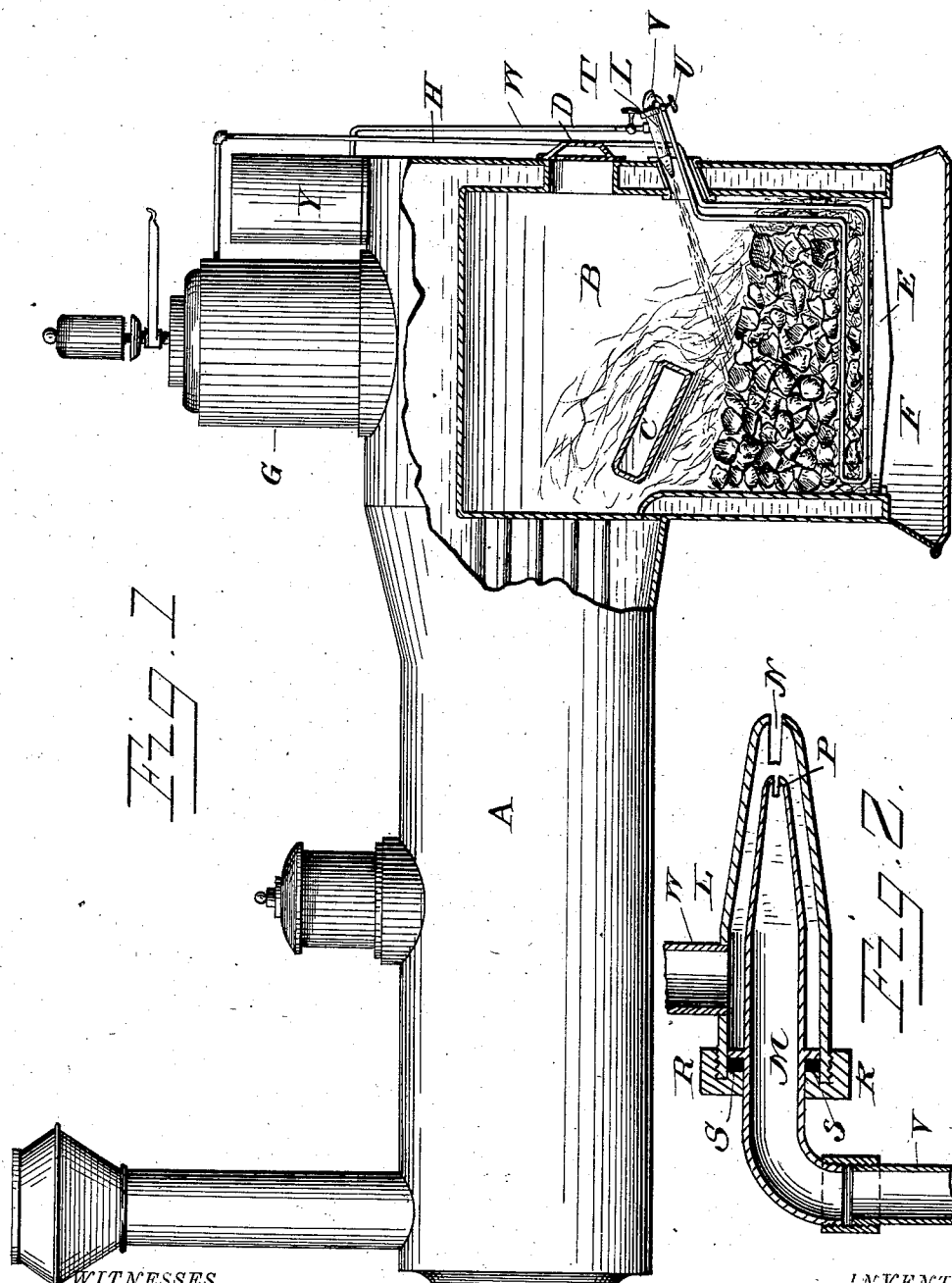


(No Model.)

B. SLOPER.
HYDROCARBON FURNACE.

No. 259,934.

Patented June 20, 1882.



WITNESSES
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HYDROCARBON-FURNACE.

SPECIFICATION forming part of Letters Patent No. 259,934, dated June 20, 1882.

Application filed March 21, 1882. (No model.)

To all whom it may concern:

Be it known that I, BYRON SLOPER, of the city, county, and State of New York, have invented a new Improvement in Hydrocarbon-Furnaces, of which the following is a specification.

This invention relates to certain improvements in the manner and mode of decomposing steam in conjunction with carbonaceous material for heating purposes, and is especially designed to furnish a means for heating steam-boilers, although it may be employed for other purposes where high temperatures are required.

In the manner heretofore employed the steam with liquid hydrocarbon is injected in a stream into a body of ignited fuel located in a retort in the fire-box of the furnace. It has been found impracticable, however, to thoroughly distribute and utilize the heat when thus produced, for the reason that the gaseous products of combustion pass directly off from the retort into the escape or eduction flue of the boiler without being brought into contact with the lower portions thereof, or portions forming the walls of the fire-box, which are technically known as the "water-legs."

It has been proved by practical experience that the most effective steam-generating portions of a boiler, especially a locomotive-boiler, are the sides or walls immediately inclosing the fire-box, where there is the most intense heat, and hence in all cases it is important that the heat should be concentrated at such place when water-legs are employed for this purpose. It has been found heretofore that an auxiliary boiler has been necessary to start the generation of steam to commence the generation of the combustible gases, and it is one of the objects of my invention to obviate the use of such auxiliary boiler and make provision whereby the boiler to be heated may supply the steam necessary for the generation of the gases. I have discovered that if the steam is superheated to a very high degree and brought into intimate contact with the carbonaceous material in the fire-box, in conjunction with liquid hydrocarbon in a thin stratum directly beneath the fire-bridge the steam may be decomposed and the gases more effectually utilized

than heretofore, thus enabling me to entirely dispense with retorts.

