

(No Model.)

W. L. TETER.
BOILER FURNACE.

No. 499,054.

Patented June 6, 1893.

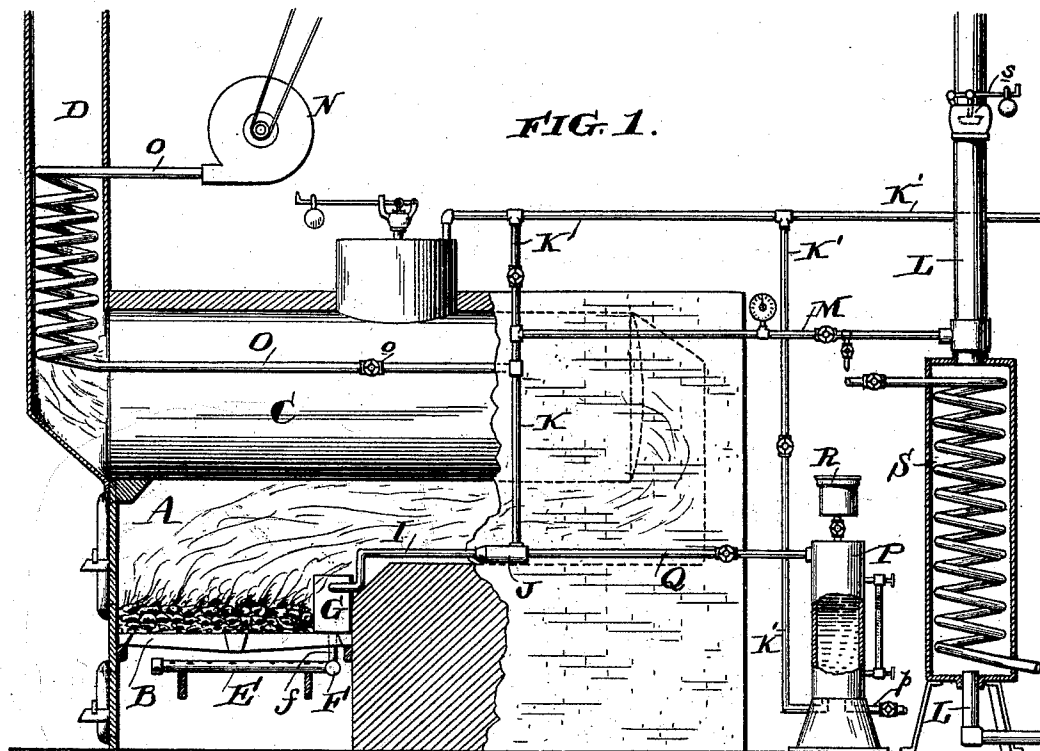
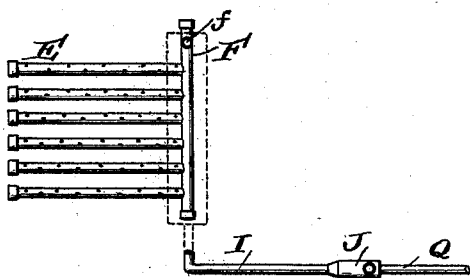
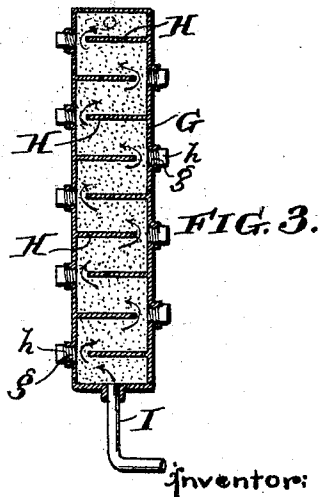


FIG. 2.



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by his atty.

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UNITED STATES PATENT OFFICE.

WILLIAM L. TETER, OF PHILADELPHIA, PENNSYLVANIA.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 499,054, dated June 6, 1893.

Application filed September 7, 1891. Serial No. 404,967. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. TETER, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Boiler-Furnaces, of which the following is a specification.

