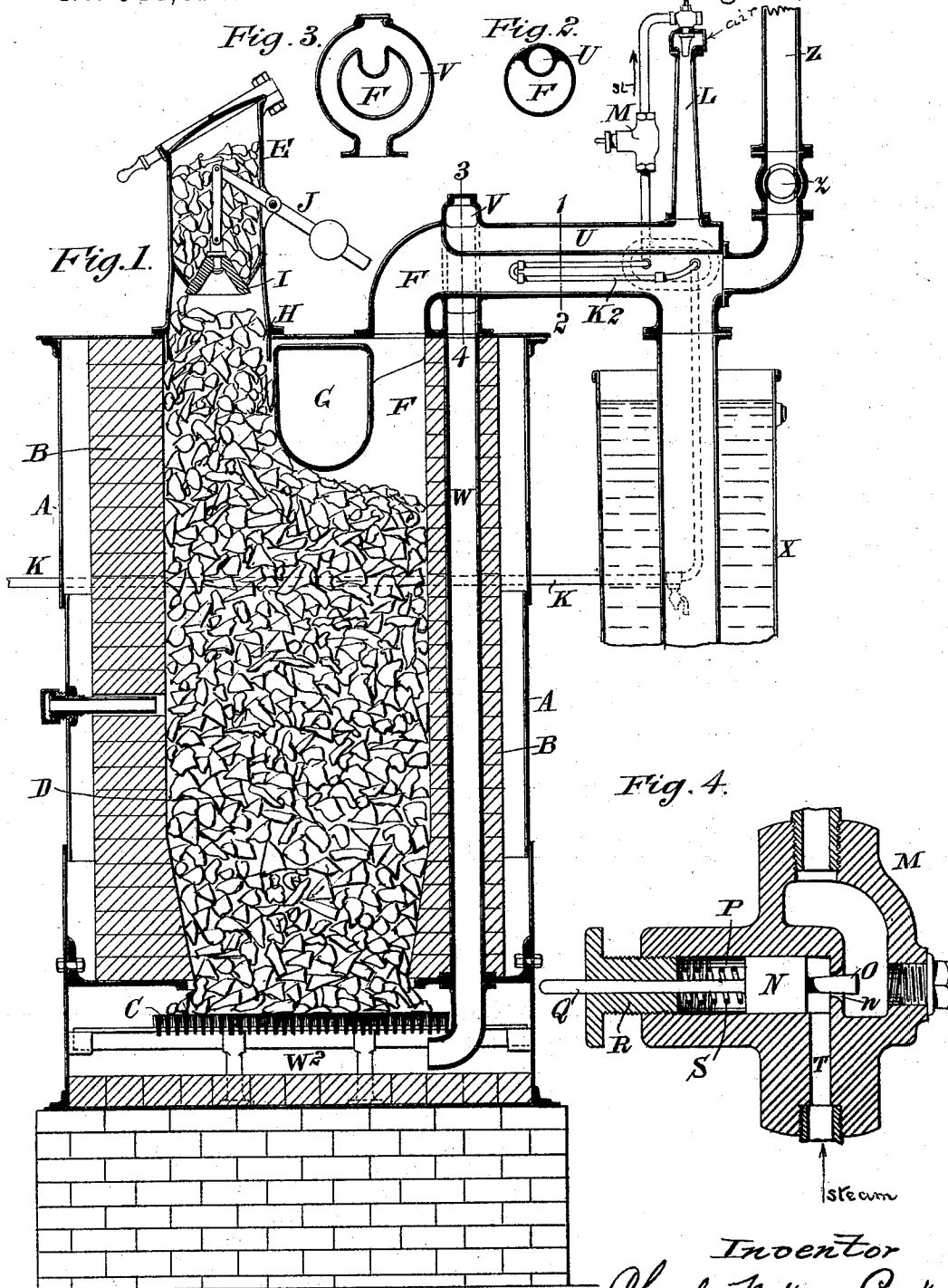


(No Model.)

C. W. PINKNEY.
APPARATUS FOR MANUFACTURE OF GAS.

No. 544,824.

Patented Aug. 20, 1895.



Witnesses
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 544,824, dated August 20, 1895.

Application filed December 21, 1894. Serial No. 532,583. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WILLIAM PINKNEY, engineer, a subject of the Queen of Great Britain and Ireland, residing at 77 Raglan Road, Smethwick, in the county of Stafford, England, have invented certain Improvements in and Apparatus for the Manufacture of Gas Suitable for use in Gas-Engines or for Heating Purposes, of which the following is a specification.

The object of my invention is to provide apparatus whereby gas suitable for use in gas-engines or for heating purposes can be produced economically and with facility and of even quality.

My said invention relates to the class of apparatus wherein superheated steam and air are forced through heated carbonaceous matter, so that the steam is decomposed and takes up carbon from the said fuel.

