H. Everett,

Hydrocarbon Furnace.

No. 79,563. Patented July 7, 1868.

Fig. 1

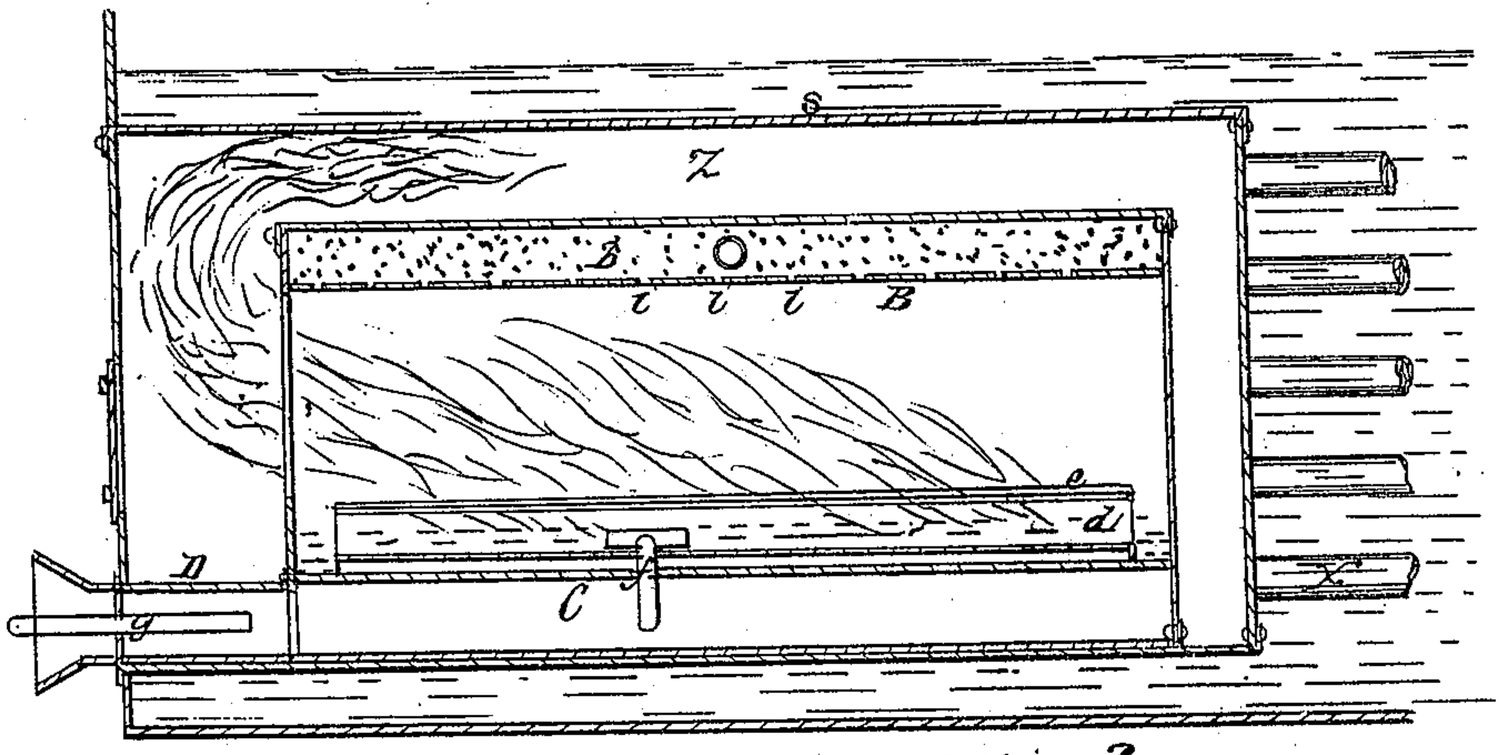
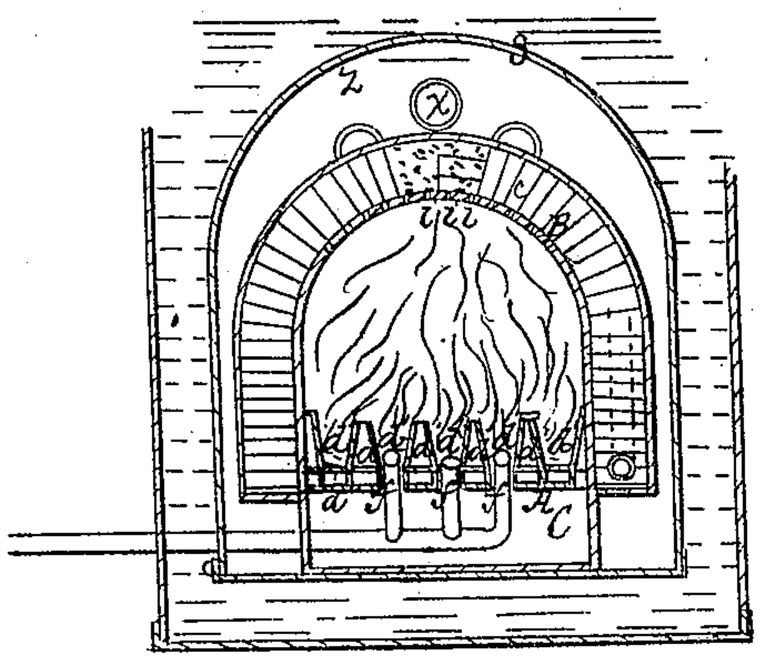
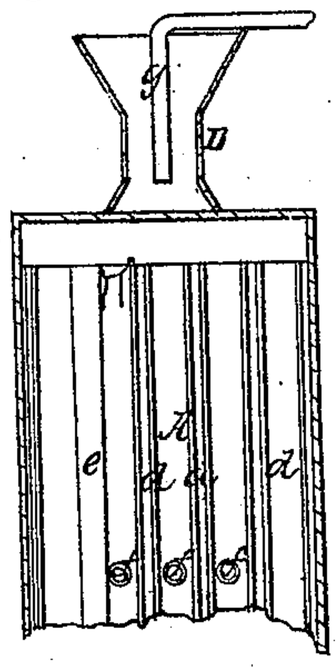