My invention relates to furnaces for the generation of heat, and consists of certain improvements which are fully set forth in the following specification and are shown in the accompanying drawings which form a part thereof.

It is the object of my invention to produce a convenient and efficient furnace for employing hydrocarbon gas or vapor as a source of heat either by itself or as an auxiliary for the purpose of producing a more perfect combustion of the ordinary fuel employed.

In carrying out my invention I employ certain novelties in the construction and arrangement of the parts whereby the live or exhaust steam of an engine may be mixed with hydrocarbon and introduced into the burners after being thoroughly mixed and gasified. In connection with the steam and oil superheated air may be employed as is more fully set forth hereinafter.

In the drawings: Figure 1 is a side elevation with part in vertical section of a steam boiler furnace embodying my invention. Fig. 2 is a plan view of the burner pipe, and Fig. 3 is a horizontal sectional view of the mixing and superheating chamber.

A is the combustion chamber of the furnace.

B is the fire grate which may be used when ordinary fuel is employed.

C is the boiler.

D is the smoke outlet or stack.

E is a burner located preferably under the grate B and consisting of a series of perforated pipes connecting with a main pipe F.

G is a superheating and mixing chamber in which the oil, air and steam are thoroughly mixed and superheated so as to be converted into a gaseous form. This superheating and mixing chamber is preferably located immediately above the grate B, and may be filled with refractory material such as broken fire brick.

H is a series of partitions within the cham-

ber G to cause the gas to pass more fully through the refractory material and come in contact with a greater area of surface. The refractory material may be inserted in the chamber G through apertures *g* therein, which may be closed and sealed by plugs *h*. The chamber G is connected with the burner through a pipe.

I is a pipe leading from an injector J to the chamber G, by which the mixture is led to the chamber G.

K is a steam pipe for conveying steam to the injector J. This pipe K connects with the exhaust pipe L of the engine through the valved pipe M. It may also connect with the boiler C to supply live steam to the injector J through a valved steam pipe K', as shown.

N is a blower for forcing air into the pipe O which connects with the steam pipe K preferably below the point of junction of the pipe K and the exhaust pipe M.

The pipe O passes through the smoke outlet or stack adjacent to the outer end of the boiler preferably in the form of a coil whereby the air therein may be superheated before it is mixed with the steam in the pipe K.

The pipe O may be provided with a valve *o*. P is an oil reservoir, the upper portion of which is connected with the injector J through a valved pipe Q. The steam pipe K' is connected with the bottom of the reservoir P to supply steam thereto to force out the oil from the reservoir into the pipe Q. The water of condensation from the steam in the bottom of the reservoir holds the oil at the top.

p is an outlet for water of condensation.

R is a supply tank for supplying oil to the reservoir P.

S is the hot water heater of the engine exhaust pipe L, and *s* is the usual back pressure valve.

The injector J may be of any convenient well known construction.

While I prefer the minor details of construction which are shown I do not limit my invention to them as it is apparent that they may be varied in many ways without departing from it.

The exhaust steam with an initial pressure equal to that produced by the back pressure valve *s* passes from the exhaust pipe L through

the pipe M into the pipe K where it is mixed with superheated air from the pipe O. This mixture of exhaust steam and superheated air enters the injector J and passes into the pipe I drawing with it a quantity of oil from the reservoir P. This mixture of steam, air and oil enters the chamber G and in passing through it becomes thoroughly mixed and gasified, in which condition it reaches the burners.

In starting the furnace ordinary fuel may be employed upon the grate B to generate enough steam to start the necessary circulation and to heat the superheating and mixing chamber. The fire upon the grate B may be discontinued however when the apparatus is fully in operation. When however the vapor or gas from the burners is to be employed as an auxiliary, it is used with the ordinary fuel upon the grate for the purpose of producing a more perfect combustion thereof, and thus obtaining a greatly increased heating effect with a less quantity of fuel. The mixture of steam and oil enters the chamber G and being subjected to the very high degree of heat by the combustion of the fuel upon the grate becomes thoroughly mixed and transformed into a gaseous condition. The oil is thus transformed into volatile hydrocarbon and reacting with the decomposed steam forms combustible gases which pass down through the pipe *f* to the burners E, and emerging therefrom below the body of incandescent fuel upon the grate are evenly distributed throughout the area thereof and are burned with the fuel upon the grate producing a more complete combustion and great heating effects. In practice a portion of the steam is usually not decomposed in the chamber G, and these undecomposed portions of the steam after emerging from the pipes E pass up through the body of the incandescent fuel and by contact therewith are converted into hydrocarbon and carbon monoxide and together with some of the hydrocarbon gases pass through the body of the fuel and are consumed in the space immediately above the same.