Hitherto considerable difficulty has been experienced in obtaining an even quality of gas owing to considerable variation in the proportions of the component gases constituting the gas produced, and it is the principal object of my invention to obviate this difficulty. I have found that in order to obtain a good result it is necessary to provide a practically constant depth of fuel in the furnace, and also to insure the proper heating of the fuel before the gases come in contact therewith inside the generator and to uniformly heat the steam and air as they pass to the generator containing the said fuel.

In an apparatus arranged according to my invention I provide the generator for containing the fuel with a hopper or supply opening for the supply of the fuel at the side of the upper part of the generator and with an outlet for the produced gases at the opposite side of the upper part of the generator with a deflecting block or deflecting blocks between the said hopper or supply opening and the outlet for the produced gases or equivalent means for separating the inlet for fuel from the outlet for the produced gases. I can then keep the hopper and passage into the generator and the generator, itself filled with fuel without detriment to the production of gas in the generator, and the attendant can readily ascertain and control the depth of the

fire in the generator, as the hopper-valve (which may be of the ordinary kind and be operated in the ordinary way) will when opened depress or touch the fuel underneath, and so indicate the depth of fire, the hopper being kept charged with fuel. The upper end of the hopper is closed by a valve or cover which can be opened, when required, by means of a lever. The deflecting block or blocks in the generator will cause the green fuel to pass down into the generator gradually or in proper proportion to the consumption of fuel, the said green fuel being raised in temperature on its way down to the lower part of the said block or blocks or the like, it (afterward and when in an incandescent or nearly incandescent state) occupying the portion of the generator across the outlet for produced gases, the depth of fuel between the fire-grate below and the outlet above, through which depth of fuel the steam and air pass, being thus kept constant, and the carbon is thereby prevented from being carried off in an imperfect condition or as an imperfect gas.

The hopper and the passage therefrom into the generator are of such a length that the green fuel is dried and heated before it comes in contact with the incandescent fuel, and the steam which results from this drying of damp green fuel may escape through an opening at the top of the hopper. It is necessary to insure good results to maintain a constant or practically constant pressure of steam from the boiler, as if the pressure, and consequently the temperature, diminishes it will take a proportionately longer time for the heated fuel in the generator to decompose the steam and consequently leave too little time for the resultant gases to properly mix with the carbon inside the generator, and the consequence is imperfectly-made gas. I have also found that when the steam comes in contact with the air which is supplied therewith to support combustion in the generator, even although the said air be somewhat heated, the steam is reduced in temperature, which is likewise an objection. To obviate these objections I cause the steam to pass on its way from the boiler to the steam-jet in the blower-box through an automatic regulating or reducing valve-box fitted with a piston having a conical projec-

tion, which acts as a valve controlling an opening, through which the steam passes to the blower-box. The piston slides in a portion of the valve-box which acts as a cylinder therefor, the said piston having a stem which passes through an adjusting nut or cover screwed into the said part which constitutes the cylinder, a spring being placed between the said nut and the piston. When steam enters the valve-box between the piston and the opening to the blower-box controlled by the aforesaid conical valve, the said steam moves the piston, compressing the spring and causing the conical valve to contract the area of opening for steam to pass to the blower-box. Thus when the pressure of the steam from the boiler rises, the conical valve will effect the requisite reduction of pressure, and if the pressure of the steam from the boiler falls the spring will act on the piston to cause the conical valve to increase the area of the opening for steam to the blower-box, and so the pressure of steam passing to the blower-box is kept practically constant. The adjusting nut or cover, by compressing the spring, will permit the valve to be set to the working-pressure desired. The steam before it reaches the blowing-jet passes through a U pipe or coil inside the outlet-pipe for the gases from the generator, and as the said U pipe or coil is kept at a high temperature by the said gases the steam is thus heated to an extent to compensate for the cooling effect of the air at the blower-box. The air can also be heated by causing it to pass over any of the heated surfaces of the apparatus on its way to the blower-box. After the steam and air meet at the steam-jet in the blower-box they pass through a pipe and along a passage which may be formed in or against the outlet-passage for the gases from the generator, so that the said steam and air are considerably raised in temperature thereby, and they then pass preferably around the said outlet-passage and into a pipe or passage which is kept at a high temperature by the incandescent fuel in the generator, and which pipe or passage leads the mixture of steam and air so superheated beneath the grate of the generator, where it diffuses and passes into the incandescent fuel and becomes decomposed and passes with the carbon taken up from the fuel out from the generator through suitable coolers and scrubbers or the like, and thence to the place of storage or utilization.

The outlet pipe or passage from the generator may be provided with a pipe or chimney controlled by a valve which is opened when the said pipe or chimney is to be used as a blow-off or in getting up heat initially in the generator.

In order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same

letters of reference indicating corresponding parts in all the figures.