My invention is designed to obviate the objections enumerated above and furnish certain means whereby the superheated steam, in conjunction with liquid hydrocarbons, may be thoroughly distributed throughout the body of the material directly in the fire-box of the furnace in such manner as to utilize the full heating capacity of the resulting products of combustion.

My invention further has for its object to utilize the heat for the carbonaceous material to superheat the steam to be decomposed by causing the steam to pass immediately under the bed of solid fuel in the fire-box, as more fully hereinafter described.

My invention still further has for its object to provide an improved injector whereby the steam and atomized fuel may be spread in a broad, thin stratum over and throughout the most extended body of solid ignited carbonaceous material, as more fully hereinafter set forth.

These objects I attain by the means illustrated in the accompanying drawings, in which Figure 1 illustrates a longitudinal vertical section of a horizontal steam-boiler, showing my invention applied thereto. Fig. 2 is a detached sectional view of the improved injector which I employ.

The letter A indicates a horizontal steam-boiler of the ordinary construction, and B the fire-box thereof, with the usual fire-bridge, C.

D designates the door of the fire-box, which is at its usual location.

E indicates the grate, and F the ash-pit, which is constructed in the ordinary manner and provided with a door or damper, as commonly employed.

The letter G designates the steam-dome of the boiler, from which extends a pipe, H, which passes down under the fuel, which pipe may be provided with a protective covering of asbestos or other refractory material. The pipe is continued through the furnace in the form of a number of return-bends, as indicated in Fig. 1 of the drawings, and then passes outward through the front of the fire-box, and connects with the inner shell of an injector, the outer

shell of which is connected with a suitable liquid-fuel supply tank, Y, by means of which liquid hydrocarbon may be fed to the injector.

The injector is composed of two concentric shells, L M, having transverse slots N P at their extremities, which lie in the same horizontal plane, so that when the superheated steam is discharged through the inner shell it will by induction carry and force a proper quantity of liquid hydrocarbon into the fire-box in a thin, broad stratum similar to the discharge of gas in a "bat-wing" burner, so as to bring the gases and vapors into instant and immediate contact with the ignited fuel and thoroughly heat the water-legs, sides, and effective steam-generating portions of the boiler.

The letter R indicates a screw-nut located on the screw-threaded rear end of the outer shell of the injector, and S a packing interposed between such nut and the inner shell, whereby provision is made for adjusting the inner and outer shells with respect to each other for the proper induction of the liquid hydrocarbon.

The operation of my invention is as follows: An ordinary fire is built in the fire-box, the ash-pit door being open for draft. When sufficient steam is generated to start the injector the ash-pit door is closed to stop any further consumption of the solid fuel, and the steam is then admitted through the pipe leading from the steam-drum through the fire-box and into the inner shell of the injector, through which it passes out of the opening into the outer shell, into which the liquid fuel is fed, atomizing the same, forcing it out of the outer nozzle, in conjunction with the steam, in a broad, thin stratum, directly upon the carbonaceous material in the fire-box, where the superheated steam and liquid hydrocarbon are instantaneously decomposed into hydrogen and carbonic oxide.

My improved burner, constructed as above described, so as to deliver the heating gases and vapors in a thin stratum over and through the fuel, will cause the gases to strike the sides of the fire-box, thus distributing the heat at the most effective place.

The injector is provided with valves T U, by means of which the admission of superheated steam and hydrocarbon may be regulated.

The current of combined hydrocarbon and superheated steam, in a broad, thin sheet, as discharged from the bat-wing injector, is projected obliquely upon the surface of the incandescent fuel immediately below the fire-

bridge, and the nascent gases generated are ignited, deflected, and caused to spread laterally and directly against the water-legs and the fire-bridge of the furnace while burning, thus subjecting the water-legs at the sides to an intense heat. The steam is admitted through the pipe V and the hydrocarbon through a pipe, W, leading from a liquid-fuel reservoir, Y, located on the top of the boiler or at any other convenient point.

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

1. A steam-boiler provided with a fire-bridge, water-legs, and a bat-wing hydrocarbon-injector, slotted as described, whereby liquid fuel, in connection with superheated steam, may be projected into the fire-box, directly below the fire-bridge, in a broad, thin stratum, so as to heat the boiler throughout, substantially as specified.

2. In combination with a bat-wing injector and the water-legs of the boiler, the steam-pipes, covered with refractory material, and passing above the grate-bars back and forth horizontally directly through a body of incandescent material, whereby the steam is superheated and passed directly in a superheated state to the liquid-fuel injector, and discharged, in conjunction with the liquid hydrocarbon, in a broad, thin sheet, forwardly and laterally immediately onto the incandescent fuel directly beneath the fire-bridge, substantially as and for the purposes specified.

3. The combination, with the outer cylindrical shell of the injector, of the inner cylindrical shell, the two having coincident transverse slots, as described, for the purpose of delivering the combustible gases in a lateral as well as forward direction, or in a bat-wing jet, to the water-legs, as specified.

4. In combination with the outer and inner shells of the injector, having coincident transverse slots, as described, the nut embracing the inner shell and secured by a screw-thread to the outer shell, and the interposed packing, arranged as set forth.

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

BYRON SLOPER.

Witnesses:

CHAS. D. DAVIS,
J. J. MCCARTHY.