all bituminous and carbonaceous fuel which remain solid below the temperature of decomposition, such as bituminous coal, lignite, peat, wood, &c.

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

1. The process of manufacturing water-gas, consisting in subjecting bituminous coal at a high temperature to the action of steam and oxygen, and simultaneously subjecting the distillate from the coal to the similar action of steam and oxygen, substantially as described.

2. The process of manufacturing water-gas, consisting in subjecting bituminous coal or equivalent solid fuel at a high temperature to the action of steam and sufficient oxygen to maintain the necessary temperature, and simultaneously subjecting the distillate from the fuel to the similar action of steam and oxygen, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES F. BRUSH.

Witnesses:

W. C. O'LEARY,
JOS. BUDD.