Fig. 3

Fig. 2





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HARRIE EVERETT, OF NEW YORK, N. Y.

Letters Patent No. 79,563, *dated July* 7, 1868; *antedated February* 8, 1868.

IMPROVEMENT IN HYDROCARBON-BURNERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, HARRIE EVERETT, of New York, in the county and State of New York, have invented a new and useful Improved Liquid-Fuel Furnace; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which drawing—

Figure 1 represents a longitudinal section of this invention.

Figure 2 is a transverse section thereof, and

Figure 3 is a partial horizontal section of the same.

Similar letters indicate corresponding parts.

The nature of my invention consists in the construction of a furnace for burning petroleum and other liquid hydrocarbons, in the generation of steam, for the smelting of ores, and for other purposes, in such a manner as to secure the most perfect combustion of said fuel, as well as the production and maintenance of the highest degree of temperature, while at the same time the supply of the fuel to the furnace is easily regulated, and the greatest economy thereof secured.

In order that the principal features of this invention may be more prominently set forth, it is proper here to state that only two distinct modes of burning the above-named ingredients have been patented or tried, namely, the "retort" or vaporizer, and the open or surface-burning systems. In the first, the material is led into a close vessel or retort, volatilized by the application of heat, then discharged and burned as a gas or vapor. This method has been found, in practice, to be attended with danger, and the interior of the retort soon becomes encrusted by the heavier products of the oil adhering to and burning on it, whereby the vaporization becomes gradually slower, and the fire from the jets gradually dies out. The "surface-burner," though superior to the other, and of more general application, possesses several radical defects, such as the escape of a large percentage of unconsumed combustible matter, there being no suitable method of arresting and retaining the same for complete combustion. This bears directly upon the question of the economy of using hydrocarbons as a fuel.

As the result of several years' experience in all the various methods of burning the above ingredients as fuel, I have demonstrated most conclusively that the greater the degree of heat maintained in and around the apparatus when working, the less oil is consumed in proportion to produce given results.

It is well known that none of the contrivances hitherto patented can maintain a continuous heat of more than about 300°, while, in order to reach the point of greatest economy and perfect combustion, there should be continually prevailing a temperature of as many thousand degrees of heat. To secure this and other important results is the object of my liquid-fuel furnace.

Avoiding the defects and retaining the merits of the other systems, I secure, by this combination, all that is valuable in both, with other and new results of the most satisfactory character. I am thus enabled to demonstrate the superiority of hydrocarbons over coal, for economy, convenience, bulk, &c., as a steam fuel for metallurgic and many other purposes.