The particular construction of the chamber G is immaterial to the present invention.

When desired live steam direct from the boiler may be used through the pipe K, either to assist the exhaust, or as a substitute for the exhaust when the engine is shut down.

The chamber G in addition to its function as a mixing and superheating chamber, serves also to equalize the pressure in the burner E.

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

1. The combination of a boiler and its furnace, a grate in the furnace, a burner located immediately under the grate, a superheating and mixing chamber located within the furnace and above the grate and connected with the burner, an oil reservoir, a steam exhaust pipe, and pipes connecting the exhaust pipe

and oil reservoir with the superheating and mixing chamber, whereby the grate may be employed with ordinary fuel to start the generation and circulation of the steam to generate a gas and introduce the same from the burner under the grate.

2. The combination of a boiler and its furnace, a grate in the furnace, a burner located immediately under the grate, a superheating and mixing chamber located within the furnace and above the grate and connected with the burner, an oil reservoir, a steam exhaust pipe, pipes connecting the exhaust pipe and oil reservoir with the superheating and mixing chamber, a blower and an air pipe leading from the blower to the pipes which lead to the superheating and mixing chamber for introducing air to said pipes and passing through furnace so as to superheat the air before it is introduced into said pipes, whereby the grate may be employed with ordinary fuel to start the generation and circulation of the steam to generate a gas and introduce the same from the burner under the grate.

3. In a furnace for generating heat by the combustion of fuel upon a grate, the combination with the fuel supporting grate, of a mixing and superheating chamber for generating gas located above the grate and at the rear portion thereof so as to be subjected to the products of combustion passing from the fuel on the grate, oil and steam pipes leading to said chamber to supply oil and steam thereto, a burner located immediately under the grate so as to be directly under the fuel thereon, and a connection between the burner and the chamber for generating gas, whereby the oil and steam are converted into a gas in the generating chamber and then in a gaseous form pass to the burner and thence to the fuel upon the grate and are burned therewith.

4. In a furnace for generating heat by the combustion of fuel upon a grate, the combination with the fuel supporting grate, of a burner located immediately under the grate so as to be close to the fuel contained thereon and consisting of a series of perforated pipes, a superheating and mixing chamber for generating a gas located above the grate and at the rear thereof, a connection between the gas generating chamber and the burner, and pipes to supply oil and steam to the gas generating chamber.

5. In a furnace the combination with the bridge wall, of a fuel supporting grate, a superheating and mixing chamber for generating a gas located above the grate and close to the bridge wall so as to leave substantially the entire upper surface of the grate unobstructed for the reception of coal, a burner consisting of a series of perforated pipes located immediately under the grate and extending under a substantial area thereof, so as to supply gas to all parts of the fuel upon the grate, a connection between the burner and gas generating chamber, and pipes to supply steam and oil to the said chamber.

6. The combination of a furnace and boiler, a superheating chamber located in the combustion chamber of the furnace, a furnace grate, a burner located below the grate and
5 connected with the burner, an injector, a pipe leading therefrom to the superheating chamber, an oil reservoir, a pipe leading from the oil reservoir to the injector, a steam pipe leading to the injector, and a hot air pipe
10 connecting to the steam pipe before it reaches the injector, whereby a mixture of hot air and steam enters the injector and draws the oil from the reservoir, and a mixture of hot air, oil and steam passes from the injector through the pipe leading therefrom into the superheating chamber within the combustion chamber
15 of the furnace.

In testimony of which invention I have hereunto set my hand.

WILLIAM L. TETER.

Witnesses:

ERNEST HOWARD HUNTER,
S. T. YERKES.