Figure 1 of the drawings represents, in longitudinal vertical section, apparatus constructed according to my invention. Fig. 2 is a transverse section on the line 1 2, and Fig. 3 is a transverse section on the line 3 4 through the passages for gas from and steam and air to the generator; and Fig. 4 is a sectional elevation, drawn to a larger scale, of an automatic regulating or reducing valve for controlling the admission of steam to the generator.

The generator consists of an outer casing A, containing or lined with fire-brick or the like B, and provided at the lower end with a grating or fire-bars C, upon which the fuel D is supported. A hopper E is provided at the upper end of the generator, by which the fuel is fed thereinto, the said hopper being arranged near one side of the top of the generator, while the outlet F for the generated gas is arranged near the opposite side of the top of the said generator. A depending block or partition G is provided between the inlet for the fuel and the outlet for the gas, the said depending block forming between it and one side of the interior of the generator an elongated passage H, through which the fresh or green fuel passes into the generator, the said fresh or green fuel thus becoming heated and dried or brought to a suitable condition to enter the generator without detriment to the production of gas in the said generator.

The hopper E is provided with a valve I, operated by a weighted lever J, which valve when opened will depress or touch the fuel beneath, and so indicate the depth of fuel in the generator. In order that the green fuel may be thoroughly dried and heated to the desired temperature before coming into contact with the incandescent fuel and gas in the generator the hopper should not be allowed to be entirely emptied before being recharged.

The vapors due to moisture in the green fuel may be allowed to escape through an opening in the hopper or in the lid or cover thereof.

In order to obtain a good quality of gas by the decomposition of steam it is necessary that the steam be admitted to the incandescent fuel in the generator at a uniform or practically-uniform pressure and at a high temperature. The pipe K, by which the steam is conducted from a steam-generator, passes in the form of a coil K² through the gas-outlet F and terminates in a steam-jet in a blower-box L, between which blower-box and the coil K² the pipe K is provided with an automatic regulating-valve M. (Shown drawn to a larger scale in Fig. 4.) This regulating-valve consists of a piston N, having a conical or tapered projection or valve O, which controls a passage *n*, through which the steam passes to the nozzle and blower-box. The

piston N is fitted to slide in a chamber P in the valve-box and is provided with a stem Q, passing through a hole or passage in an adjusting nut or plug R, screwed into the chamber P behind the piston N, a spring S being interposed between the said piston and the plug R, so that by screwing the plug more or less into the chamber the spring S will be more or less compressed, so that the valve O may be set to the working-pressure of steam required. The steam entering the valve-box by the passage T moves the piston so as to more or less compress the spring S, according to the pressure of the steam, and so causes the valve O to close more or less the passage *n* for the steam to the blower-box L. Thus the pressure of steam entering the blower-box is maintained practically constant. The steam passing through the jet in the blower-box induces a current of air, which tends to cool the steam; but as the steam passes through the coil K² in the gas-outlet before reaching the blower-box it is heated to a sufficiently high temperature to compensate for the cooling effect of the air. The mixture of steam and air passes from the blower-box through a passage U in the gas-outlet F into an annular passage V, communicating with a passage W, passing down through the brick-work B of the generator C. The mixture of steam and air, in passing through the passages U, V, and W, becomes superheated and enters a chamber W² beneath the fire-bars C, in which chamber the said mixture of air and steam diffuses and passes thence into and up through the incandescent fuel in the generator, whereby the steam is decomposed into its constituent gases, and the air gives up its oxygen and nitrogen. The gas thus produced passes, with the carbon taken up from the fuel, through the outlet F, and may be conducted thence through any suitable cooling

apparatus—such, for example, as that shown at X—and therefrom through a scrubber, or through scrubbers, and thence to a gas-holder or place of utilization. 45

Z is a pipe in connection with the gas-outlet passage F and fitted with a valve *z*, which may be opened when it is required to use this pipe or passage as a blow-off or for getting up heat initially in the generator, the valve being closed when the apparatus is at work producing gas. 50

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is— 55

In an apparatus for the manufacture of gas, a producer having an inlet for the fuel at one side thereof and an outlet for the produced gas at the other side and provided with a depending partition or separator across the interior of the producer between the inlet for the fuel and the outlet for the produced gas, in combination with a steam pipe from the generator situated or in part situated in the outlet for the produced gas and communicating with a steam jet, an automatic valve in said pipe operated by variation in the pressure of the steam to regulate the supply thereof to said steam jet, an inlet for air in proximity to said steam jet, and a pipe or passage for the mixed steam and air, the said pipe or passage passing through the producer or its lining to the inlet for the mixed steam and air, to the producer, all substantially as and for the purposes hereinbefore described. 60 65 70 75

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

CHARLES WILLIAM PINKNEY.

Witnesses:

WILLIAM JOHN PARKINS,
WILLIAM HENRY HOWSE.