I will now describe my said method and apparatus more particularly, with the manner of constructing and working the same.

The appearance of the apparatus as a whole resembles an oblong letter, ▭, resting upon its flat side. The lower or flat part A is the burner proper, while the semicircular portion B, joined with the other, constitutes the combustion-chamber of the furnace. Both parts may be made of ordinary fire-brick or fire-clay, or any material capable of resisting intense heat, and of retaining or reflecting heat without transmitting it. The upper portion B should always be made of this or similar material, while, for all ordinary purposes, the lower part A may be made of cast iron or other metal, as the blast thrown against this part is always sufficient to prevent melting. The style and shape of either part will depend upon the uses and places in which it is to be put. The two sections, when united, form a complete combustion-chamber. For some uses, it will be found

desirable to have the opening or outlet *a*, for the flame and heat, at one end or one side only; for other purposes, at both ends or sides.

The upper segment of the combustion-chamber proper is constructed to form a hollow chamber, *b*, which here constitutes the crown of the arch, and occupies about one-tenth of the elongated semicircle described by the walls of the furnace, and runs longitudinally through the entire structure, as shown at *b*, fig. 1. Into this chamber I conduct either steam or atmospheric air, by means of one or more pipes *c*, which steam or air speedily becomes superheated, and is discharged into the burning mass below, through jets or openings pierced in the upper interior portion of the furnace, which forms the floor of the rarefying-chamber *b*. Perfect combustion is thus facilitated, and the heat thereby intensified.

By filling this chamber from time to time with iron filings, coke, or other material, which, when heated and supplied with water or steam, will assist in producing hydrogen gas, I also secure favorable results in intensifying heat and economizing fuel. Access to this chamber, whenever it may be deemed desirable to supply it with these hydrogen-generating substances, may be had by arranging a small movable section in front, in the direction of lines *v*, fig. 1, or at any other convenient point.

Arranged substantially as above, the desideratum so long sought for is attained, viz, the presence in the combustion-chamber of several thousand degrees of heat, and consequently the economical and perfect combustion and utilization, without waste, of all the elements of heat of which the ingredients used are capable.

If used in a boiler, the grate-bars should be removed, and the apparatus put in their place should only occupy so much space as to leave ample room on both sides and top, and generally at the back, for the flame and heat to impinge and act upon all the tubes, flues, and entire water-surface of the boiler.

Special care should be taken that sufficient room be left between the combustion-chamber and front of the fire-box, so that the flame may issue and spread without coming in contact with the fire-door. As a guide in constructing the apparatus, due regard being had to proportions, its actual oil-surfaces, including also the air-spaces of the burner part, need not exceed one-third of the ordinary grate-surface. As a general rule, this is applicable to all cases and uses to which the liquid-fuel furnace may be applied.

The upper surface of the base of the combustion-chamber or the burner-plate A, as shown at fig. 3, when said base is constructed of metal, resembles a large pan, with a number of corrugations or hollow ribs, *d*, which, being open at top, and still wider open at bottom, serve as air-channels and alternate burner-grooves, which, having elevated rims to prevent the escape of oil, admit a full supply, and an intermixture of oxygen with the oil at the earliest point of combustion. For instance, in a fifteen-horse-power boiler, two superficial feet of oil and air-surface or interior space would be quite sufficient for the burner. Three corrugations or ribs, at equal distances therein, two inches high, with a continuous slot or opening, of five-eighths of an inch at top and seven-eighths underneath, and with the rim or outer upright portion of the pan or burner one-half inch higher, to secure the escape of unconsumed oil through the air-slots, and not in front, should an excess be accidentally admitted to the burner-surface, and a three-inch flange on each side, to be inserted in the brick-work, will be about right, and, in connection with the drawings, answer as a guide in constructing an apparatus for any purpose whatever.

The refractor *e*, as seen in the drawing, is of cast iron or other material, in T-shape, and is fastened on and rests over the ribs, extending its sharp edge slightly down into the air-channel or slot. This is for the purpose of dividing the current of air, and for causing it to turn down and intermingle more intimately with the free carbon at the point of ignition. There should be usually about half an inch of clear air-space allowed under either side of each refractor. Between the air-ducts, channels, or slots, at any point along the longitude of the slotted plate A, issue the oil-supply pipes, *f*. It may be better if these ends or branches terminate with a T, as shown at *f*, fig. 1, for the better delivery of the oil, all being regulated by one supply-pipe and one stop-cock outside.

