No. 820,959. PATENTED MAY 22, 1906.

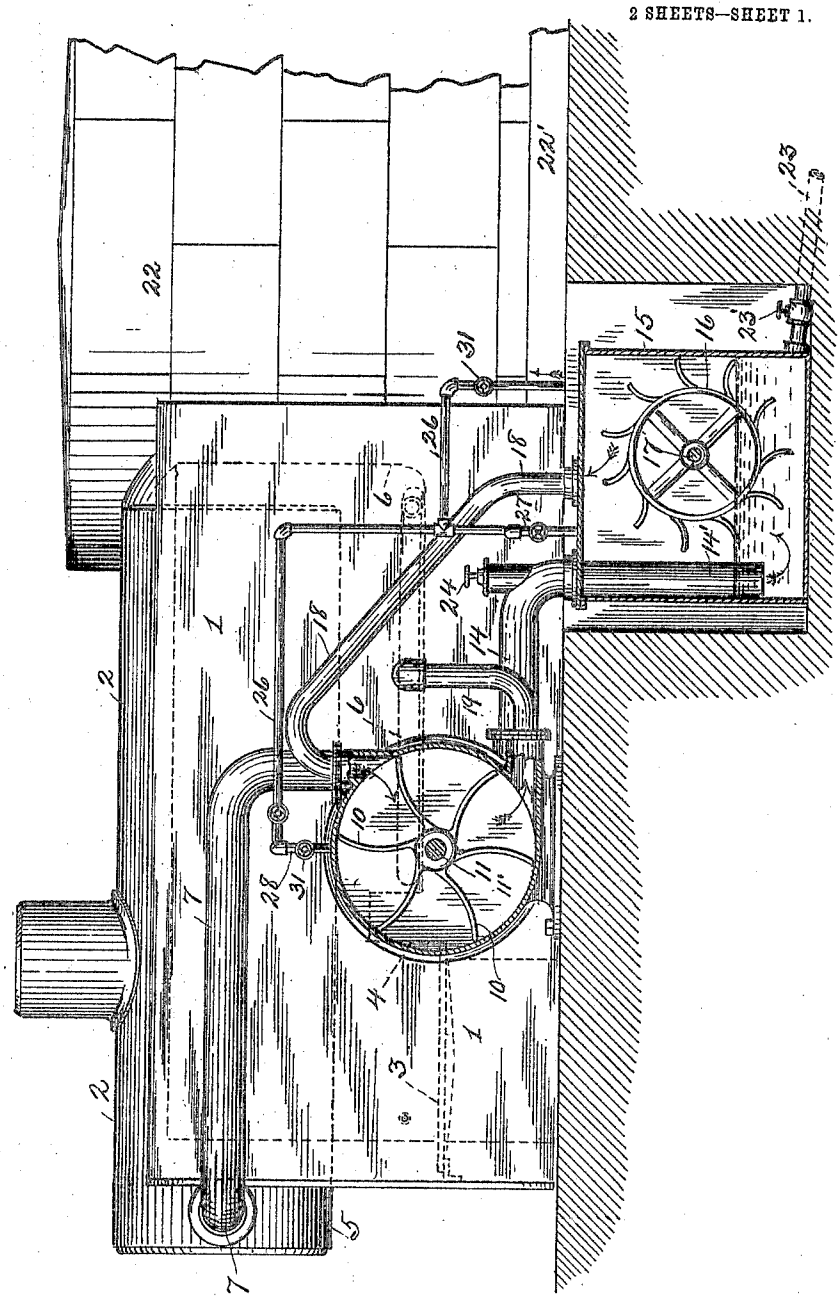
H. Y. B. DUFF.

GAS APPARATUS.

APPLICATION FILED APR. 21, 1905.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses:
Geo. B. Griffith
Frank Smith

Inventor:
Hugh. Y. B. Duff.
by his Attorney
M. E. Harrison.

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2 SHEETS—SHEET 2.

