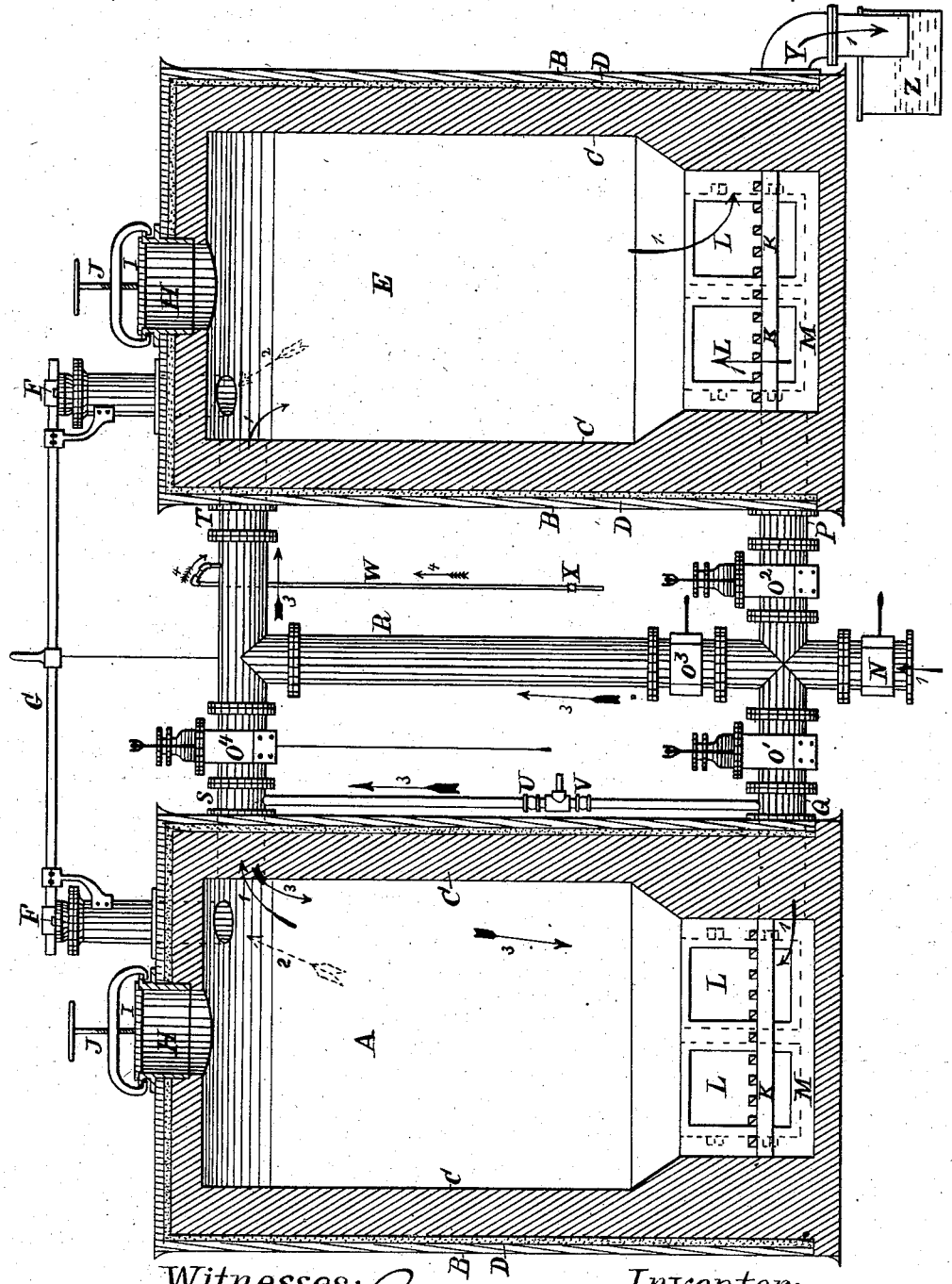
(No Model.)