When preferable, the supply of oil may be through the sides or ends of the burner-plate, near the bottom, instead of issuing directly through the bottom, as shown at *f f f*, fig. 3.

Pieces of broken fire-brick, about the size of a small chestnut, or pieces of any similar material, in one or more layers, placed in the channels of the burner, form a good burner-surface, although not essential to success.

The air-chamber *c*, underneath, may be made of cast, plate, or sheet iron, of suitable depth, of similar width and length of the burner-plate, and attached thereto, air and steam-tight, by any suitable means, substantially as shown in the drawings. Into this is set an air-duct or funnel, D, which extends outward sufficiently to secure a strong draught, through which funnel is led a steam-pipe, *g*, to promote the draught, essentially as shown in fig. 3, or in any other manner to effect the same purpose. Through this pipe a jet of steam may be discharged, when required to increase the draught, as well as to agitate and refract or spray the hydrocarbon from its position on the burner-plate throughout the entire combustion-chamber. It is also arranged and contemplated to use and take a blast from an air-holder, or from any air-forcing machine, with but slight change, in case a greater supply is required for heating ores, metals, and for any purpose whatever.

In the heating, smelting, and manufacture of the various ores and metals, as well as for numerous other purposes, a pure flame and most intense heat are necessary. It is the object of this invention to furnish those requisites, and, by the variety of its forms and facility of adaptation, to meet every requirement of human industry, when an efficient heating-agent may be required.

By means of the annexed drawings and foregoing explanations, the whole process and application being so very simple and plain, almost any person may be able to construct and operate my burner.

Constructed and arranged substantially as above, the necessary connections with an elevated oil-tank and with steam being made, with the ordinary stop-cocks in the intervening pipes, the whole apparatus is ready to be put in operation.

This is done by simply turning the oil-cock, permitting a small quantity to flow into the channels of the burner, then lighting it with a candle or piece of lighted paper or shaving. If it be desired to heat up with great rapidity, a forced blast is to be applied in one of the methods herein provided for.

Special care must be taken that all doors or openings through which air may enter, except through the funnel D, be hermetically tight, as very much depends on the draught and the manner of admitting it.

The approximate amount of oil being burned, and the degree of heat produced or desired, may always be seen by noting the color of the flame through a small eye-hole or pane, of mica or other indestructible transparent substance, directly in front of the burner. Very slight observation will enable any person to regulate all this with great accuracy.

As soon as the furnace has become well heated, the proper proportions of the ingredients admitted may be readily arranged, the gauges set, and the whole left to run with but the slightest attention.

The red smoky flame indicates the presence of unconsumed carbon, and contains the least heat, and even the pure white flame is not the hottest. The oxyhydrogen flame, slightly carburetted, of a thin, bluish-silvery color, emitting no smoke or vapor from the chimney, indicates the point of greatest economy in fuel, perfect combustion, and most intense heat. This accomplished, the process and apparatus may be considered in perfect working operation.

In using my furnace, constructed as described, as a steam-generator, it is inserted in the front part of the boiler, the interior water-line of which is shown at *s*, and a portion of the flues of which are seen in the rear of the furnace in figs. 1 and 2. The chimney, being situated in the rear of the boiler, the flame is drawn backward, over and around between the exterior surface of the furnace D and the fire-surface of the boiler, at *z*, thereby exposing extensive boiler-surfaces to the action of the intense heat generated by the combustion of the liquid fuel.

What I claim as new and useful, and desire to secure by Letters Patent of the United States, is—

1. A liquid-fuel furnace, constructed substantially as described, and as and for the purposes specified.

2. The combustion-chamber B, in the form of an elongated semicircle, constructed of fire-proof material, and supplied with the rarefying-chamber *b* and the pipe or pipes *c*, for admitting air or steam thereto, the whole forming the upper portion of a liquid-fuel furnace, in combination with the corrugated and slotted burner-plate A, forming the base thereof, the whole arranged substantially as and for the purposes specified.

3. The refractor *e*, for dividing and distributing the jets of team or currents of air, arranged substantially as and for the purposes set forth.

4. The mode, herein described, of admitting and employing liquid fuel, air, and steam through and upon the burner-plate A, together with superheated air or steam admitted through the rarefying-chamber *b*, for the purpose of facilitating the combustion of said fuel, the whole arranged substantially as described.

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Witnesses:

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