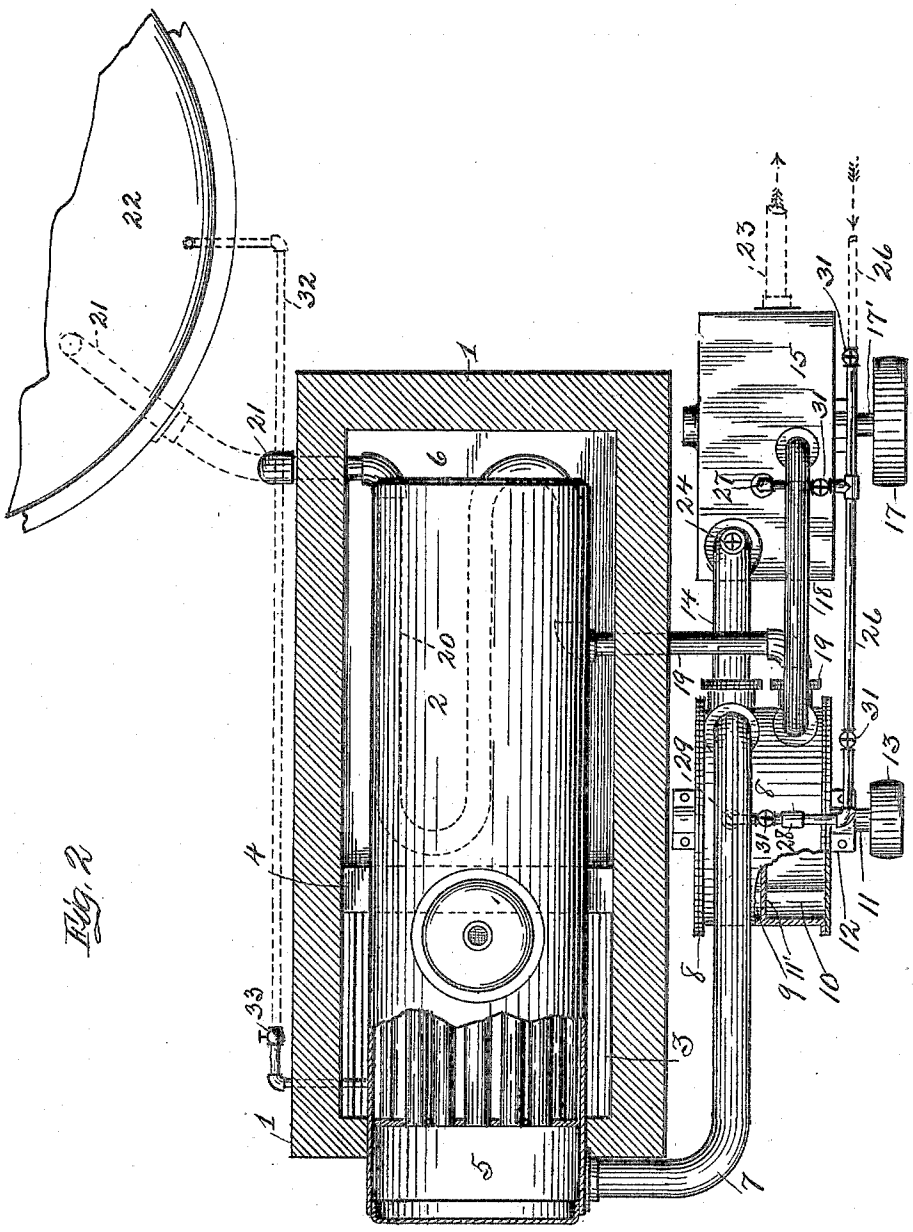

Fig. 2

Witnesses:
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UNITED STATES PATENT OFFICE.

HUGH Y. B. DUFF, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR TO A. Q. CARPENTER, JOSEPH STUART, JOHN McCUNE, WILLIAM Y. CADWALLADER, AND G. B. GRIFFITHS, INDIVIDUALLY AND AS TRUSTEES, ALL OF PITTSBURG, PENNSYLVANIA.

GAS APPARATUS.

No. 820,959. Specification of Letters Patent. Patented May 22, 1906.

Application filed April 21, 1905. Serial No. 256,714.

To all whom it may concern:

Be it known that I, HUGH Y. B. DUFF, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in an Apparatus for Converting the Waste Products of Combustion from Furnaces into Gas; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to an improved apparatus for the elimination of smoke in boiler and such other furnaces and the converting of such waste products of combustion into a commercial gas, the object being to provide means whereby the smoke and products arising from a furnace where coal or other gaseous fuel is used may be passed through purifiers and such other apparatus necessary to convert the same into a gas and collecting and storing said gas for future use; and the invention consists in forming a smoke-chamber in connection with said furnace, a means for removing and forcing said smoke through water or other purifying substance and at the same time create a draft to aid combustion in the furnace, a means for removing this gaseous product from said purifiers, a means for drying the gas and finally storing the same in a suitable holder; and the invention further consists in the certain details of construction and combination of parts, as will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a side elevation of an ordinary boiler-setting, showing my improved apparatus in connection therewith, a part of the said apparatus being shown in section the better to show the inner working parts. Fig. 2 is a plan view, a portion of the boiler and setting being in section.