H. C. SHIELDS.

PROCESS OF AND APPARATUS FOR PRODUCING ILLUMINATING AND HEATING GAS.

No. 259,723. Patented June 20, 1882.



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HENRY C. SHIELDS, OF TROY, NEW YORK.

PROCESS OF AND APPARATUS FOR PRODUCING ILLUMINATING AND HEATING GAS.

SPECIFICATION forming part of Letters Patent No. 259,723, dated June 20, 1882.

Application filed November 12, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SHIELDS, of the city of Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in the Process of and Apparatus for Producing Illuminating and Heating Gas, of which the following is a specification, reference being had to the accompanying drawing and letters of reference marked thereon.

My invention relates to the mode of applying heat to a mixture of water-gas and hydrocarbon vapors for the purpose of fixing and combining the same, also to the manner of connecting the generator and the superheater.

The drawing represents a vertical section of the apparatus, showing the various parts of my device.

Heretofore in the manufacture of what is known as "water-gas" two chambers containing fuel were employed, the fuel in one of these being heated by the combustion of the gases produced in the other. This is objectionable for the reason that the body of fuel where the gas is produced becomes too highly heated before the body of fuel in the other is sufficiently heated for the decomposition of steam, thereby decomposing the hydrocarbons to such an extent as to produce lamp-black. Also, two chambers containing fuel have been employed, the incandescent condition of the fuel being maintained by alternating the blast from one chamber to the other. This process is also objectionable on account of the large amount of atmospheric air being admitted during the production of the illuminating-gas, and the illuminating power of the gas is diminished by the nitrogen contained in the admitted air.

The object of the first part of my invention is to remove these difficulties by making separate fires in and using separate blasts to each chamber, to secure the incandescent condition of the carbonaceous materials in a short period of time. The fuel in the generator, being greater than that in the superheater, requires the largest amount of heat, while the fuel in the superheater, being less, requires less amount of heat, and is consequently more quickly heated; and by the employment of the independent fires and blasts I am enabled to heat the bodies of carbonaceous material independent of each other, at a great saving of fuel and time, without producing lamp-black or effecting the illuminating property of the illuminating-gas.

The object of the second part of my invention, which pertains more to the manner of connecting the generator and the superheater than to the apparatus as a whole, is to maintain a uniform temperature throughout the mass of fuel, and thereby prevent the formation of clinker.

A is the gas-generator, which consists of a casing, B, made of boiler-iron or other suitable material, and lined with some suitable refractory material, C.

D is a space filled with non-conducting material to prevent radiation.

E is the superheater, and in construction is similar to the generator.

F is an escape-valve for passage of the products of combustion.

G is a lever for manipulating the valve F; H H, the openings for introducing the fuel to generator and superheater; I I, the covers for same; J, the cutter-bars for securing the covers; K, the bearing and grate bars; L, the doors; M, the ash-pans; N, the air-valve in blast-pipe; O′, O^2, O^3, and O^4, the air and gas valves; P, the blast-pipe to superheater; Q, the blast-pipe to and gas-pipe from generator; R, the lower gas-outlet from the generator; S, the upper gas-outlet of generator; T, the gas-inlet to the superheater; W, the oil-pipe; X, the oil-valve; Y the gas-outlet of superheater; Z, the hydraulic seal; U and V, the valves for supplying steam to the top and bottom of the generator, respectively.