To construct an apparatus in accordance with my invention and adapt the same for use in connection with a furnace of a steam-generator such as shown in the accompanying drawings, said furnace comprises the boiler-setting 1, in which the boiler 2 is supported, the fire-chamber fitted with the grate 3, a bridge-wall 4 at the back of said chamber, the smoke-flue 6, leading to the return-flues of said boiler in a manner well known in the art. Arranged at the front of the boiler 2, inclosing the exit ends of the flues thereof, is a smoke-receiving compartment or receptacle 5, adapted to receive all the products of combustion arising from the consumption of the fuel in the fire-chamber 3 below. Placed at one side of the boiler-setting 1 or at any other convenient point is a double blower or suction-fan 8, the one side of which is connected by a pipe 7 to the smoke-receptacle 5. These fans are arranged in a suitable casing 8, the one fan 9 separated from the other, 10, by a partition-wall 11′, the said fans being mounted in bearings 12 upon a common shaft 11 and driven by a pulley 13. One of these parallel-arranged fans 9 is for the purpose of drawing the products of combustion from the smoke-receptacle 5 through the medium of the pipe 7 and force the same by pipe connection 14, the other end 14′ of which is submerged in a body of water placed in a tank 15, forming a part of the apparatus for purifying and separating the combustible gases or valuable products from the non-combustible portions mingled therewith. This washer or purifier consists of a tank 15, in which an agitating-wheel 16 is placed, the said wheel being mounted on a shaft 17′ and given a slow rotatable movement by means of a pulley 17, and the said tank fitted with a water connection 27, a drain-pipe 23, and regulating-valve 23′ and 31. The supply-pipe 26, furnishing the water to the different parts of the apparatus, is connected by branches 28 and 29 to the two fans or blowers 9 and 10, and suitable stop-valves 31 arranged to regulate the supply thereto. The water connections 28 and 29 enter their respective chambers from the top and the water therefrom injected in the form of a spray or mist and is used for the purpose of cooling and precipitating the heavy sediment of the products of combustion. An air siphon-valve 24 is located in the pipe 14, leading from the fan 9 to the tank 15, for the purpose of introducing a certain amount of air with the products passing through said pipe.

Leading from the top of the tank 15 is a

pipe 18, which enters the top of the second fan-casing 10 and is used to remove the partially-purified gases from said tank and discharge the same, through the medium of said fan 10 and an exit-pipe connection 19, into and through a heating-coil 20, the said coil being located at the back of the bridge-wall 4 and is heated to a high temperature from its close proximity to the fire-chamber 3. This heating-coil 20 will superheat the gas passing through the same and is connected by a pipe 21, entering and discharging into a suitable gas-holder 22, the said holder being of any well-known construction and of a capacity sufficient to store a considerable quantity of gas. From this holder 22 the gas contained therein may be conducted by pipes 32 to points or places requiring its use or may be conducted to the fire-chamber 3 to aid and reduce the consumption of the fuel in said chamber.

It will be noticed from the above description, taken in connection with the accompanying drawings, that I have produced a stackless furnace, and while I have demonstrated the working principle with a boiler-furnace the same apparatus may be used with equal success in connection with any other furnace, either for the single purpose of eliminating the smoke arising from such furnaces or for the double purpose of eliminating the smoke and the saving of such combustible gases as may be contained therein.

In the operation of the above-described furnace and apparatus connected thereto it is first necessary to obtain some independent power outside or separate from the boiler 2 in order that the parallel fans 9 and 10 may operate to withdraw the products of combustion from the freshly-started fire in the chamber 3 to give the same a proper draft. When this has been accomplished and a sufficient quantity of gas has accumulated in the holder 22, the apparatus may be put in full working power by utilizing such gas to drive an ordinary gas-engine connected by belts to the pulleys 13 and 17. These fans being set in motion will siphon the smoke from the receptacle 5 and by passing the same through the purifier and heater producing a combustible gas, which when properly utilized will economize and save a large percentage in the consumption of fuel.

The apparatus as above described may be used in connection with blast-furnaces to save ore-dust or may be used in connection with the boiler-furnaces of ocean-going steamers and prevent what is known as "torching."

It is obvious that various modifications and changes may be made in the details of construction without departing from the spirit of the invention. Thereore I do not wish to confine myself to that shown and described.

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

1. In a furnace using a gaseous fuel such as bituminous coal, comprising a smoke-receptacle connected to said furnace, a pipe leading from said receptacle, a fan or blower connected to said pipe, the free end of which is submerged in water, a means comprising a coil of pipe arranged within the said furnace for superheating the gases passing through the fan or blower, and a means for spraying water into the said fan-chamber, as described.

2. In a furnace using a gaseous fuel such as bituminous coal, the combination comprising the smoke-receptacle, connected to said furnace, a pipe leading from said receptacle, a fan or blower connected to said pipe, an exit-pipe from said fan, an air-valve in said pipe, a gas-washer comprising a tank and agitator for the water therein, a pipe leading from said tank to a second fan or blower, whereby the gaseous contents of said washer may be removed to a gas-holder.

3. In a furnace using a gaseous fuel such as bituminous coal, the combination comprising a smoke-receptacle connected to said furnace, a pipe leading from said receptacle, a fan or blower connected to said pipe, an exit-pipe leading from the fan-chamber, an air siphon-valve in said pipe, a gas-washer consisting of a tank with inclosed agitator, a pipe leading from said tank to a second fan or blower, and a pipe leading from said second blower to a heating-coil arranged in connection with the furnace, as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

HUGH Y. B. DUFF.

Witnesses:
CLARA I. HOUSTON,
O. H. HENSEL.