When it is desired to put this apparatus in operation I first build a fire on grate-bars K in the generator and superheater, the escape-valve F and door L being left open to allow a supply of air to the fuel and to permit the products of combustion to escape, as indicated by the dotted-line arrows marked 2. As soon as the fires are properly kindled in the generator and superheater fuel is introduced through the openings H until filled to the required height for the decomposition of steam in the generator A and for fixing and superheating the gases in the superheater E. In

the meantime, the doors L having been closed, a blast of air is introduced through the valve N and pipes P and Q to the ash-pans of the generator A and superheater E. The air then passes up through the coal, and the products of combustion escape through the valves F, and the blast is continued until the coal or other carbonaceous material attains the proper temperature. The air-valve N, escape-valves F, and valves O′ and O² are then closed and valve O⁴ in pipe S opened. Steam perfectly superheated is then admitted to the ash-pan of the generator through steam-valve V and pipe Q, and passes under and up through the grate-bars and fuel, becoming decomposed, and the escaping products—water-gas—pass out of the generator through pipe S and enter the superheater E through pipe T, as indicated by arrows marked 1, at a very high temperature. Just after admitting steam to the ash-pan of the generator, hydrocarbon-oil or other suitable material containing carbon—for example, petroleum or rosin—is admitted to the inlet-pipe T of the superheater through oil-valve X and oil-pipe W, as indicated by arrows marked 4, where it comes in contact with and is instantly vaporized by the hot gases from the generator, when the mixed gases, now consisting of hydrocarbon vapors and the gases produced in the generator, are passed down through the incandescent fuel contained in the superheater, where any carbonic-acid which may have escaped through the generator is converted into carbonic oxide and a thorough combination of all the gases effected. In the passage of the gas from the top of the superheater to the ash-pan and outlet-pipe Y at the bottom of the superheater every particle of it is brought in direct contact with the incandescent fuel, which insures it against condensation and loss of illuminating-power during storage and distribution, and is also a cheaper and much more effective way of applying heat than the methods heretofore employed, such as passing the gas through retorts or brick-work heated by radiation or otherwise. After considerable steam has passed through the generator A and gas through the superheater E, much heat has been absorbed, and it becomes necessary to restore it to both chambers. The proper time for doing so is determined by the appearance of the fuel, which can be seen through the bull's-eyes provided for that purpose. The steam-valve V, oil-valve X, and outlet-valve O⁴ of the generator are then closed, and the escape-valve F, air-valve N, also valves O′ and O², are opened, and the blast passes into the generator and superheater at the bottom, and the products of combustion then escape through valves F until the fuel in the generator and the superheater has again reached the desired temperature. The air-valve N and valves O′ and O² are then closed, also escape-valves F, and steam and hydrocarbon oil are admitted, as before described. When it is found that the fuel in the generator is at a higher temperature at its top than it is at the bottom the steam is admitted through steam-valve U into pipe S at the top of the generator, and is forced down through the fuel, the gas escaping through pipe Q, valves O′ and O³, and up through pipe R to inlet-pipe T of the superheater, as indicated by the arrows marked 3, when the hydrocarbon oil is introduced, and the balance of the manipulation the same as before described.

In reversing the charges of steam from the top to the bottom of the generator the formation of clinker is prevented to a great extent, as the temperature is kept equal throughout the entire mass of fuel. The same rule can be applied to advantage to the superheater; but for convenience I have only shown one inlet and one outlet.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The process of manufacturing a heating or illuminating gas which consists in heating independently the carbonaceous materials simultaneously in a generator and a superheater by separate blasts, and the direct internal combustion of the coal in each generator and superheater, then decomposing steam by passing it through one of the beds of the carbonaceous material, then carrying the escaping product—water-gas—forward and mingling it with hydrocarbon vapors, then passing the mixed gases through the other bed of carbonaceous material for fixing the gases, and finally conducting the same to the hydraulic main or seal, as hereinbefore set forth.

2. In combination with a gas-generator, the by-pass pipe R, pipes S and Q, and connecting steam-pipes U and V, with their connecting-valves, for the purpose of reversing the direction of steam into the generator and the escape of gas therefrom, substantially as set forth.

In witness whereof I have hereto set my hand this 1st day of November, 1881.

HENRY C. SHIELDS.

Witnesses:

WM. H. HOLLISTER, Jr.,

N. DAVENPORT.